



सत्यमेव जयते

**National Commission for Allied and Healthcare Professions**

**COMPETENCY BASED CURRICULUM**

for

# “NUTRITION AND DIETETICS”



**As per the NCAHP Act -2021**

# APPROVED SYLLABUS 2025

Ministry of Health & Family Welfare

NATIONAL COMMISSION FOR ALLIED AND HEALTHCARE PROFESSIONS  
राष्ट्रीय सहबद्ध और स्वास्थ्य देख-रेख वृत्ति आयोग

स्वास्थ्यम् सर्वार्थसाधनम्  
NCAHP  
Since-2021



## Contents

Contributors to drafting and reviewing	-	3
List of Abbreviations	-	4
Chapter 1: Introduction to the Handbook	-	7
Who is an Allied and Healthcare Professional	-	7
Scope and need for allied and healthcare professionals in the Indian healthcare system	-	8
Learning goals and objectives for allied and healthcare professionals	-	9
Introduction of salient elements in allied and healthcare education	-	14
Competency-based curriculum	-	15
Promoting self-directed learning of the professionals	-	16
Credit Hours	-	16
The integrated structure of the curriculum	-	17
Introduction of Foundation course in the Curriculum	-	17
Learning methodologies	-	18
Assessment methods	-	19
Chapter 2: Methodology of Curriculum Development	-	21
Chapter 3: Background of the Profession	-	24
Statement of Philosophy– Why this profession holds so much importance	-	24
About Nutrition and Dietetics	-	25
Education of the Nutrition and Dietetics	-	26
Becoming a Nutritionist / Dietitian	-	26
Entry requirements	-	26
Nomenclature	-	26
Course duration	-	27
Courses in Graduation	-	27
Courses in Post-Graduation	-	27
Exit exam/Licensure exam	-	28
Teaching faculty and infrastructure	-	28
Scope of Practice	-	29
Overview of current Nutrition and Dietetics Science practice	-	29
Desirable Dietitian-Patient Ratio	-	31
Recognition of Title and Qualification	-	31

Career Advancement Scheme	-	32
Job Availability	-	32
Levels of careers in Clinical fields, Academics, Research and Industry	-	35
Chapter 4: Model Curriculum of Nutritional Sciences	-	47
Background	-	47
Bachelor of Nutrition and Dietetics	-	49
Introduction	-	49
Eligibility for admission	-	50
Duration of the course	-	51
Medium of instruction	-	52
Attendance	-	52
Assessment	-	52
Curriculum Outline	-	53
Curriculum Mapping & Credit Management	-	54
Internship guidelines	-	224
Master of Nutrition and Dietetics	-	241
Eligibility for admission	-	241
Duration of the course	-	241
Medium of instruction	-	241
Attendance	-	241
Curriculum Outline	-	242
Assessment	-	304
PhD guidelines	-	305
Chapter 5: Competency Standards for Entry Level into the Profession of Nutrition and Dietetics in India	-	313
Chapter 6: Job Description for all levels	-	342
Minimum Standard Requirement	-	342
Library details	-	355
References	-	356

## Contributors to Drafting and Review

### Nutrition and Dietetics Taskforce

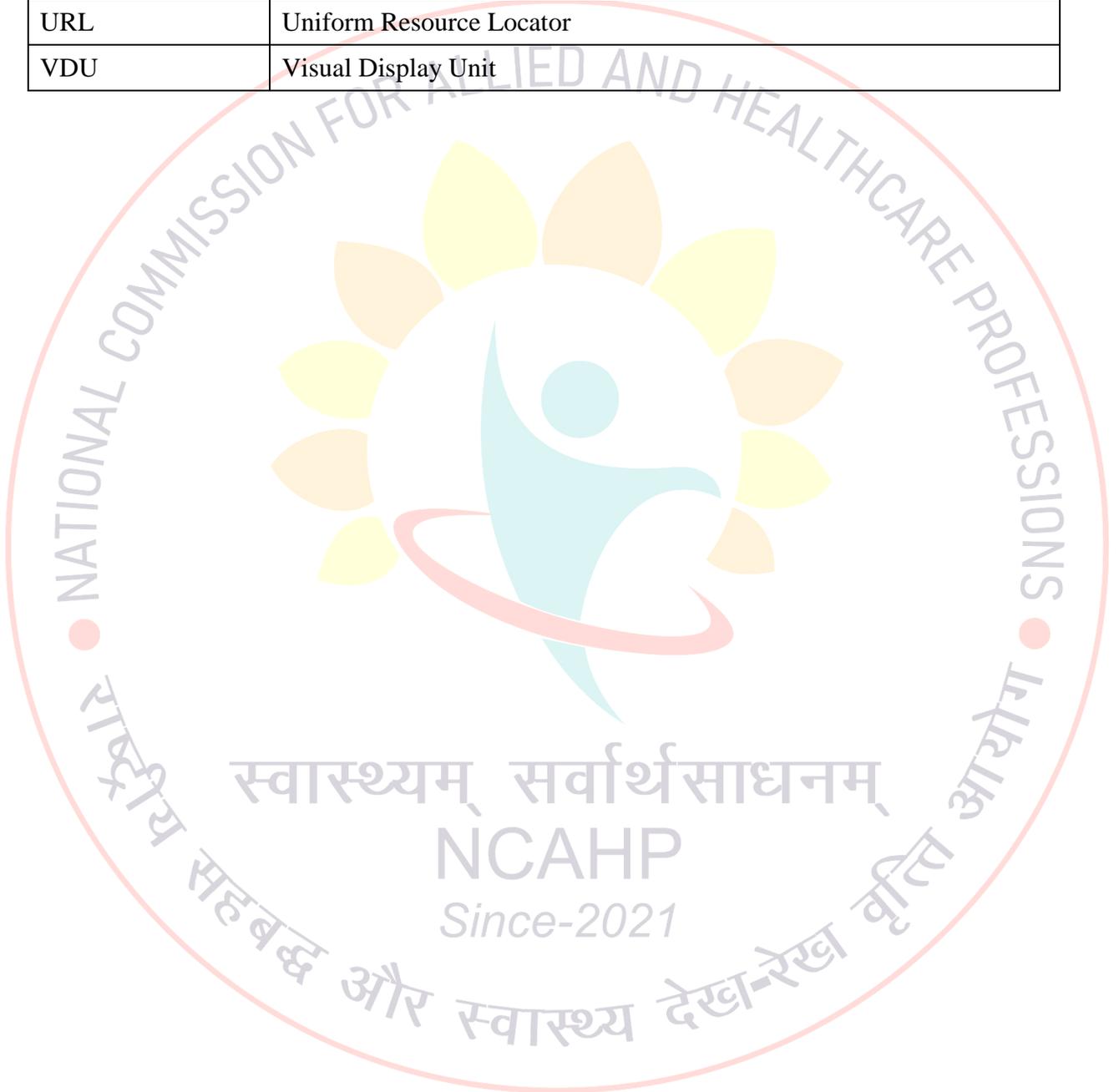
1. Dr. Parmeet Kaur, Chief Dietician, Department of Dietetics, All India Institute of Medical Sciences. New Delhi  
Interim Commission Member in ICAHP, MOHFW, Govt. of India.
2. Ms Beena Mathew. Former Senior Dietician, NIMHANS, Bangalore. Interim Commission Member in ICAHP, MOHFW, Govt. of India.
3. Dr. Vanisha Nambiar, Professor, Co-ordinator- Public Health Nutrition- Research and Training, Department of Foods and Nutrition, Faculty of Family and Community Sciences, Deputy Director, Office of International Affairs, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat
4. Dr. Jagmeet Madan, Principal, Professor, Director, Research and Development Centre, Sir Vithaldas Thackersey College of Home Science (Empowered Autonomous Status) SNDTWU, Mumbai
5. Dr. Kanika Varma, Professor and Head, Department of Home Science, University of Rajasthan, Jaipur
6. Dr. Kausalya, Professor, Department of Food Science and Nutrition, Avinashilingam University for Women, Coimbatore, Tamil Nadu
7. Dr. Lakshmi Jagarlamudi, Former Associate Dean, College of Community Science, University Head Department of Food Science and Nutrition and Member Board of Management Acharya N G Ranga Agricultural University, Andhra Pradesh
8. Dr. Kiran Bains, Dean, College of Community Science, Punjab Agricultural University, Ludhiana.

## LIST OF ABBREVIATIONS

ACEND	Accreditation Council for Education in Nutrition and Dietetics
AHP	Allied and Healthcare Professional
AI	Artificial Intelligence
AWS	Anganwadi Centre
BMI	Body mass index
BND	Bachelor of Nutrition and Dietetics
CATS	Credit Accumulation and Transfer System
CBCS	Choice-Based Credit System
CBD	Case-based discussion
CEX	Case Evaluation Exercise
CGPA	Cumulative Grade Point Average
CL	Credit for Lecture
CME	Continuing Medical Education
CNE	Continuing Nutrition Education
CNV	Copy number variations
CP	Credit for Practical
CPU	Central Processing Unit
DNA	Deoxyribonucleic acid
DOPs	Direct observation of procedures
EAR	Estimated Average Requirement
ECTS	European Credit Transfer System
ENA	Essential Nutrition Actions
FFA	Free fatty acids
GALT	Gut Associated Lymphoid Tissue
GRS	Genetic Risk Scores
HACCP	Hazard Analysis and Critical Control Points
IBD	Irritable Bowel Syndrome
ICAHP	International Community for Alternative and Holistic Professionals
ICDA	International Confederation of Dietetic Associations
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research

ICT	Information and communication technology
ICU	Intensive Care Unit
IECT	Information Electronics and Communication Technology
LAN	Local area network
LL	Lifelong Learning
MAM	Moderate acute malnutrition
MASLD	Metabolic dysfunction-associated steatotic liver disease
MNA	Mini Nutrition Assessment
MND	Masters of Nutrition and Dietetics
MOUs	Memorandum of Understanding
MUAC	Mid-upper arm circumference
MUST	Malnutrition Universal Screening Tool
NAAC	National Assessment and Accreditation Council
NCAHP	National Commission for Allied & Healthcare Professions
NCD	Non-communicable diseases
NEET	The National Eligibility cum Entrance Test
NFHS	National Family Health Survey
NHM	National Health Mission
NIN	National Institute of Nutrition
NNMB	National Nutrition Monitoring Bureau
NSS	National Social Service
NSSO	National Sample Survey Organisation
OPD	Outpatient Department
OPSE	Objective Structured Practical Examination
OSCE	Objective Structured Clinical Examinations
OSLER	Objective Structured Long Examination Record
HP	Hours for Practical
RAC	Research Advisory Committee
RDA	Recommended Dietary Allowance
RNA	Ribonucleic acid
RTC	Ready to cook
RT	Ready to eat
SAM	Severe acute malnutrition

SDGs	Sustainable Development Goals
SDL	Self-directed learning
SGA	Subjective Global assessment
SNP	Single nucleotide polymorphism
UGC	University Grants Commission
URL	Uniform Resource Locator
VDU	Visual Display Unit





## Chapter 1

### Introduction to the Handbook

The report 'From Paramedics to Allied Health Professionals: Landscaping the Journey and Way Forward' which was published in 2012, marked the variance in education and training practices for the allied and healthcare courses offered by institutions across the country. This prompted the Ministry of Health and Family Welfare to envisage the creation of national guidelines for the education and career pathways of allied and healthcare professionals, with a structured curriculum based on skills and competencies. Thus, this handbook has been designed to familiarize universities, colleges, healthcare providers as well as educators offering allied and healthcare courses with these national standards.

Individually created for different professional groups of allied and healthcare, this handbook aims to reduce the variation in education by comprising a standardized curriculum, career pathways, nomenclature, and other details for each profession. The change from a purely didactic approach will create better-skilled professionals and improve the quality of overall patient care. In the absence of a national standard-setting authority, this handbook can also guide the thousands of young adults who choose healthcare as a profession – not as doctors or nurses but to play several other critical roles – on the appropriate course of action to enable them to be skilled allied and healthcare professionals of the future.

### Who is an Allied and Healthcare Professional?

The Ministry of Health and Family Welfare, accepted in its entirety the definition of an allied and healthcare professional based on the aforementioned report, though the same has evolved after multiple consultations, and the recommended definition is now as follows-

'Allied and healthcare professionals (AHPs) include individuals involved with the delivery of health or healthcare-related services, with qualification and competence in therapeutic, diagnostic, curative, preventive, and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialists), nurses, and public health officials to promote, protect, treat, and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.

Since the past few years, many professional groups have been interacting and seeking guidance on all those who would qualify under the purview of “allied and healthcare professionals”. Currently, the Government is regulating the allied and healthcare system by NCAHP Act, 2021. However, this number of allied and healthcare professions is subject to changes and modifications over time, particularly considering how quickly new technologies and new clinical avenues are expanding globally, creating newer cadres of such professionals.

### **Scope and need for allied and healthcare professionals in the Indian healthcare system**

The quality of medical care has improved tremendously in the last few decades due to the advances in technology, thus creating fresh challenges in the field of healthcare. It is now widely recognized that health service delivery is a team effort involving both clinicians and non-clinicians and is not the sole duty of physicians and nurses. Professionals who can competently handle sophisticated machinery and advanced protocols are now in high demand. Diagnosis is now so dependent on technology, that allied and healthcare professionals (AHPs) are vital to diagnosis and successful management.

Effectiva delivery of healthcare services depends largely on the nature of education, training, and appropriate orientation towards community health of all categories of health personnel, and their capacity to function as an integrated team. As the Indian government aims for Universal Health Coverage, the lack of skilled human resources may prove to be the biggest impediment in its path to achieving targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to a significant reduction in the cost of care, the Indian healthcare system still revolves around the doctor-centric approach. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the population. However, many examples assert the need for skilled allied and healthcare professionals in the system, such as in the case of stroke survivors, it is the support of AHPs that significantly enhances their rehabilitation, and long-term treatment ensures a return to normal life. AHPs also play a significant role in caring for patients who struggle mentally and emotionally in the current challenging environment and require mental health support; and help them return to well-being. Children with communication difficulties, the elderly, cancer patients, patients with long-term conditions such as diabetes, people with vision problems, and amputees; the list of people and potential patients who benefit from AHPs is indefinite.

Thus, the breadth and scope of the allied and healthcare practice varies from one end to another, including areas of work listed below:

1. Across the age span of human development from neonate to old age;
2. With patients having complex and challenging problems resulting from systemic illnesses such as in the case of diabetes, cardiac abnormalities/conditions, and elderly care to name a few;
3. Towards health promotion and disease prevention, as well as assessment, management, and evaluation of interventions and protocols for treatment;
4. In a broad range of settings from a patient's home to a community, primary care centers, tertiary care settings; and
5. With an understanding of the healthcare issues associated with diverse socio-economies and cultural norms within the society.
6. To provide management and rehabilitative therapies to patients/ individuals where non-surgical treatments are indicated or advocated.

#### **Learning goals and objectives for allied and healthcare professionals**

The handbook has been designed with a focus on performance-based outcomes at different levels. The learning goals and objectives of the undergraduate and graduate education program will be based on performance expectations. They will be articulated as learning goals (why we teach this) and learning objectives (what the students will learn). Using the framework, students will learn to integrate their knowledge, skills, and abilities in a hands-on manner in a professional healthcare setting. These learning goals are divided into nine key areas, though the degree of required involvement may differ across various levels of qualification and professional cadres:

1. Clinical care
2. Communication
3. Membership of a multidisciplinary health team
4. Ethics and accountability at all levels (clinical, professional, personal and social)
5. Commitment to professional excellence
6. Leadership and mentorship
7. Social accountability and responsibility
8. Scientific attitude and scholarship (only at a higher level- PhD)
9. Lifelong learning

## 1. Clinical Care

Using a patient/family-centered approach and the best evidence, each student will organize and implement the prescribed preventive, investigative, and management plans; and will offer appropriate follow-up services. Program objectives should enable the students to:

- 1) Apply the principles of basic science and evidence-based practice
- 2) Use relevant investigations as needed
- 3) Identify the indications for basic procedures and perform them in an appropriate manner
- 4) Provide care to patients – efficiently and in a cost-effective way – in a range of settings, and maintain foremost the interests of individual patients
- 5) Identify the influence of biological, psycho-social, economic, and spiritual factors on patients' well-being and act in an appropriate manner
- 6) Incorporate strategies for health promotion and disease prevention with their patients.

## 2. Communication

The student will learn how to communicate with patients/clients, caregivers, other health professionals, and other members of the community effectively and appropriately. Communication is a fundamental requirement in the provision of health care services. Program objectives should enable the students to:

- 1) Provide sufficient information to ensure that the patient/client can participate as actively as possible and respond appropriately to the information
- 2) Discuss the diagnosis and options with the patient, and negotiate appropriate treatment plans in a sensitive manner that is in the patient's and society's best interests
- 3) Explain the proposed healthcare service – its nature, purpose, possible positive and adverse consequences, limitations, and reasonable alternatives wherever they exist
- 4) Use effective communication skills to gather data and share information including attentive listening, open-ended inquiry, empathy, and clarification to ensure understanding
- 5) Appropriately communicate with, and provide relevant information to, other stakeholders including members of the healthcare team
- 6) Use communication effectively and flexibly in a manner that is appropriate for the reader or listener
- 7) Explore and consider the influence that the patient's ideas, beliefs, and expectations have during interactions with them, along with varying factors such as age, ethnicity, culture, and socioeconomic background

- 8) Develop efficient techniques for all forms of written and verbal communication including accurate and timely record-keeping
- 9) Assess their communication skills, develop self-awareness, and be able to improve their relationships with others
- 10) Possess skills to counsel for lifestyle changes and advocate health promotion
- 11) Membership of a multidisciplinary health team
- 12) The student will put a high value on effective communication within the team, including transparency about aims, decisions, uncertainty, and mistakes. Team-based health care is the provision of health services to individuals, families, and/or their communities by at least two health providers who work collaboratively to accomplish shared goals within and across settings to achieve coordinated, high-quality care. Program objectives will aim at making the students able to:
  - Recognize, clearly articulate, understand, and support shared goals in the team that reflect patient and family priorities
  - Possess distinct roles within the team; to have clear expectations for each member's functions, responsibilities, and accountabilities, which in turn optimizes the team's efficiency and makes it possible for them to use division of labor advantageously, and accomplish more than the sum of its parts
  - Develop mutual trust within the team to create strong norms of reciprocity and greater opportunities for shared achievement
  - Communicate effectively so that the team prioritizes and continuously refines its communication channels creating an environment of general and specific understanding
  - Recognize measurable processes and outcomes, so that the individual and team can agree on and implement reliable and timely feedback on successes and failures in both the team's functioning and the achievement of their goals. These can then be used to track and improve performance immediately and over time.

### 3. Ethics and accountability

Students will understand core concepts of clinical ethics and law so that they may apply these to their practice as healthcare service providers. Program objectives should enable the students to:

- 1) Describe and apply the basic concepts of clinical ethics to actual cases and situations
- 2) Recognize the need to make healthcare resources available to patients fairly, equitably, and without bias, discrimination, or undue influence

- 3) Demonstrate an understanding and application of basic legal concepts to the practice
- 4) Employ professional accountability for the initiation, maintenance, and termination of patient-provider relationships
- 5) Demonstrate respect for each patient's rights to autonomy, privacy, and confidentiality.

#### **4. Commitment to professional excellence**

The student will execute professionalism to reflect in his/her thoughts and actions a range of attributes and characteristics that include technical competence, appearance, image, confidence level, empathy, compassion, understanding, patience, manners, verbal and non-verbal communication, an anti-discriminatory and non-judgmental attitude, and appropriate physical contact to ensure safe, effective and expected delivery of healthcare. Program objectives will aim at making the students able to:

- 1) Demonstrate distinctive, meritorious, and high-quality practice that leads to excellence and that depicts commitment to competence, standards, ethical principles, and values, within the legal boundaries of practice
- 2) Demonstrate the quality of being answerable for all actions and omissions to all, including service users, peers, employers, standard-setting/regulatory bodies, or oneself
- 3) Demonstrate humanity in the course of everyday practice by having respect (and dignity), compassion, empathy, honor, and integrity
- 4) Ensure that self-interest does not influence actions or omissions, and demonstrate regard for service users and colleagues

#### **5. Leadership and mentorship**

The student must take on a leadership role where needed to ensure clinical productivity and patient satisfaction. They must be able to respond autonomously and confidently to planned and uncertain situations and should be able to manage themselves and others effectively. They must create and maximize opportunities for the improvement of the health-seeking experience and delivery of healthcare services. Program objectives should enable the students to:

- 1) Act as agents of change and be leaders in quality improvement and service development, so that they contribute and enhance people's well-being and their healthcare experience
- 2) Systematically evaluate care; ensure the use of these findings to help improve people's experience and care outcomes, and shape clinical treatment protocols and services
- 3) Identify priorities and effectively manage time and resources to ensure the maintenance or enhancement of the quality of care

- 4) Recognize and be self-aware of the effect their values, principles, and assumptions may have on their practice. They must take charge of their own personal and professional development and should learn from experience (through supervision, feedback, reflection, and evaluation)
- 5) Facilitate themselves and others in the development of their competence, by using a range of professional and personal development skills work independently and in teams. They must be able to take a leadership role to coordinate, delegate, and supervise care safely, manage risk, and remain accountable for the care given; actively involve and respect others' contributions to integrated person-centered care; yet work in an effective manner across professional and agency boundaries. They must know when and how to communicate with patients and refer them to other professionals and agencies, respect the choices of service users and Others, promote shared decision-making, deliver positive outcomes, and coordinate smooth and effective transitions within and between services and agencies.

#### **6. Social Accountability and Responsibility**

The students will recognize that allied and healthcare professionals need to be advocates within the healthcare system, judiciously manage resources, and acknowledge their social accountability.<sup>10</sup>

They have a mandate to serve the community, region, and nation and will hence direct all research and service activities towards addressing their priority health concerns. Program objectives should enable the students to:

- 1) Demonstrate knowledge of the determinants of health at local, regional, and national levels and respond to the population's needs
- 2) Establish and promote innovative practice patterns by providing evidence-based care and testing new models of practice that will translate the results of research into practice, and thus meet individual and community needs in a more effective manner
- 3) Develop a shared vision of an evolving and sustainable healthcare system for the future by working in collaboration with and reinforcing partnerships with other stakeholders, including academic health centers, governments, communities, and other relevant professional and non-professional organizations
- 4) Advocate for the services and resources needed for optimal patient care.

## 7. Scientific Attitude and Scholarship

The student will utilize sound scientific and/or scholarly principles during interactions with patients and peers, educational endeavors, research activities, and in all other aspects of their professional lives. Program objectives should enable the students to:

- 1) Engage in ongoing self-assessment and structure their continuing professional education to address the specific needs of the population
- 2) Practice evidence-based by applying principles of scientific methods
- 3) Take responsibility for their educational experiences
- 4) To develop a scientific temper and skills towards reviewing evidence-based scientific publications and skills in scientific writing.

## 8. Lifelong learning

The student should be committed to continuous improvement in skills and knowledge while harnessing modern tools and technology. Program objectives will aim at making the students able to:

- 1) Perform objective self-assessments of their knowledge and skills; learn and refine existing skills; and acquire new skills.
- 2) Apply newly gained knowledge or skills to patient care.
- 3) Enhance their personal and professional growth and learning by constant introspection and utilizing experiences.
- 4) Search (including through electronic means), and critically evaluate medical literature to enable its application to patient care.
- 5) Develop a research question and be familiar with basic, clinical, and translational research in its application to patient care.
- 6) Identify and select an appropriate, professionally rewarding, and personally fulfilling career pathway.
- 7) To foster upgradation in the field of specialization by engaging in continuous medical and nutrition education training, seminars, and workshops.

### Introduction of new elements in allied and healthcare education

Self-directed learning, in its broadest meaning, describes a process in which individuals take the initiative with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying resources for learning, choosing and implementing learning strategies, and evaluating learning outcomes.

## Competency-based curriculum

A significant skill gap has been observed in the professionals offering healthcare services irrespective of the hierarchy and level of responsibility in the healthcare settings. The large variation in the quality of services is due to the diverse methodologies opted for healthcare education and the difference in expectations from a graduate after completion of a course and at work. What one is expected 'to perform' at work is assumed to be learned during the course, however, the course design focuses on what one is expected 'to know'. The competency-based curriculum thus connects the dots between the 'know what' and 'do how'.

The efficiency and effectiveness of any educational program largely depend on the curriculum design that is being followed. With emerging medical and scientific knowledge, educators have realized that learning is no longer limited to memorizing specific lists of facts and data; in fact, by the time the professional aims to practice in the healthcare setting, the acquired knowledge may stand outdated. Thus, competency-based education is the answer; a curricular concept designed to provide the skills that professionals need. A competency-based program is a mix of skills and competencies based on individual or population needs (such as clinical knowledge, patient care, or communications approaches), which is then developed to teach relevant content across a range of courses and settings. While the traditional system of education focuses on objectives, content, teacher-centric approach, and summative evaluation; competency-based education focuses on competencies, outcomes, performance, and accomplishments. In such a case, teaching activities are learner-centered, and evaluation is continuous and formative in structure. The competency-based credentials depend on the demonstration of a defined set of competencies that enables a professional to achieve targeted goals. Competency frameworks comprise an articulated statement of a person's abilities on the completion of the credential, which allows students, employers, and other stakeholders to set their expectations appropriately.

Considering the needs of the present and future healthcare delivery system, the curriculum design depicted in this handbook thus will be based on skills and competencies.

## **Promoting self-directed learning of the professionals**

The shift in the focus from traditional to competency-based education has made it pertinent that the learning processes may also be revisited for suitable changes. It is a known fact that learning is no longer restricted to the boundaries of a classroom or the lessons taught by a teacher. The new tools and technologies have widened the platform and introduced innovative modes of how students can learn and gain skills and knowledge. One of the innovative approaches is learner-centric and follows the concept of self-directed learning.

In self-directed learning, learners themselves take the initiative to use resources rather than simply reacting to transmissions from resources, which helps them learn more in a better way. Lifelong, self-directed learning (SDL) has been identified as an important ability for medical graduates and so applies to other health professionals including AHPs. It has been proven through many studies worldwide that the self-directed method is better than the teacher-centric method of learning. Teacher-directed learning makes learners more dependent and the orientation to learning becomes subject-centred. If a teacher provides the learning material, the student is usually satisfied with the available material, whereas if a student is asked to work on the same assignment, he or she invariably has to explore extensive resources on the subject.

Thus, the handbook promotes self-directed learning, apart from the usual classroom teaching, and opens the platform for students who wish to engage in lifelong learning.

## **Credit hours**

Recently the National Assessment and Accreditation Council (NAAC) and the University Grants Commission (UGC) have highlighted the need for the development of a Choice-Based Credit System (CBCS), at par with global standards and the adoption of an effective grading system to measure a learner's performance. All the major higher education providers across the globe are operating a system of credits. The European Credit Transfer System (ECTS), the 'National Qualifications Framework' in Australia, the Pan-Canadian Protocol on the Transferability of University Credits, the Credit Accumulation and Transfer System (CATS) in the UK as well as the systems operating in the US, Japan, etc. are examples of these. Globally, a need now exists for the use of a fully convertible credit-based system that can be accepted at other universities. It has now become imperative to offer flexible curricular choices and provide learners mobility due to the popularity of initiatives such as 'twinning programs, 'joint degrees' and 'study abroad' programs. To ensure the global acceptability of the graduates, the current curriculum structure is divided into smaller sections with a focus on hours of studying which can be converted into credit hours as per the international norms followed by various other countries.

### **Integrated structure of the curriculum**

Vertical integration, in its truest sense, is the interweaving of teaching clinical skills and knowledge into the basic science years and, reinforcing and continuing to teach the applications of basic science concepts during the clinical years. (Many efforts called ‘vertical integration’ include only the first half of the process).

Horizontal integration is the identification of concepts or skills, especially those that are clinically relevant, that cut across (for example, the basic sciences), and then putting these to use as an integrated focus for presentations, clinical examples, and course materials. e.g. Integration of some of the basic science courses around organ systems, e.g., human anatomy, physiology, pathology; or incorporating ethics, legal issues, finance, political issues, humanities, culture and computer skills into different aspects of a course like the Clinical Continuum.

An integrated curriculum aims to lead students to a level of scientific fluency that is beyond mere fact and concept acquisition, through the use of a common language of medical science, with which they can begin to think creatively about medical problems.

This innovative new curriculum has been structured in a way such that it facilitates horizontal and vertical integration between disciplines; and bridges the gaps between both theory & practice and between hospital-based practice and community practice.

### **Introduction of foundation course in the curriculum**

The foundation course for allied and healthcare professions is an immersive program designed to impart the required knowledge, skills, and confidence for a seamless transition to the second semester of a professional allied and healthcare course. Post admission, the foundation course is designed for 6 months to prepare a student to study the respective allied and healthcare courses effectively and to understand the basics of the healthcare system. This aims to orient the student to national health systems and the basics of public health, medical ethics, medical terminologies, communication skills, basic life support, computer learning, infection prevention, and control, environmental issues, and disaster management, as well as orientation to the community with focus on issues such as gender sensitivity, disability, human rights, civil rights etc. Though the flexibility to the course designers have been provided in terms of – modifying the required numbers of hours for each foundation subject and appropriate placement of the subject across various semesters.

## Learning methodologies

With a focus on self-directed learning, the curriculum will include a foundation course that focuses on communication, basic clinical skills, and professionalism; and will incorporate clinical training. It is recommended that the primary care level should have sufficient clinical Nutrition and Dietetics exposure integrated with the learning of basic and laboratory sciences. There should also be an emphasis on the introduction of case scenarios for classroom discussion/case-based learning. Healthcare education and training is the backbone of an efficient healthcare system and India's education infrastructure is yet to gain from the ongoing international technological revolution. The report '*From Paramedics to Allied Health: Landscaping the Journey and Way Ahead*', indicates that teaching and learning of clinical skills occur at the patient's bedside or other clinical areas such as laboratories, augmented by didactic teaching in classrooms and lecture theatres. In addition to keeping up with the pace of technological advancement, there has been a paradigm shift to outcome-based education with the adoption of effective assessment patterns. However, the demand for demonstration of competence in institutions where it is currently limited needs to be promoted. The report also mentions some teaching modalities and learning opportunities in the field of Nutrition and Dietetics practice. The table mentioned below lists various modes of teaching and learning opportunities that harness advanced tools and technologies.



**Table 1. Clinical learning opportunities imparted through the use of advanced techniques**

Teaching modality	Learning opportunity examples
Patients	Teach and assess in selected clinical scenarios
	Practice soft skills
	Practice nutritional assessment
Nutrition Screening Tools and Techniques	Evaluation of the nutrition care process
	Utilizes validated and reliable tools to conduct nutrition assessments
	Apply principles of Clinical Nutrition and Dietetics for interpretation of the cases in health and different disease conditions
Nutrition and Dietetics Unit Equipment	Collects and analyses anthropometric and body composition data to contribute to nutrition diagnosis. Analyses, designs, and monitors food service systems to optimize operations.
Evidence-based practice	Students should learn to apply evidence-based findings in varied healthcare settings Translating Research-based scientific evidence in nutrition and dietetic practice

### Assessment methods

Traditional assessment of students consists of the yearly system of assessments. In most institutions, assessments consist of internal and external assessments and a theory examination at the end of the year or semester. This assesses knowledge instead of assessing skills or competencies. In competency-based training, the evaluation of the students is based on the performance of the skills as per their competencies. Hence, all three attributes – knowledge, skills, and attitudes – are assessed as required for the particular competency.

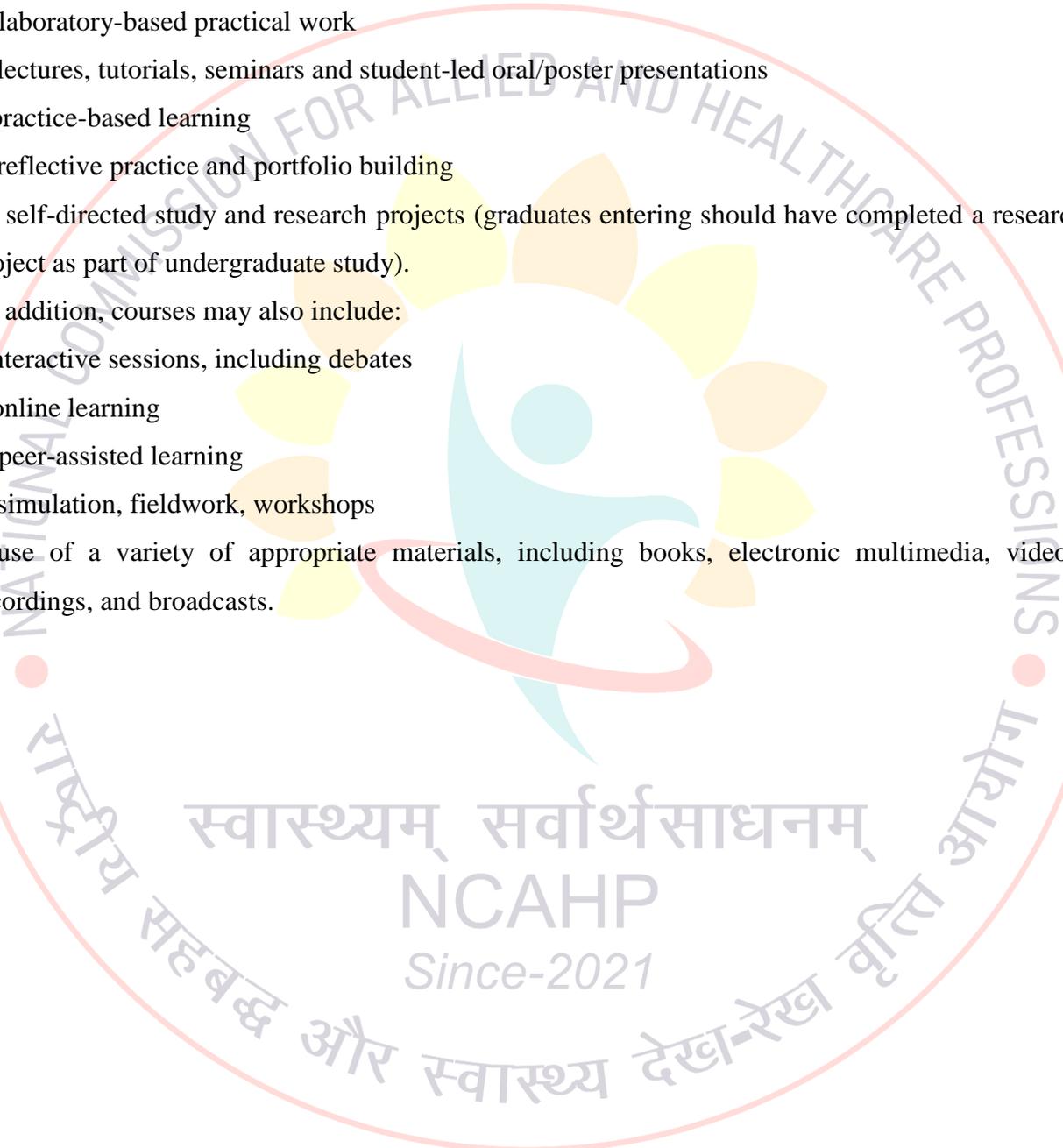
Several new methods and tools are now readily accessible, the use of which requires special training. Learning and teaching strategies in dietetics are not static but adapt to changes in philosophy, pedagogy, and technology. Cross-referencing of topics from one element to another is essential to ensure effective teaching and integrated learning.

These strategies are designed to be enriching, stimulating, challenging, effective, and enjoyable. Current strategies are learner-centered and incorporate experiential, practical and formal academic practice, and degree courses incorporate elements of the following:

- i case studies and problem-based (or case-based) learning
- ii interprofessional, peer, and collaborative learning
- iii laboratory-based practical work
- iv lectures, tutorials, seminars and student-led oral/poster presentations
- v practice-based learning
- vi reflective practice and portfolio building
- vii self-directed study and research projects (graduates entering should have completed a research project as part of undergraduate study).

In addition, courses may also include:

- i interactive sessions, including debates
- ii online learning
- iii peer-assisted learning
- iv simulation, fieldwork, workshops
- v use of a variety of appropriate materials, including books, electronic multimedia, videos, recordings, and broadcasts.





## Chapter 2

### Methodology of Curriculum Development

With the release of the report 'From Paramedics to Allied Health: Landscaping the Journey and the Way Ahead', the Ministry of Health and Family Welfare prioritized the key recommendations and concerns raised by various allied and healthcare professionals' groups and experts as indicated in the report. One of the major recommendations in the report was the need for standardization of curriculum and pedagogic requirements for the major allied and healthcare professional courses. The curricular plan for Nutrition and Dietetics aims to standardize the curriculum of the Degree Program for Nutrition and Dietetics to achieve uniformity in the standards of training across India. The basic prerequisite of training for a qualified professional in the field of Nutrition and Dietetics should be a Four-Year Bachelor's Degree Program with Eight Semesters. This would also encompass the hands-on 6 months of internship in defined clinical settings as per the guidelines laid down and a research project with a defined evaluation rubric.

### Steps undertaken in the curricula review process

All the Nutrition science experts deliberated on this issue and a consensus was attained on the following thematic areas. Minimum curricula guidelines designed for the Nutrition and Dietetics Science Profession

- Curricula should be patient-centric and futuristic.
- Must include the latest advanced technology
- Should be aligned with global standards and allow global mobility
- All programs should be delivered in full-time mode
- No institutions should deliver any part-time or distance program in healthcare Sciences Curricula must consider
- Definition of the profession
- Entry criteria to the profession
- Entry qualification to the professional programs desired in the profession other than entry qualification
- Nomenclature of the qualifications
- Duration of each level of the program with duration of internship.
- Must have competency-based outcomes at the end of each level of the curriculum content.
- Program evaluation framework/assessment at the end of each program.

- Number of desired faculty (with hierarchy/designation) and defined minimum qualifications for each level of the program
- Batch size and student and faculty ratios.
- Details of reference books, journals, and a list of desirable and essential equipment should be considered.

A defined Choice Based Credit System with 20-22 credits per semester is to be followed for the nutrition and dietetics program which is learning outcome-based and ensures a basic minimum competency in core subjects. Credits and the number of hours must be allocated to each subject. While lateral entry and bridge programs can be devised for existing professionals for entry. Multiple exits may not be implemented. Common entrance mechanism to be considered for Nutrition and Dietetics programs; Universities can consider a common entrance examination along with 50% in 10+2 science (Biology and/chemistry) or University/State entrance examination for admission in the Allied and healthcare programs. The medium of teaching should be English. Students from other boards without English as a compulsory subject may be encouraged to take English as an elective from available resources on Swayam and similar platforms.

Competency framework (including performance criteria and related knowledge, skill, and behaviors) to be included in each level of the program. Competencies should be measurable and aligned with assessments.

Soft skills and communication skills are to be highlighted and developed. All programs must have a mandatory internship. Clinical programs can also mandate rotatory internships to increase the level of clinical exposure to the students

- Teaching institutions should be accountable for ensuring the internship of the students considering it is a part of the academic program. Academic Institutions should be encouraged to sign an MoU with either a medical college hospital or healthcare facility as per the guidelines (desired number of OPD etc.) defined in the curriculum to ensure practical exposure to the students. MoU should define the deliverables for both the medical organization and the academic institutions. It should also define the clinical supervision of the students -institutional staff or clinical preceptors.
- A stipend of a reasonable amount can be considered to be paid for internship to students. The amount and details can be decided by the council as per the category of healthcare facility.
- Internships cannot be reflected as work experience as it is a part of the academic program.
- Studentship or observership must also be built into the curriculum.
- Simulation and skill labs can be used for practicing skills specific to the program if available in the initial years of observership/studentship.
- Some hours in every semester can be considered for seminars/workshops on new developments/technologies.

- If the clinical facility is not within the same campus, transportation should be provided to the students and interns.
- All practical skills must be supervised and recorded in a digital Logbook and skills to be evaluated after the completion of the internship.
- The Master's Program should be promoted to develop a specialization in the field of Nutrition and Dietetics to facilitate capacity building and generation of trained human resources.
- All Master programs must focus on research and engage with industry partners to promote innovation and development in the field
- Dietitians and Nutrition experts specialized in the field can be engaged as guest faculty/ conduct workshops/ seminars under the framework of programs.

It was agreed upon that an Exit Examination (including testing of skills and competencies) could be potentially conducted by a third-party agency or organization as eventually identified by the NCAHP. This can also evolve as a licensure examination for all allied and healthcare professionals.

A common curriculum for Nutrition and Dietetics was done with the support of task force members appointed by ICAHP/NCAHP from various regions of India to ensure wide geographic representation, catering to diverse needs across the nation. Feedback on amendments to the syllabus scheme, including program duration, incorporation of recent developments in courses, alterations in course positioning, and credit distribution, was solicited from task force members and institutional representatives. Meetings were convened multiple times, approximately to 15 sessions, each lasting 2 to 3 hours, resulting in a cumulative effort of 30 to 45 hours to finalize the curriculum. Additionally, input was sought on assessment methods and faculty requirements, with relevant updates made to textbooks. Competencies about knowledge, skills, and attitudes were delineated for both undergraduate and postgraduate programs. Following the submission of the curriculum by the task force to the Ministry, it will be made available in the public domain for feedback.



## Chapter 3

### Background of the profession

#### Statement of philosophy – why this profession holds so much importance

A vital component of well-being and growth is nutrition. Stronger immune systems, safer pregnancies and deliveries, lowered risk of non-communicable diseases (including diabetes and cardiovascular disease), and longer life spans are all associated with better nutrition. The study of nutrition is becoming increasingly important as the understanding and practice of a healthy diet is recognized as the prerequisite to good health and well-being.

A balanced diet is necessary across the lifespan for healthy growth, healthy aging, and improved immunity with increased resistance to keep away infections. The risk of several non-communicable diseases (NCD), such as diabetes, cardiovascular disease, cancers, and musculoskeletal and neurological disorders is increased by a poor-quality diet.

Nutritionists assess an individual's dietary intake, and eating habits and create a personalized dietary plan using a scientific food-based approach. A nutritionist is a health professional who is professionally trained to apply principles of Food Nutrition and Dietetics to treat diseases and improve overall health.

Nutritionists can leverage their expertise in a wide range of settings which can include clinical dietetics settings at hospitals, private consultations, community health and nutrition settings, sports, hospitality, food and pharmaceutical industry, non-government organizations (NGO) to government organizations advising local health or social services on food policy issues. They develop, provide, and implement evidence-based nutritional guidelines, and public health nutrition strategies for future safe, sustainable, and healthy foods.

## About Nutritional Sciences

Nutritional Sciences is the study of food, nutrients, and other food substances, the intake and biochemical processing of food substances, their relationship to health and disease, and the application of this information to policy and programs.

Nutrition science has evolved from the provision of basic nutrition to support essential functions and structures of the body for health promotion and disease prevention.

Those who work in the field of nutritional science also draw on knowledge of the social sciences to understand the socio-cultural, psychological, economic, and political factors influencing food choice and health status. Foci within the field include diverse approaches, from the study of biochemical pathways and interactions with genetics to observing population intake and relationship to health outcomes (nutritional epidemiology). It may extend to designing and testing nutrition interventions to improve community health, to managing nutrition programs and policies to ensure access to nutritious food, among others.

According to ISCO 08 Code 2265 Title EN Dieticians and Nutritionists, Dieticians and nutritionists plan and conduct food service or nutritional programs to promote and maintain health and to prevent and treat illness and disease. Task statement include

- a. Planning diets and menus, and instructing people on the requirements and importance of diet and on the planning and preparation of food;
- b. Supervising the preparation and serving of meals;
- c. Collecting, organizing, and assessing data relating to health and nutritional status of individuals, groups, and communities;
- d. Monitoring food intake and quality to provide nutritional care;
- e. Calculating nutritional values of food served;
- f. planning, conducting and evaluating nutrition intervention programs and compiling educational material;
- g. Providing nutrition assessments, nutrition management, and nutrition education, research and training;
- h. Consulting with other Health Professionals and related workers to manage the dietary and nutritional needs of patients.

Included occupations Examples of the occupations classified here: - Consultant, dietetic - Dietician – Nutritionist.

## **Education of Nutritionist/ Dietitian**

It is well recognized that Nutrition Education is a crucial catalyst for the impact of nutrition on food security, community nutrition, and health interventions. Additionally, it is capable of enhancing eating habits and nutritional status on its own. The students must be able to integrate information, skills, and attitudes to do a professional act appropriately in a particular setting to receive the best education and training possible. As a result, the following curriculum is created with an emphasis on a learning strategy that is focused on skills and competencies. The prescriptive curriculum is created to harmonize the subject matter across the country.

## **Becoming a Nutritionist/ Dietitian**

The science stream in class 12 (Chemistry, Biology/ Food, Nutrition, and Dietetics as mandatory subjects)

### **Entry Requirements:**

Candidates should have 10+2 with science. The minimum percentage of marks is 50% aggregate. The student should be 17 years of age as of 31<sup>st</sup> December of the admission year.

Students entering the Nutrition and Dietetics program at the postgraduate level should have completed the Bachelor of Nutrition and Dietetics in Honors in a regular full-time on-campus mode with a minimum of 60% marks from a recognized university.

Students entering the PhD program should be as per the NCAHP regulations.

Students entering the Nutrition and Dietetics program at the postgraduate level should have completed the Bachelor of Nutrition and Dietetics in Honors in a regular full-time on-campus mode with a minimum of 60% marks from a recognized university.

Students entering the PhD program should be as per the NCAHP regulations.

## **Nomenclature**

The nomenclature of both undergraduate and postgraduate programs should be uniform across the country. The nomenclature for the undergraduate program is "Bachelor in Nutrition and Dietetics with Honours, and for the post-graduate program is "Masters in Nutrition and Dietetics".

### **Course Duration**

It is recommended that any program developed from this curriculum should have a minimum of the following duration to qualify for an entry-level

- 4-year Bachelor's degree level: Honors program (Including 6 months of Clinical Training/Internship)
- 2-year Program- Master's Degree Level (Including 3 months of Clinical Training/Internship)
- A PhD degree may be desirable for academic growth. However, the curriculum has not indicated any prescriptive guidelines for the same.

### **Courses in Graduation**

**Bachelor of Nutrition and Dietetics in Honours:** It is a 4-year degree that covers a wide range of subjects, including human physiology, the fundamentals of nutrition, biochemistry, food microbiology, nutrient-drug interactions, etc which are graded and follow a chronological order of complexity and interrelatedness in different years. The degree not only emphasizes general health and disease but also offers knowledge in areas like maternal and child nutrition, public health, sociology and psychology in healthcare etc.. Additionally, the learner will also develop the foundation of food analysis, and research methods. It is mandatory to complete a 6-month internship which is a part of the program and a prerequisite for the award degree.

### **Courses in Post Graduation**

**MSc in Nutrition and Dietetics:** Post-graduate programs provide advanced knowledge from various fields in food and nutrition such as Advanced Human Nutrition, Preventive and Therapeutic Nutrition, Advanced pathophysiology and Clinical Nutrition (for patients in clinical settings ), Public Health Nutrition, Precision Nutrition, Advanced Research Methods and Biostatistics, Food Science and Quality Control, etc. It is mandatory to complete a 3-month internship as a part of the Master's Program.

A Masters student is expected to do a Thesis as a part of the coursework. A Thesis is a short research where the student identifies thrust areas of research and selects a topic of interest. There is exposure to learning research design, data collection, data analysis, results, and discussion with summary and conclusion. The application of statistical analysis to the data is a value addition towards the interpretation of the results and its presentation for a viva voce besides submission of the thesis.

### **Exit exam / Licensure exam**

There shall be a third-party exit/licensure exam at the end of the Internship (4th year) for the Bachelor's program. The exit examination, or licensure examination, serves as a prerequisite assessment for clinical practice eligibility. While the university may confer a degree completion certificate, it is contingent upon the successful clearance of the exit examination to be eligible for clinical practice privileges within India. Additional criteria and regulations governing the exit examination will be as per the guidelines established by the National Commission for Academic and Health Professions (NCAHP).

### **Teaching Faculty and Infrastructure**

The significance of providing a stimulating teaching-learning environment for students is a prerequisite for a good learning outcome.

The number of teaching staff must be adequate as per the expected student-to-teacher ratio. Ideally, a ratio of 75 to 100:1 for theory and 20: 1 for practicum is desired. Different innovative teaching pedagogies should be used for different subjects. A teacher is expected to make a teaching plan before the commencement of the semester spelling out the teaching and evaluation methodologies aligned with the learning outcomes of the students.

The infrastructure should include big and small classrooms. Ideally, the majority of the classrooms should be smart classrooms and equipped with interactive boards and computers. The Internet facility should be available to the students. The laboratories for practicals should be equipped with the desired equipment as per the coursework. Smaller teaching areas for tutorial and problem/case-based learning approaches should also be provided.

The teaching workload will be based on the norms set by the National State Councils for the designated posts (20 hours per week for Assistant Professors and 18 hours per week for Associate Professors and Professors)

## Scope of Practice

Dietitians or nutritionists are experts at an individual and wider public health level. They use the most up-to-date public health and scientific research on food, health, and disease which they translate into practical guidance to enable people to make appropriate lifestyle and food choices. They often work as integral members of multidisciplinary teams to treat complex clinical conditions such as diabetes, other non-communicable diseases, food allergies and intolerance, IBS syndrome, eating disorders, chronic fatigue, malnutrition, kidney failure, and bowel disorders. They advise and influence food and health policy across the spectrum from government to local communities and individuals. Nutritionists / Dietitians are guided by their code of ethical principles. Thus, they may be concerned with any of the following purposes:

1. Promoting the health and well-being of individuals and the general public/society, emphasizing the importance of physical activity and diet.
2. Advising eating healthy food
3. Monitoring eating habits and diets of individual
4. Creating and customizing diet plans for those who are suffering from a variety of major health concerns in a hospital setting.

## Overview of Nutrition and Dietetics Science Practice

1. Prevention, health promotion, treatment/intervention, pre - rehabilitation, and rehabilitation take place in multiple settings.
2. Community-based rehabilitation programs
3. Community settings including primary health care centers, individual homes, and field settings
4. Education center
5. Research and Development institutes for governments or private firms
6. Hospitals
7. Clinical nutritionist private offices, practices, clinics
8. Schools, including pre-schools and special schools
9. Senior citizen centers
10. Sports centers/clubs
11. Workplaces/companies

12. Nutrition Officers who work at charitable organizations, support groups, and NGOs where poor and needy people need help with their diets to prevent malnutrition
13. Academic research at colleges and universities
14. Sports and Health facilities at the district level, state level, and national level
15. Space Nutritionist: planning diet of people involved in NASA projects
16. Product Nutritionist: Development of nutritional and innovative recipes, and nutritional content analysis of the developed recipes.

As with many other professions, both within and beyond the health industry, the role of a nutritionist / dietitian is constantly changing and diversifying into new areas in a highly dynamic work environment. Nutritionists / Dietitians of India can probably set standards for best practices, foster professionalism, and provide the basis for internal disciplinary mechanisms. Nutrition and Dietetic practice includes using professional knowledge in both clinical and non-clinical relationships with patients or clients, communities, and populations and can be working in different settings as discussed above.

The breadth of professional practice being carried out within the Nutrition and Dietetic profession in India is expanding rapidly. The scope of dietetic practice is such that Nutritionists /Dietitians may work in a variety of settings and have a variety of work functions. In the past, most dietitians were employed in hospital settings. Presently many work in various aspects of the food and nutrition industry. Hence, the contexts in which individual Nutritionists and Dietitians work, the population groups they serve, and the services they provide may be very different.

The role of nutritionists and dietitians continues to expand and does not wish to define practice too narrowly, as it may stifle innovation. It also recognizes that there are several models of nutrition and dietetic services provision that can be implemented to ensure equity of access to dietetic services cost-effectively.

### **Desirable Dietitian-Patient Ratio**

The staffing of a Dietician is related to the workload of patients and dietetic activities. As per the capacity assessment of Individual staff members, the parameters to be considered are:

- Number of patient contacts per year per
- Referral rate and rate of patient turnover
- Ratio of new to follow-up contacts
- Patient complexity mix
- Referral to treatment time
- Percentage of time spent in workforce activities

Estimates based on the above parameters of the Desirable Dietitian-Patient Ratio in Hospitals in India are proposed as :

Dietitian: Patients in General Wards; 1: 60

Dietitian: Patients in Intensive Care Unit; 1:25

### **Recognition of Title and Qualification**

A Dietitian-Nutritionist is a professional who applies the science of food and nutrition to promote health, prevent and treat disease to optimize the health of individuals, groups, communities, and populations. It is a known fact that with career advancement, the nomenclature will also vary and will also depend on the sector and profile of the professional. The following level progression table has been proposed by the task force to map the nomenclature, career pathways, and progression in different sectors of professional practice for dietitians. Tables 2 (A), 2 (B), 2(C), and 2(D) below indicate the various channels of career progression in four distinct sectors such as clinical setting, academic, research and industrial setup. It is envisaged that the dietitian will have one entry pathway – students with baccalaureate. The level of responsibility will increase as the career progresses. The table also indicates the corresponding level of qualification with experience required by the professional to fulfill the requirements of each level. Considering the extent of the patient dealing in the case of dietitians and other professions, the government aims to promote bachelor's and master's degree courses. In a clinical setting to work the position of Assistant Dietitian and Dietitian, the candidate must attain a baccalaureate and to work the position of Senior Dietitian and Chief Dietitian the candidate must attain masters.

On the academic front, as per UGC guidelines, to work in the position of Assistant Professor the candidate must attain a Master's degree with NET Qualification and to work as an Associate Professor and Professor the candidate must attain a PhD. The table also indicates that the career progression of a dietitian is up to level 4 however it needs to be stated that diet prescription of patients, department management, and final clinical decision will be with the Chief Dietitian or Head of the Department.

### **Career Advancement Scheme (CAS)**

In the academic path, the career advancement scheme has been laid down by NCAHP. Irrespective of the paths chosen, at entry level with a basic Bachelor of Nutrition and Dietetics (Honours) degree job openings may be available, but to grow in the profession, years of experience, coupled with postgraduate degrees may provide better opportunities. Academic performance indicators as per the NCAHP recommendations, and key performance indicators as per the private sector may be followed.

### **Job Availability**

As per International Labour Organization (ILO) documentation, employers worldwide are looking for job applicants who not only have technical skills that can be applied in the workplace but who also can communicate effectively, including with customers; can work in teams, with good interpersonal skills; can solve problems; have good Information and Communications Technology (ICT) skills. Graduates can expect to be employed in hospitals and private practices as dietitians. A career in research, following the completion of a higher degree such as an MSc and PhD, is an option chosen by some post-graduates. Graduates are eligible for employment overseas where their qualifications, training, and experience are highly regarded. Graduates have good employment prospects and will enter a field in which the demand for professionals has increased in recent years and will keep on increasing due to the need to combat the epidemic of Non-Communicable Diseases – an outcome of Nutrition Transition and lifestyle changes. An aging population and lifestyle changes requiring increased medical rehabilitation services potentiate a strong demand for future graduates. As per the scope of Nutrition Science practice, the job sectors are divided into the following :

1. Clinical Settings
2. Public health
3. Food and Pharmaceutical Industries/Companies
4. Education sector
5. Private practice
6. Scientific Research
7. Corporate sector

1. **Clinical Settings:** A clinical dietitian is to design nutrition programs to improve or maintain the health of patients. They provide critical nutrition and dietary guidance to patients, which is required during their acute illness and recovery stages.
2. **Public Health Nutritionist:** Public Health Nutritionists work for the promotion of good health through the prevention of Nutrition-related illnesses/problems in the population, and the government policies and programs aimed at solving these problems. Public health nutritionists are food and nutrition experts who work to improve the health and well-being of communities and populations. They help prevent diseases by educating people and encouraging them to adopt healthier lifestyles. Public health nutritionists bridge the gap between science and practice by translating complex nutritional information into actionable strategies for a wide range of groups. They often develop and share practical tools and information that can help local communities. Public health nutritionists emphasize prevention and education, unlike clinical nutritionists who focus on treating existing health conditions.
3. **Food and Pharmaceutical Industries/Companies:** Industry specialist dietitians work in an area of dietetics where the research, development, and production of nutritional products, services, resources, and communications are the main outputs. Industry can include both medical nutrition and commercial enterprises. Industry-based dietitians represent the dietetic community within the industry; aiming to promote and apply sound nutritional principles in the work, they do within their varied roles. This can include the development of nutritional products and services, marketing and communications, scientific research, nutritional strategy and policy, food regulation and safety, education, and training.

4. **Education sector** – Schools/ Higher Education: Nutritionists/ Dietitians can be employed in Schools and Higher Education Institutions in different capacities. The eligibility would be as per the recruitment norms, eligibility, and experience. The faculty for higher education should have prerequisite qualifications as per UGC norms. They can be employed in various positions in Academics/Universities & National and International Research organizations. Qualified Dietitians can be invited as Guest Faculty in Colleges to provide practical knowledge in the field of Nutrition and Dietetics to young students. Nutrition science can be leveraged through school and college canteens, Eat Right Campus, Hostel Mess , and School lunch programs in these environments.
5. **Private practice:** They should create personalized food plans about clients' health conditions, preferences, and needs. It helps them to set realistic goals and develop strategies to manage nutritional challenges
6. **Scientific research:** Nutritionists/Dietitians can be engaged with several eminent Government and Non-Government research organizations for a variety of nutrition-related activities. It can range from the development of standardized tools, data collection, data analysis, evaluation, and impact analysis for a range of research projects. These include ICMR, MOHFW, MWCD, GAIN, PATH, Alive and Thrive, Action Against Hunger, CARE, and United Way; UN organizations such as UNICEF, WHO, FAO, WFP, USAID
7. **Corporate Sector:** A growing range of personal businesses and corporations hiring welfare consultants to produce steerage on healthy feeding and exercise habits. These consultants may supply general tips about nutrition and health or lead seminars on how workplace employees will manage stress or avoid muscle fatigue. This will need robust client service skills.

## Levels of Career in Clinical fields, Academic, Research, and Industry

### Clinical Fields -Overview of Current Dietetic Practice

The majority of patient-focused work can be grouped under the following categories:

**Acute:** Hospital wards and outpatient clinics.

**Community:** Community clinics, care homes, railway catering, and patient's own homes, day care services, or schools. Many dietetic one-to-one consultations take place in the efficient environment of wards or clinics.

Many dietetic one-to-one consultations take place in the efficient environment of wards or clinics. However, Nutritionists and Dieticians in Hospitals are also involved in non-patient-focused activities (other dietetic activities) as an integral part of a dietetic workload. Activities such as training and supporting others to deliver nutritional care have previously been overlooked when it comes to considering workload. Service-focused, staff-focused, and self-focused activities must be considered key elements and be given appropriate emphasis when reviewing or developing posts and services.

At present, group education sessions are also a common way of delivering care to diabetic patients. This format of caregiving enables advice to be given to more than one patient with the same dietetic diagnosis at the same time. Initially, just a few specialties moved towards group education sessions for conditions such as diabetes and coeliac conditions. However, group sessions have been evaluated well and are now much more widely available across a variety of specialist fields.

स्वास्थ्यम् सर्वार्थसाधनम्

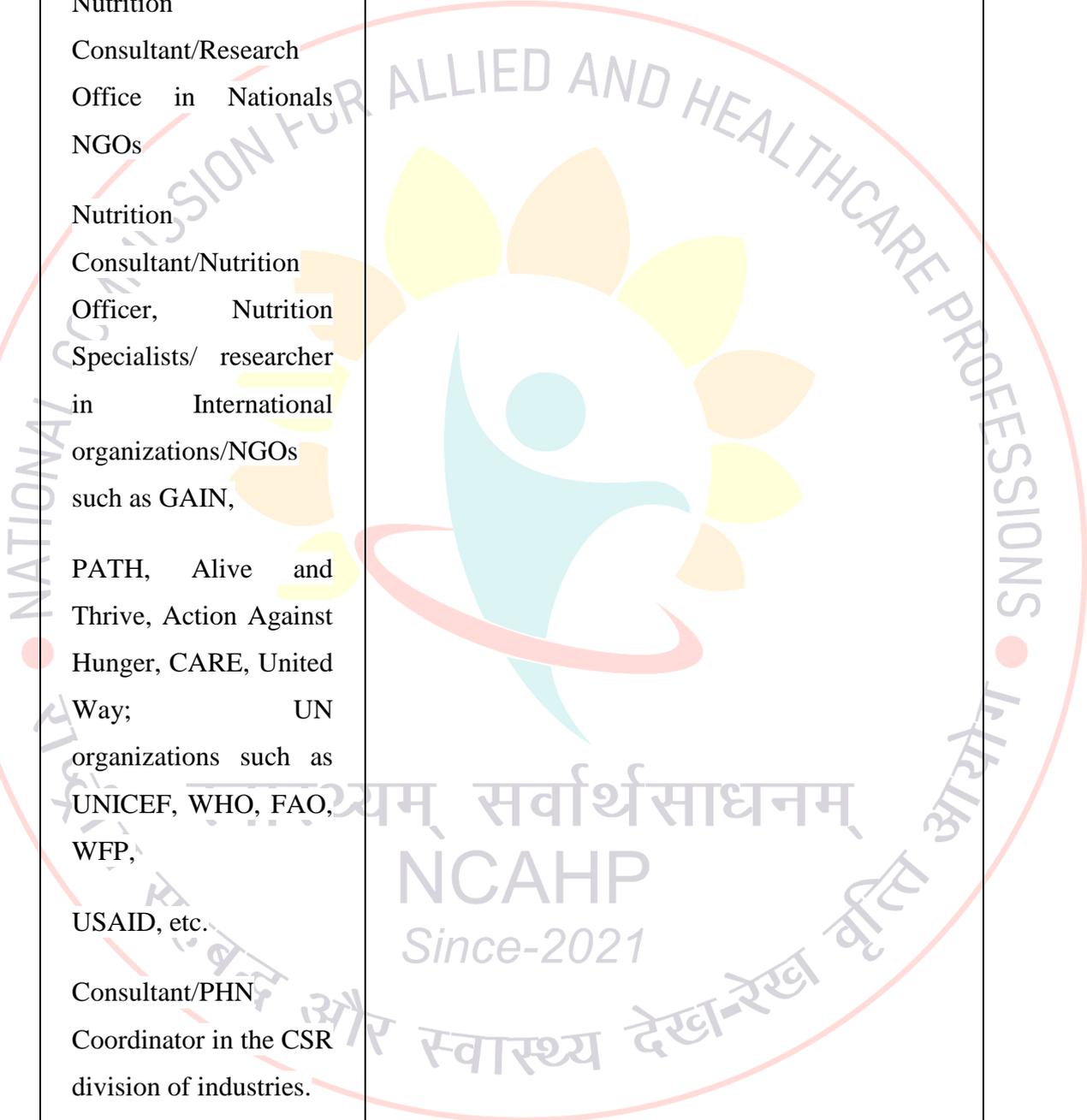
NCAHP

Since-2021

**Table 2 (A). Level for careers in the Clinical field**

Clinical (Designation)	Qualification & Experience
Assistant Dietitian Eligibility and experience for direct recruitment	Essential : <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and Dietetics (04 years course )</li> <li>• BSc (Hons) in Nutrition and Dietetics and MSc in Nutrition and Dietetics</li> <li>• Desirable: PhD in Food, Nutrition, and Dietetics</li> </ul>
Dietitian Eligibility and experience for promotion	Essential : <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and Dietetics and MSc in Nutrition and Dietetics and 5 years Experience as Assistant Dietitian</li> <li>• Desirable: PhD in Food, Nutrition, and Dietetics</li> </ul>
Senior Dietitian Eligibility and experience for promotion	Essential : <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and Dietetics and MSc in Nutrition and Dietetics with 5 years of experience as a Dietitian, and</li> <li>• Should have two research publications or should have completed a PhD in Food, Nutrition, and Dietetics</li> </ul>
Chief Dietitian Eligibility and experience for promotion:	Essential : <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and MSc in Nutrition and Dietetics with five years of experience as a Senior Dietician, and</li> <li>• Should have two research publications or should have completed a Ph.D. in Food, Nutrition, and Dietetics</li> </ul>

<p>State Nutrition Officer and State Nutrition Research Officer</p> <p>Eligibility and experience for promotion</p>	<p>Essential :</p> <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and Dietetics and MSc in Nutrition and Dietetics, and Ph.D. in Food, Nutrition, and Dietetics, with 5 years of experience as Chief Dietitian</li> </ul>
<p>Government sector:</p> <p>Field Research officers/Research Personnel for National Health Surveys like NFHS, DLHS, CNNS</p> <p>Various positions – at Block, Districts, State and Central in various programs of Government of India</p> <p>Monitoring, Evaluation &amp; Supervisory positions in Nutrition &amp; Health related Programs</p> <p>From Programme Officer to Deputy Director Level in Govt. Sectors (MoHFW, MoWCD, NHM, NRLM, PM Poshan, FSSAI, etc.)</p>	<p>Essential :</p> <ul style="list-style-type: none"> <li>• BSc (Hons) in Nutrition and Dietetics and MSc in Nutrition and Dietetics, and Ph.D. in Food, Nutrition, and Dietetics, with 5 years of experience as Chief Dietitian</li> <li>• Should have two research publications or should have completed a Ph.D. in Food, Nutrition, and Dietetics</li> </ul>

<p>Other Organization:</p> <p>Nutrition Consultant in various local NGOs.</p> <p>Nutrition Consultant/Research Office in Nationals NGOs</p> <p>Nutrition Consultant/Nutrition Officer, Nutrition Specialists/ researcher in International organizations/NGOs such as GAIN, PATH, Alive and Thrive, Action Against Hunger, CARE, United Way; UN organizations such as UNICEF, WHO, FAO, WFP, USAID, etc.</p> <p>Consultant/PHN Coordinator in the CSR division of industries.</p>	
--	---

## **Dieticians Cadre- Duties and Responsibilities**

### **1. Assistant Dietician**

- 1) To do routine day-to-day activities of the department as assigned by Chief Dietician.
- 2) Duties include menu planning, ensuring hygiene and safety of food preparation, supervising diet setting, diet counseling for in-patients and outpatients, and provision of Medical Nutrition Therapy (MNT) to the patients.
- 3) If a single person in the hospital- is in charge of registers maintained in dietary, work in collaboration with the medical superintendent in deciding the work policy of patient food service, and planning educational and training programs for food service staff. Eg:- coordinating with the food safety office for training staff.
- 4) Gain academic credits through participating in training and academic programs conducted by the Nutrition department, colleges, Associations, etc.
- 5) Support the students from the UG/PG level who come to the Hospital/Institute for internship.
- 6) It is advisable to advance the research career which will get additional credits.
- 7) Decide patient care policies- documentation in hospital records, follow-up care planning, and organizing community-level education programs and camps in underdeveloped rural areas.
- 8) Should report to the chief dietitian for professional grievances and requirements.
- 9) Organize and conduct institutional-level research activities of high standard which can be considered for publication. Participation in collaborative research activities as assigned by the state nutrition research officer should be encouraged.

### **2. Dietician**

- 1) In charge of assistant dietitians.
- 2) Overall supervision of patient food service management. To be the chair of the canteen committee and involved in the administration of food service, in charge of menu planning, designing the layout and equipment of the canteen, whether to stock nutraceuticals in the canteen store and distribute, modify the duty arrangement of canteen staff in case encountering practices that challenge food safety.
- 3) The F&B manager should inform the dieticians about any change in food served to patients.

- 4) The canteen committee shall consist of dietitians, an F&B manager, a medical superintendent, and representatives from the canteen administration. The committee shall meet every month and review the activities of the canteen. The committee is also responsible for addressing grievances from patients and F&B staff.
- 5) Aid the students in their research activities- UG, PG, RD training, and PhD program.

### **3) Senior Dietician**

- 1) In charge of the Assistant Dietitians and dietitians. Department head if the institute does not have a chief dietician post.
- 2) Responsibility for all the activities happening in the department.
- 3) Should formulate and implement department-level administrative and academic policies.
- 4) Evaluate the quality of products being presented before you- nutraceuticals, artificial sweeteners, foods for special dietary purposes, foods developed by small entrepreneurs for patients, etc. Senior dietitians preferably should gain additional skills in food safety certifications, nutraceutical certification, and product development. In collaboration with hospital administration, senior dietitians can organize product trials with them and propose to be included in the purchase list.
- 5) Try to acquire a guideship and academic counsellorship from universities and guide scholars.
- 6) Aid the students in their research activities- UG, PG, RD training, and PhD program.
- 7) It is desirable to enroll for PhD research and gain additional skill certificates.

### **4, Chief Dietician**

- 1) The role is responsible for overall clinical, dietary, academic, and administrative responsibilities.
- 2) Responsible for setting the vision and mission and framing policies and procedures for attaining the food and quality control standards of dietary services.
- 3) 3.The role oversees the functioning of all Dietitians.
- 4) 4.To create academic responsibilities of research, teaching, and development of course content for training programs.
- 5) 5.To promote the sharing and dissemination of food, nutrition, and dietetic knowledge through representation in various national and international conferences/programs.

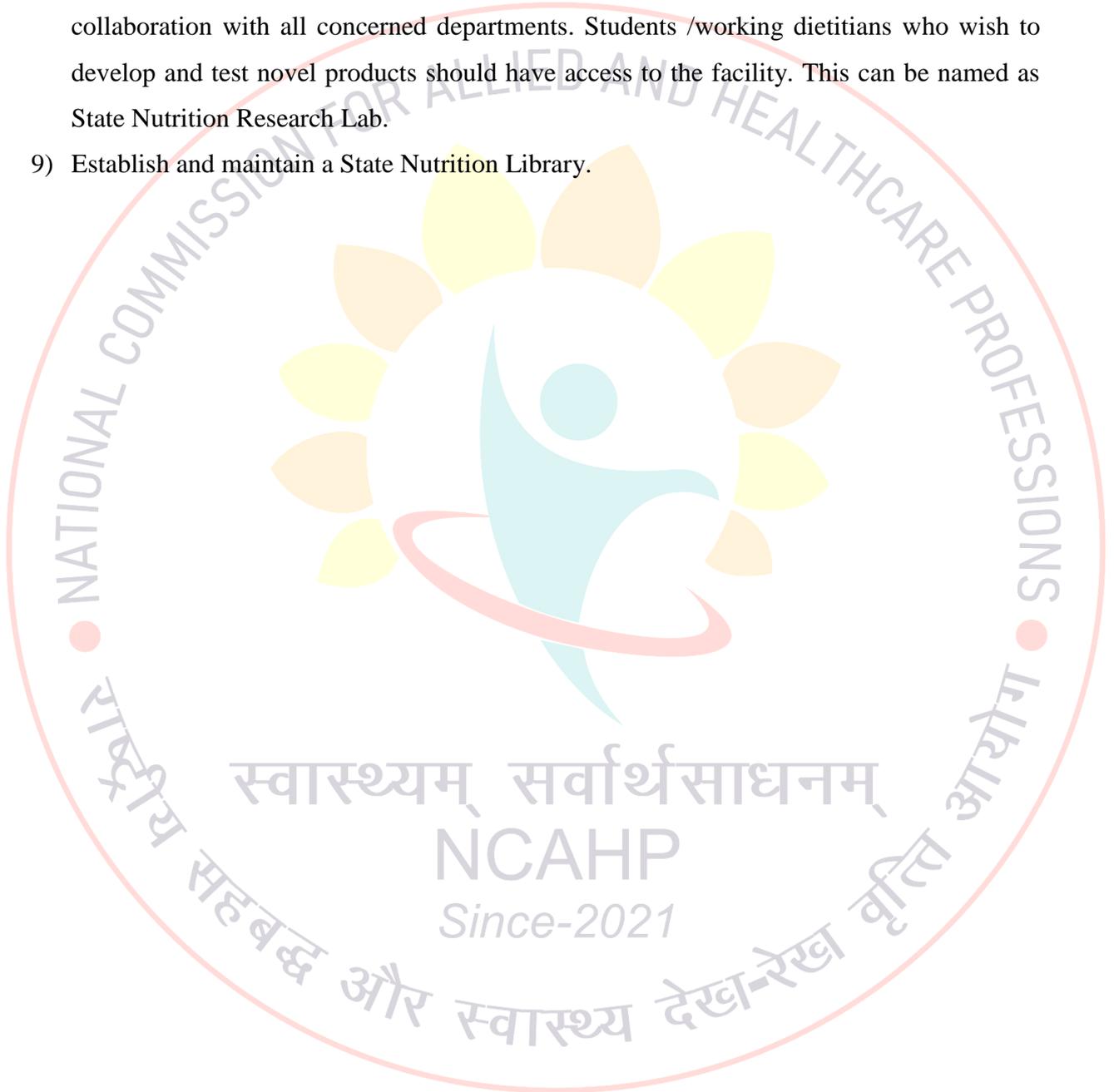
### **5. State Nutrition Officer**

- 1) To make administrative decisions regarding the appointment, duties and responsibilities, and promotion criteria at the state level.
- 2) To represent dietitians in the state dietetic council and decide on registration criteria.
- 3) To coordinate the organization and fund utilization of state-level nutrition-related activities.
- 4) To organize in-service training and educational activities for dietitians enrolling in service.
- 5) To represent the state in national and international level venues discussing nutrition policies.
- 6) Responsible for maintaining ethical conduct of duties by dietitians.

### **6. State Nutrition Research Officer**

- 1) To plan, organize, and conduct state-level research activities conducted by dietitians in government and private sectors.
- 2) To form an Indian Council of Medical Research (ICMR) -approved ethical committee and Nutrition research committee.
- 3) Formulate a state-level peer-reviewed journal to publish such data and function as the editor-in-chief of the journal.
- 4) To coordinate fund utilization of research activities.
- 5) To form a committee to examine the authenticity of nutrition-related information reaching the public through print, audio-visual media, and social platforms. This committee should have the power to report to the council if any fellow is seen spreading false or fake messages to the public. This committee should maintain a website where such complaints can be lodged by public and fraternity members, the actions taken also should be on display here. Any authentic scientific information can be shared with the public through this platform.
- 6) Function as part of the academic council of the subject in different universities and contribute to the curriculum.

- 7) Organize collaborative research activities including academicians, clinicians, NGOs, and research funding agencies.
- 8) Be in charge of a state-level research lab facility where nutrient analysis, analysis of antioxidants, toxic materials, pesticide residue, genetic testing, biotechnology, food engineering, food microbiology analysis, etc are possible. This should be formed in collaboration with all concerned departments. Students /working dietitians who wish to develop and test novel products should have access to the facility. This can be named as State Nutrition Research Lab.
- 9) Establish and maintain a State Nutrition Library.



**Table 2 (B). Levels for careers in the Academic field**

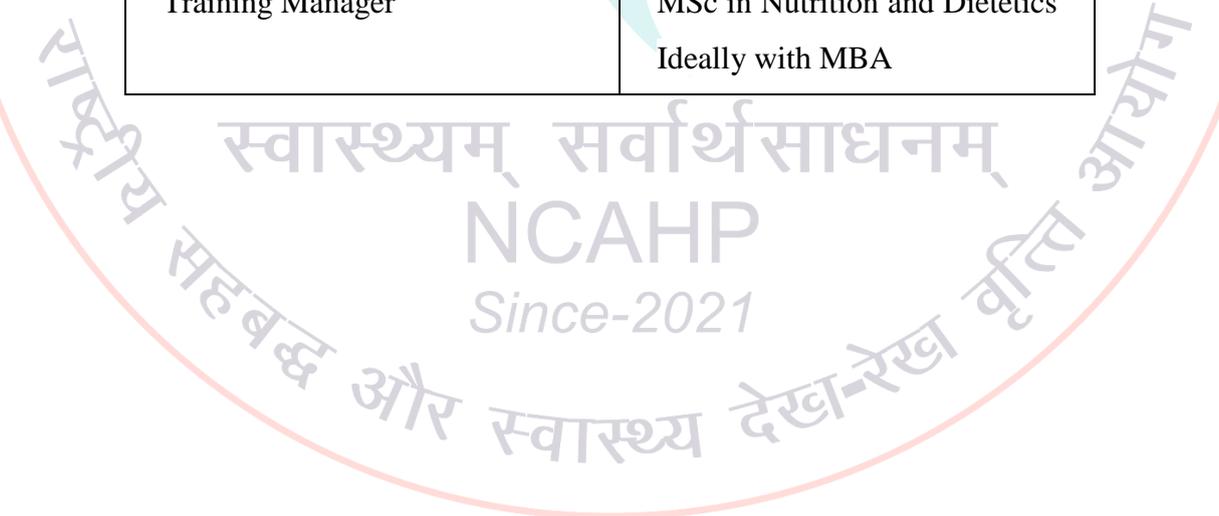
Academic (Designation)	Eligibility and experience requirement (on Promotion as per NCAHP -CAS-Career Advancement Scheme)
Assistant Professor	Masters in Food, Nutrition, and Dietetics; NET Cleared.
Assistant Professor (Senior Scale)	Masters in Food, Nutrition, and Dietetics; NET Cleared; One Orientation Course of 21 days and One Refresher/Research Methodology Course Or Two Short term (5 Days ) FDP Or Completed One MOOC course.
Assistant Professor	5 Years of Service in Academic Level 11; Ten days One FDP or TWO 5 Days FDP Or 10 modules of MOOC Course
Associate Professor	3 year's service in Level 12; A PhD degree; Ten days One FDP or TWO 5 Days FDP Or 10 modules of MOOC Course
Professor	3 year's service in Level 13A; A PhD degree; 10 research publications in peer reviewed journals; API score of 110

**Table 2 (C) Levels for careers in the Research field**

<b>Research (Designation)</b>	<b>Qualification &amp; Experience</b>
Project Assistant	Post graduate in Nutrition and Dietetics
Research Associate	Post graduate in Nutrition and Dietetics and PhD degree
Research manager	Post graduate in Nutrition and Dietetics and PhD degree and 3-5 years of experience in research along with publications. Experience as research associate for 3 years
Research Consultant	Post graduate in Nutrition and Dietetics and PhD degree and 8-10 years of experience in research along with publications. Experience as research manager for 3 years
Chief Scientist/State Nutrition Research Officer	Post graduate in Nutrition and Dietetics and PhD degree more than 10 years of experience in research along with publications. Experience as research consultant for 3-5 years.  (Kanika)

**Table 2 (D). Levels for careers in Industry**

<b>Industry (Designation)</b>	<b>Qualification</b>
Clinical/Field Nutritionist	BSc Hons in Nutrition and Dietetics /MSc in Nutrition and Dietetics
Zonal Nutrition Manager	MSc in Nutrition and Dietetics
Nutritionist in Product Management Team	MSc in Nutrition and Dietetics
Medical Affairs Nutrition	MSc in Nutrition and Dietetics
Marketing Product Manager	MSc in Nutrition and Dietetics Ideally with MBA
Sales Manager	MSc in Nutrition and Dietetics Ideally with MBA
Training Manager	MSc in Nutrition and Dietetics Ideally with MBA



## Nutritionist working in the technical field

- 1) Clinical/Field Nutritionist–Conducts camps, and gives counselling to the trade OPDs (Outsourced Product Development)
- 2) Zonal Nutrition Manager–Handling the Nutritionist in the field, and coordinating with the sales team for sales improvement.
- 3) Activity or key accounts Manager–Responsible for conducting CMES, coordinating for conferences can be a pan India role, with reporting to the Zonal Nutrition Manager
- 4) Nutritionist in supporting the pharma marketing team with references for their communications, making PPTs for doctors and Dietitians for their presentations
- 5) Medical Affairs Nutritionist--Conducting and supporting clinical trials, and publications.
- 6) Marketing product manager--Be a part of strategic and decision making and marketing.
- 7) Sales--work as a sales manager
- 8) Training Manager--giving training to the team





## Chapter 4

### Model Curriculum of Nutrition Science Courses

#### Background

According to the World Health Organisation nutrition is the intake of food, considered with the body's dietary needs. Adequate food is vital in keeping people alive. Good nutrition is essential to good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity. Nutrition impacts the development process at every stage of the life cycle from conception to death. Freedom from hunger and malnutrition is a basic human right and their alleviation is a fundamental prerequisite for human and national development. Nutrition encompasses the science of the significance of essential nutrients, their functions, effect of deficiencies and excess. The Nutrition Science translates the science of nutrition into practical applications in clinical, food service, or community settings.

Dietetics is the science of how nutrition affects our health. Scientific studies have shown how a change to our diet can help prevent or control a variety of health problems, including obesity, diabetes, and heart disease.

The curriculum provides an excellent foundation of principles of science and art as applied to Food Nutrition and Dietetics. There is a professional focus on applying knowledge of nutritional sciences to benefit human health and to abate disease. The program aims towards a standardized template of capacity building of Nutritionists and Dieticians with academic excellence and professional skills to be leveraged in a variety of settings ranging from clinical settings to community and people at large. The program focuses on excellence in intellectual development, the development of a professional inquiring attitude, and equality of opportunity.

The recommended curriculum aims to produce Dietitian/Nutritionists who are:

1. Technically and clinically competent for independent decision-making
2. Enable to assess a patient
3. Aware of patient conditions and treatment along with the importance of quality benchmarks
4. Understand the theoretical basis for evidence-based practice

5. Effective members of the multidisciplinary team
6. Prepared to participate in or initiate research into practice

All aspects of Nutrition and Dietetics have been considered in the development of this curriculum keeping in mind the possible roles expected at different levels by nutritionists and dietitians based on their qualifications and experience.

The need for connecting the dots between education and employment practices has been the road map for devising this curriculum. The career pathway indicates direct Entry after the completion of a minimum 4 years of degree-level program in Bachelor of Nutrition and Dietetics in Honours. The components of the programs have been detailed in the following chapters. The coursework has been grouped under:

1. Foundation courses;
2. Core/ Essential Courses;
3. Specialized Courses and
4. Ability Enhancement Courses,
5. Research Component.

These have been aligned and graded with the increasing levels of complexity along the Four Years of Graduation. The flow has been interwoven with Ability Enhancement Courses. Adequate emphasis has been given to Experiential Learning through hands-on training and internship which is embedded as a part of the coursework and is a mandatory prerequisite for the award of the degree and graded. Research inquiry in the form of seminars, projects, and thesis is a part of the final year of graduation and has credits allocated for assessment.

NCAHP  
Since-2021

## 4.1 Bachelor of Nutrition and Dietetics (Honors)

### **Introduction:**

### **Learning Objectives:**

The learning objectives of a Bachelor of Nutrition and Dietetics (Honors) degree program include:

- **Practical skills:** to develop the ability to acquire practical skills for monitoring food and nutrition-related clinical problems.
- **Analytical skills:** to develop analytical and practical skills.
- **Knowledge:** to provide knowledge of nutrition, food, and how to stay healthy to the population.
- **Career opportunities:** to develop skills and abilities that open up new career opportunities.
- **Communication:** to learn to communicate effectively with patients, individuals, and multi-disciplinary healthcare team health professionals.
- **Health status assessment:** to design and carry out health and nutritional status assessment protocols.
- **Nutritional risk factors:** to learn to identify nutritional risk factors and application of tools for nutrition screening.
- **Nutrition and dietetic care:** to learn to provide nutrition and dietetic care for individuals, groups, and populations at risk of developing long-term health conditions.
- **Therapeutic diets:** to learn to plan and provide therapeutic diets to manage and treat medical conditions.
- **Higher education:** to enable to pursue higher education and research in clinical nutrition, dietetics, and food science.
- **Nutritional assessment:** Students learn the methods and application of validated tools of assessing human nutritional requirements and diet planning for the individual and community.

Dietitians are specialist nutritionists who apply the science of food and nutrition to promote health, prevent and treat disease to optimize the health of individuals, groups,

communities, and populations. They are accredited to work in roles such as community and public health nutrition, clinical dietetics, food service systems management, and research. This enables them to work in settings such as hospitals, private practice, research, the food industry, nursing homes, sports teams, and food service.

Throughout this degree, the students will study the building blocks of nutrition: biochemistry, nutritional epidemiology, public health nutrition, and pathophysiology. The students will learn about medical nutrition therapy, which involves translating the science of nutrition into dietary advice to manage specific medical conditions and to develop community nutrition program plans to help improve the nutrition of communities. Other subjects include nutrition and food innovation, allied health practice, and food service management.

### **Expectations from the future graduates in providing patient care.**

Dietitians and Nutritionists are professionals who study, advise, research, supervise, or provide preventive, curative, rehabilitative, therapeutic, or promotional health services and who have obtained a qualification of degree under this Act, the duration of which shall not be less than three thousand six hundred hours spread over four years divided into eight semesters.

Competency Standards for Dietitians and Nutritionists include the key areas of professional practice, improving nutrition outcomes for individuals, groups, and communities, critical thinking and evidence-based practice, and collaboration with stakeholders.

### **Eligibility for admission:**

#### **Selection procedure:**

1. He/she has passed the Higher Secondary (10+2) or equivalent examination recognized by any Indian University or a duly constituted Board with pass marks (50%) in physics, chemistry, biology/mathematics. Admission is done based on the NEET exam / equivalent exam conducted by the Government of India (for both UG and PG programs) followed by a counseling session.

2. Candidates who have studied abroad and have passed the equivalent qualification as determined by the Association of Indian Universities will form the guideline to determine the eligibility and must have passed the subjects: Physics, Chemistry, Biology, Food, Nutrition and Dietetics, and English up to 12th Standard level with pass marks (equivalence to) 50% in physics, chemistry, and biology.
3. Candidates who have passed the Senior Secondary school Examination of National Open School with a minimum of 5 subjects with any of the following group subjects with pass marks of 50% in physics, chemistry, biology/Food, Nutrition, and Dietetics
  - a- English, Physics, Chemistry, Botany, Zoology, Food, Nutrition and Dietetics
  - b- English, Physics, Chemistry, Biology, Food, Nutrition and Dietetics and any other language
4. He/she has attained the age of 17 years as on 31st December of the year of admission.
5. He/she has to furnish at the time of submission of the application form, a certificate of Physical fitness from a registered medical practitioner and two references from persons other than relatives testifying to satisfactory general character.
  - a. During subsequent counselling the seat will be allotted as per the merit of the candidate depending on the availability of seats on that particular day.
  - b. A candidate who fails to attend the Medical Examination on the notified date(s) will forfeit the claim for admission and placement in the waiting list except permitted by the competent authority under special circumstances.
  - c. The name of the student(s) who remain(s) absent from classes for more than 15 days at a stretch after joining the said course will be struck off from the college rolls without giving any notice.

#### **Duration of the course**

The Bachelor of Nutrition and Dietetics (Honors) undergraduate degree program is of four years duration including a compulsory internship.

**Duration of the course: 4 years or 8 semesters.**

**Total hours –3735 (theory + practical +internship)**

**Semesters** - An academic year consists of two semesters

Odd Semester: June/July to November/December

Even Semester: November/December to April/May

**Medium of instruction:**

English shall be the medium of instruction for all the subjects of study and examination of the course.

**Principal/Head of the Institute**

In an affiliated college, the Principal or Head of the institute must be a Dietician or a Nutritionist. In a University setup, the Head of the Department(HOD) must be a Dietician or a Nutritionist. The Dean must belong to Allied and Healthcare professions as mentioned in the NCAHP Act.

**Attendance:**

A candidate has to secure a minimum-

1. 75% attendance in theoretical
2. 80% in Skills training (practical and clinical training) for qualifying to appear for the examination.

**Assessment:**

Assessments should be completed by the academic staff, based on the compilation of the student's theoretical and clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated.

**Competency Standards**

Classification Units of Competency Skills at Entry level for Dietitians and Nutritionists

1. Communication Skills
2. Professional Conduct
4. Patient management and counseling skills
5. Documentation

**Curriculum Outline**  
**Bachelor of Nutrition and Dietetics (Honors) [4-years program]**

**Proposed Credit Hours**

Year	Semester	Theory Hours	Practical Hours	Hours Per semester
1	1	240	180	420
1	2	210	240	450
2	3	255	150	405
2	4	270	120	390
3	5	210	240	450
3	6	135	330	465
4	7	165	330	495
4	8	0	660	660
<b>Total Credit Hours</b>		<b>1485</b>	<b>2250</b>	<b>3735</b>

**Credit details:**

One credit implies one hour of lecture per week or two hours of laboratory/practical per week or two hours of clinics per week or two hours of Research projects per week

A semester is considered to have 15 weeks. For example,

1 credit course = 15 hours of lectures per semester

3 credits course = 45 hours of lectures per semester

0.5 credit course = 15 hours of practical/laboratory.

CL	CP	L	P
1	1	15	60

**CL: Credit for Lecture**

**CP: Credit for Practical**

**L: Hours for Lecture**

**P: Hours for Practical**

## Curriculum mapping & Credit Management

### First Semester

Course code	Course Titles	Credits			Hours /Semester		
		Theory	Practical	Total	Theory	Practical	Total
BND 101	Fundamentals of Nutrition	3	1	4	45	30	75
BND 102	Human Anatomy and Physiology	3	1	4	45	30	75
BND 103	Basics of Food Science	3	1	4	45	30	75
BND 104	Environmental Science	3	1	4	45	30	75
BND 105	Indian Knowledge System on Foods	2	0	2	30	0	30
BND 106	Computer literacy	0	2	2	0	60	60
BND 107	English for Communication	2	0	2	30	0	30
<b>TOTAL</b>		<b>16</b>	<b>6</b>	<b>22</b>	<b>240</b>	<b>180</b>	<b>420</b>

## Second Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND 201	Food Microbiology	3	1	4	45	30	75
BND 202	Fundamentals of Biochemistry	3	1	4	45	30	75
BND 203	Nutrition Through Life Cycle	2	2	4	30	60	90
BND 204	Psychology and Sociology Applied to Health Care	4	0	4	60	0	60
BND 205	Techniques of Nutritional Assessment	0	2	2	0	60	60
BND 206	Soft Skills and Communication	2	0	2	30	0	30
BND 207	Computer Literacy for Nutrition	0	2	2	0	60	60
<b>TOTAL</b>		<b>14</b>	<b>8</b>	<b>22</b>	<b>210</b>	<b>240</b>	<b>450</b>

### Third Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Theory	Theory	Practical	Total
BND 301	Macronutrients in Human Nutrition	4	0	4	60	0	60
BND 302	Advanced Food Science	3	1	4	45	30	75
BND 303	Public Health Nutrition	3	1	4	45	30	75
BND 304	Basics of Medical Nutrition Therapy (Theory and Practical)	2	2	4	30	60	90
BND 305	Advanced Biochemistry	3	0	3	45	0	45
BND 306	Food Processing and Preservation	2	1	3	30	30	60
<b>TOTAL</b>		<b>17</b>	<b>5</b>	<b>22</b>	<b>255</b>	<b>150</b>	<b>405</b>

#### Fourth Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND-401	Clinical Biochemistry and Pathophysiology	3	1	4	45	30	75
BND-402	National Health and Nutrition Programs and Policies	3	1	4	45	30	75
BND-403	Micronutrients in Human Nutrition	4	0	4	60	0	60
BND-404	Functional Foods and Nutraceuticals	3	1	4	45	30	75
BND-405	Advanced Dietetics	3	1	4	45	30	75
BND-406	Food Safety and Standards	2	0	2	30	0	30
<b>TOTAL</b>		<b>18</b>	<b>4</b>	<b>22</b>	<b>270</b>	<b>120</b>	<b>390</b>

### Fifth Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND-501	Research Methodology and Statistics	4	0	4	60	0	60
BND-502	Sports Nutrition	2	2	4	30	60	90
BND-503	Tools and Techniques for Nutrition Counselling	1	3	4	15	90	105
BND-504	Nutritional Epidemiology and Anthropology	3	1	4	45	30	75
BND-505	Food Analysis	2	2	4	30	60	90
BND-506	Emerging concepts in Nutrition and Dietetics	2	0	2	30	0	30
<b>TOTAL</b>		<b>14</b>	<b>8</b>	<b>8</b>	<b>210</b>	<b>240</b>	<b>450</b>

### Sixth Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND-601	Social Behaviour Change Communication/ Nutrition Health Promotion	3	1	4	45	30	75
BND-602	Sustainable Food Systems	3	1	4	45	30	75
BND-603	Field Practice in Public Health and Nutrition	1	3	4	15	90	105
BND-604	Food Product Development	2	4	6	30	90	120
BND-605	Case study Reviews	0	4	4	0	90	90
<b>TOTAL</b>		<b>9</b>	<b>13</b>	<b>22</b>	<b>135</b>	<b>330</b>	<b>465</b>

### Seventh Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND-701	Information Technology in Nutrition and Dietetics	2	2	4	30	60	90
BND-702	Entrepreneurship in Nutrition and Dietetics	3	1	4	45	30	75
BND-703	Nutrition in Critically ill	2	2	4	30	60	90
BND-704	Management and Administration in Dietetics Services	2	2	4	30	60	90
BND-705	Nutrition in Emergencies	2	0	2	30	0	30
BND-706	Applied Dietetics/Internship Project	0	4	4	0	120	120
<b>TOTAL</b>		10	5	22	165	330	495

### Eighth Semester

Course code	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
BND-801	Internship in Hospital /Experiential Learning (6 months) 1 semester	0	14	14	0	420	420
BND-802	Research and Trends in Nutrition and Dietetics	0	4	4	0	120	120
BND-803	Scientific Writing in Nutrition and Dietetics	0	4	4	0	120	120
<b>TOTAL</b>		0	22	22	0	660	660

**First Semester**  
**BND 101 Fundamentals of Nutrition**

CL	CP	L	P
3	1	45	60

<b>Course Name</b>	<b>BND 101 Fundamentals of Nutrition 4 (3+1)</b>
<b>Course Description</b>	The students would be able to understand the fundamentals of Food and Nutrition and acquire knowledge of nutrients, their functions, deficiency disorders, sources, various food groups, and recommended dietary allowances (RDA).
<b>Objectives</b>	1. To introduce different food groups, their nutritional value, and their significance in daily diet.
	2. To recognize the roles of food and the role of different nutrients, their requirements, and their impact on deficiency and excess.
	3. To acquaint students with diverse methods of cooking and their advantages and disadvantages.
	4. Understand various food groups and RDA
<b>Reference Books</b>	1. Srilakshmi B. 9th Edition (2023). Dietetics. New Age Publishers. ISBN 13: 9789395161848 2. Dietary Guidelines for Indians A Manual, Revised Edition 2024. ICMR NIN, Hyderabad 3. Mudambi, S. R. (2007). <i>Fundamentals of foods, nutrition and diet therapy</i> . New Age International Pvt. Ltd. ISBN-10 : 9788122433494 4. Bamji, M. S., Krishnaswamy, K., & Brahmam, G. N. V. (Eds.). (2016). <i>Textbook of human nutrition</i> . Oxford & IBH. ISBN 13: 9788120417908.

	<p>5. Chowdhury SR, Tamber Aeri B ()Textbook of Food Science and Nutrition. Kindle Edition.</p> <p>6. Shadaksharaswamy, M, Manay, S, (2010): Food facts and Principles, 3<sup>rd</sup> Edition, New Age International Publishers. ISBN 13: 978-9395161091.</p> <p>7. G Subbulakshmi, Udipi SA, Ghurge PA (2021). Food Processing and Preservation. ISBN: 978-8122472332.</p>	
<b>Webliography</b>	<p><a href="https://www.coursera.org/learn/food-and-health">https://www.coursera.org/learn/food-and-health</a></p> <p><a href="https://www.nutrition.gov">https://www.nutrition.gov</a></p> <p><a href="https://www.who.int/health-topics/nutrition">https://www.who.int/health-topics/nutrition</a></p>	
<b>Prerequisites</b>	Higher secondary level 12 <sup>th</sup> standard pass science or Food, Nutrition, and Dietetics students	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1</b>	<p>Concept of Food and Nutrition :</p> <p>Introduction to nutrition- definition of food, nutrition, nutrients, and health, functions of food, food groups- classification, Food pyramid, My Plate and dietary guidelines, Recommended Dietary Allowances (RDAs), Balanced diet (ICMR-NIN)</p>	9
<b>2</b>	<p>Composition, Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients/non nutrients: Carbohydrates, lipids, protein, water, fiber</p>	9
<b>3</b>	<p>Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients:</p> <p>Fat soluble vitamins</p> <p>Vitamin A, D, E, K and Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C</p>	9

4	Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients Macro minerals- Calcium, potassium, Phosphorous, Chlorine, Sulfur, Magnesium , Micro Minerals – iron, zinc, selenium, copper, manganese	9
5.	<b>Introduction to different culinary terms</b> Boiling, Simmering, Poaching, Steaming, Pressure cooking Grilling, broiling, roasting, Baking, Sautéing, Shallow fat frying, Deep fat frying, Combined (Moist and dry) Methods: Braising, Stewing Germination, Fermentation, Braising, Microwave cooking, Solar cooking	9
*Practical		
Unit 1	Market survey of locally available food items viz. cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, nuts and oilseeds, sugar and jaggery, meat, fish, and poultry and miscellaneous food items like biscuits, jams, jellies, ketchup etc. and their cost.	5
Unit 2	Classify foods on the basis of nutrients: Protein, Iron, Calcium, Vitamin A, Vitamin C (list of 10 foods with highest and lowest amount of these nutrients- Plant and animals courses) Calculate the cost of food required for providing a given amount of nutrient for an adult man/woman as per RDA/EAR for each food group : cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, nuts and oilseeds, sugar and jaggery, meat, fish, and poultry	5

Unit 3	<p>Overview of Controlling techniques and Food exchange system</p> <p>Controlling techniques: Weights and measures - standard and household measures for raw and cooked foods (metric)</p> <p>Food exchange system and its applications.</p>	10
Unit 4	<p>Standardization of basic food preparations</p> <p>Beverages: Tea, coffee, cocoa, fruit juice, milk shakes and smoothies</p> <p>Cereal and flour mixtures: Basic preparations - boiled rice &amp; rice, pulao; chapati, puri, paratha, sandwiches, pastas</p> <p>Pulses and legumes: Using whole, split and sprouted</p>	15
Unit 5	<p>Standardization of basic food preparations</p> <p>Nuts and oilseeds: Chikki, ladoo</p> <p>Vegetables: Simple salad, dry and gravy vegetable</p> <p>Fruits: Fruit preparations using fresh fruits - jam, squash, fruit salad</p> <p>Milk and products: Milk porridge – dalia; curd, paneer and their commonly made preparations- butter milk, lassi, shrikhand; milk based simple desserts and puddings - custards, kheer, ice-cream</p> <p>Egg : Hard and soft boiled, poached, scrambled, fried, omelette, eggnog</p> <p>Soups : Basic, clear and cream soups</p> <p>Snacks : Pakoras, upma, pohe</p>	30

## BND 102 Human Anatomy and Physiology

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>Human Anatomy and Physiology Theory</b>
<b>Course Description</b>	This course shall enable the student to learn about the structure and functioning of the human body.
<b>Objectives</b>	1 To understand the anatomy of the various organs and organ systems of the human body. 2 To understand the functioning of the various systems of the human body
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>. Tortora, G.J. and Derrickson, B.H. (2017). Principles of Anatomy and Physiology. 15<sup>th</sup> Edition. John Wiley and Sons.ISBN 1119400066</li> <li>. Waugh, A and Grant, A. (2022). Ross &amp; Wilson Anatomy and Physiology in Health and Illness. 14<sup>th</sup> Edition. Elsevier Health Sciences. ISBN 0323834612</li> <li>. Standring, S. Gray's Anatomy. (2020). The Anatomical Basis of Clinical Practice. 42<sup>nd</sup> Edition. Elsevier ISBN 0702077054</li> </ul>
<b>Webliography</b>	Carbrey, J. and Jakoi, E. 2024. Introductory Human Physiology. Duke University. Available on Coursera. <a href="https://www.coursera.org/learn/physiology?action=enroll">https://www.coursera.org/learn/physiology?action=enroll</a>
<b>Prerequisites</b>	12 <sup>th</sup> Science or Food, Nutrition and Dietetics

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1</b>	<p>Definition of Human anatomy and physiology</p> <p>Relevance of Human anatomy and physiology for Dietitians and Nutritionists</p> <p>Basic concepts –Anatomical positioning of various organs in the human body, Homeostasis -definition and relevance</p>	<b>2</b>
<b>2</b>	<p>Cell structure and functions- Cell organelles -Structure and functions of nucleus, cytoplasm, lysosomes, endoplasmic reticulum, Golgi apparatus, mitochondria, and cell membrane.</p> <p>Movement of particles across cell membrane -active transport and passive transport, body fluids and their compartments and functions</p> <p>Cellular growth, Mitosis, and meiosis.</p> <p>Tissues – Classification, structure, and functions</p> <p>Body fat and water percentage across the life cycle and relevance for health</p>	<b>7</b>
<b>3.</b>	<p>Musculoskeletal system: structure and functions of bone, cartilage and connective tissue and muscle fibres. Types of muscles, structure and function.</p> <p>Bone health- Changes in bone mass during aging: osteoporosis</p>	<b>2</b>
<b>4.</b>	<p>Respiratory System: Structure and functions of organs of respiration, mechanism of respiration, Pulmonary ventilation, external &amp; internal respiration. Role of hemoglobin. Regulation of respiration: nervous and chemical. Respiratory function tests, Lung volume &amp; Capacities</p>	<b>3</b>

5.	<p>Digestive System: Structure and function of organs of gastrointestinal tract- Oral cavity, oesophagus, stomach, small intestine, large intestine, colon, pancreas, liver and gall bladder. Role of liver, gall bladder and pancreas in digestion. Enzymes and hormones of the GIT. Role of gut microbiota. Digestion and absorption process. Gut brain connection</p>	8
6.	<p>Excretory System, : Anatomy and physiology of kidneys, ureter, urinary bladder. Structure and function of nephron. Glomerular filtration rate. Urine formation. Normal and abnormal constituents of urine.</p>	3
7.	<p>Circulatory System: Structure and function of the heart and blood vessels. Capillary exchange. Regulation of cardiac output, cardiac cycle, blood-pressure and factors affecting it. Systemic, hepatic portal and pulmonary circulation. Interstitial fluid and lymph. Blood constituents- Erythrocytes, leucocytes, thrombocytes, plasma. Blood coagulation. Blood groups</p>	5
8.	<p>Endocrine system; Structure, Mode of Action and Physiological functions of Pituitary, Thyroid, Parathyroid, Adrenal and Reproductive Hormones.</p>	3
9.	<p>Immunology: Basic principles of Immunology- concept of immunity and types. Immunoglobulin- Types, general structure &amp; function. T-Cells, B-Cells structure &amp; function. Humoral and Cell-mediated Immunity. Role of nutrition in immunity</p>	3

10.	Regulation of body temperature: Thermo genesis, thermolysis, pyrexia, hypothermia, role of skin in maintaining body temperature.Homeostasis -definition and relevance	2
11.	Reproduction System: Male reproductive system -anatomy and physiology, Female reproductive system- anatomy and physiology, Organs including hormones- structure and function, Menarche, Menstruation and ovarian cycles, Pregnancy-conception, three trimesters, Parturition, Lactation, Menopause	7
<b>Practical</b>		
<b>Unit 1</b>		
1.	Respiratory System: Spirometry, Breath holding test, Use of Respirometer to estimate respiratory quotient	6
2.	Cardiovascular System: Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulse rate	6
3.	Blood test: Demonstration: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count	8
4.	Blood test: Demonstration : Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count	8
5.	Digestion: Test salivary digestion	2
6.	Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells and cysts  First aid medical skills like CPR, how to measure Blood Pressure	8

### BND 103 Basics of Food Science

CL	CP	L	P
3	1	45	15

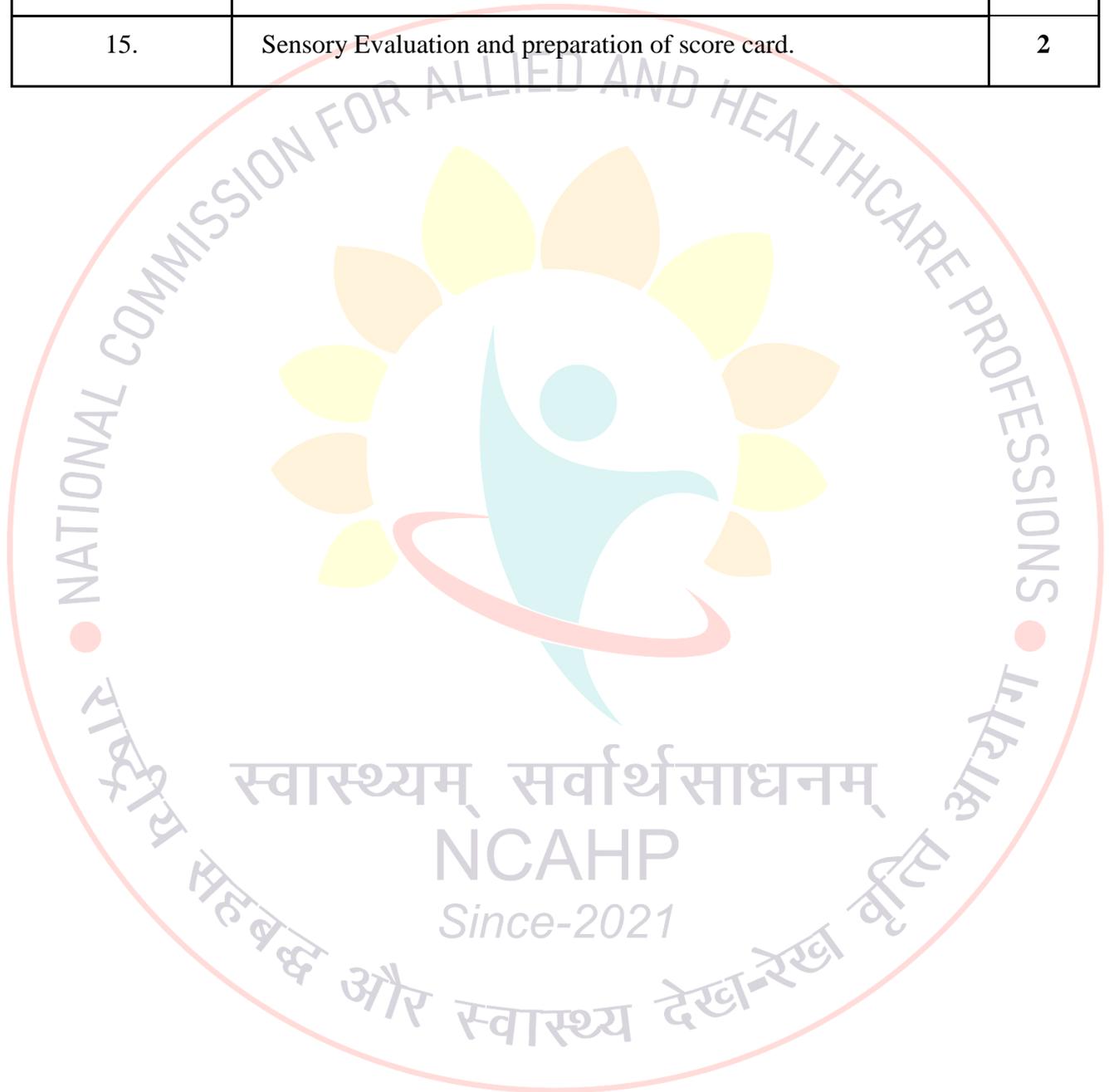
Course Name	BND 103 Basics of Food Science	
Course Description	It is a first basic course in Food Science. The course enables students to understand basic principles of Food Science.	
Objectives	<ol style="list-style-type: none"> <li>1. Understand the concepts and principles of Food Science.</li> <li>2. To gain knowledge of different plant and animal derived foods and their nutritive values and properties.</li> <li>3. Gain both theoretical as well as practical knowledge in handling foods and applying processing principles.</li> </ol>	
Reference Books	<ol style="list-style-type: none"> <li>1. Swaminathan. M.S(1987) <i>Food science, Chemistry and Experimental Foods</i> (2<sup>nd</sup> edition) Bappco Publishers</li> <li>2. Norman. N. Potter (2007) <i>Food Science</i> (5<sup>th</sup> edition) CBS</li> <li>3. Griswold R.M (1962, Digitized in 2008) <i>Experimental study of Foods</i> (digitized edition 2008) Houghton Mifflin Publishers</li> <li>4. Thangam Philip (1965 digitized in 2006). <i>Modern Cookery for Teaching and Trade</i>, volume I&amp;II (Digitized edition 2006), Orient Longmans Ltd. ISBN 8125025189,9788125025184</li> <li>5. MacWilliams (2013). <i>Food Fundamentals</i> (10<sup>th</sup> edition) Pearson Education. ISBN 1292054409,978129205407.</li> </ol>	

	<p>6. Shakunthala Manay &amp; Shadakhraswamy.(2008) <i>Food Facts &amp; Principles</i>(2008 Reprint) New Age International. ISBN 8122422152</p> <p>7. Srilakshmi .B.(2018) <i>Food Science</i> (7<sup>th</sup> edition). New Age International(P) Ltd, ISBN 9789386418890</p>	
<b>Prerequisites</b>	12 <sup>th</sup> Science or Food, Nutrition and Dietetics subject	
<b>Course Plan</b>		
<b>Theory</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<p>Function of Foods and classification of Food groups; Cooking Techniques – Dry heat and Moisture heat techniques, Combination techniques, Techniques using fat as cooking medium.</p> <p>Fruit &amp; Vegetable Preservation – Pickling, Preservation with high concentration of sugar – jam, jelly, candied fruit, Dehydration of fruits and vegetables, Concentration – Tomato sauce, Canning of acid and non-acid foods, Freezing, Chemical Preservation</p>	9
2.	<p>Cereals: Structure and Composition of Rice, Wheat, and Millets. Effect of cooking on starch- Dextrinization, gelatinization, factors affecting Gel strength and Retrogradation; Primary processing of cereals and Millets – Drying and Milling of cereals and millets, Byproducts; Value-added products like pasta, noodles, multigrain flours, and RTE mixes</p> <p>Pulses: structure Composition of Pulses and Nutritive value of various pulses; Cooking study of pulses with different cooking media; Germination process and factors affecting germination; processing of fermented products from pulses like soybean</p>	9

3.	Milk– Milk composition and nutritive value; Homogenization, Pasteurization of milk, types of pasteurization and effect on nutritive value, UHT; Milk Products – Flavored milk, Ice cream, Cheese and Milk powders; Preparation of Indigenous milk products - channa, paneer, Sandesh, Rasogolla and Khoa	9
4.	Eggs and Poultry: Structure of an egg; Composition and Nutritive value of eggs; functional properties of egg and cooking of eggs – green ring formation; preparation of egg powders; Nutritive value of poultry meat; Dressing of a poultry bird and cuts of poultry  Meat – Structure of muscle, Composition and nutritive value of meat, Classes of meat, Slaughter and steps in slaughtering of animals, Postmortem changes of meat, factors affecting cooking quality of meat – Juiciness, marbling, flavor and tenderness; Meat cooking techniques; Meat emulsion and value added meat products	9
5.	Spices and Condiments: Roles of spices and condiments in cooking; health benefits and types of spices & herbs; Essential oils ,fixed oil and oleoresins; Primary processing of spices – Sterilization of spices; milling of spices and cryogenic grinding of spices; Curry Powders  Oils and Fats: Types of fats and oils; Smoking oils, Physical and chemical properties of oils- FFA, Iodine value, saponification, Rechiert Miessl value, fat emulsification and emulsifiers; Factors affecting absorption of oils; Processing of oils- Oil extraction, Refining of oils and Fractionation of oils; hydrogenated fats, Mayonnaise and specialty fats  Sensory Evaluation of Foods: Types of sensory organs, Perception of sensory response , Basic tastes, Preparation of sensory card using various methods	9

<b>Practical</b>		
1.	Cooking methods Moist heat methods – (i) boiling, simmering, steaming & Pressure cooking	2
2.	ii) Dry heat methods – baking. (iii), Fat as a medium for Cooking - shallow and deep fat frying.	2
3.	Studying Temperature of gelatinization in different cereal and millet starches and gel Strength	2
4.	Cooking of soaked and unsoaked pulses	2
5.	Common preparations with pulses – Composite mixes and malts	2
6.	Processing of vegetables- Fermentation and Pickling	2
7.	Prevention of darkening in fruits & vegetables	2
8.	Preservation of fruits - Jam, Jelly and Candied fruit	2
9.	Preservation of fruits – Dehydration of fruits and vegetables	2
10.	Processing of Milk & milk products – Paneer and Cheese.	2
11.	Processing of Milk & milk products - Common preparation indigenous milk sweets like Channa based Rasogolla and Sandesh	2
12.	Processing of Flesh foods: meat & poultry- preparations like pickling and value added products – nugget , meat loaf and meat balls	2

13.	Processing of Flesh foods: Fish and shrimp – preparations like battered shrimp, Pickled fish & shrimp; fish wafers and fingers	2
14.	Egg Experimental cookery- boiled egg, poached egg. Common preparations with eggs.	2
15.	Sensory Evaluation and preparation of score card.	2



### BND 104 Environmental Science (Theory)

CL	CP	L	P
2	0	30	0

<b>Course Name</b>	<b>Environmental Science</b>
<b>Course Description</b>	It is the first basic course in Environmental Science giving an insight into various aspects of environment, ecology, and conservation of Natural resources.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Understand the concepts and principles of Environmental Science.</li> <li>2. Develop the students' knowledge base to conserve nature and forests to fight climate change</li> <li>3. Develop and apply knowledge regarding Disaster management and preserve the food chain</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Fellows P.J (2017) <i>Food Processing Technology</i> (4<sup>th</sup> edition) Wood head Publishing series. ISBN 978-0-08-101907- 8</li> <li>2. Norman. N. Potter (2007) <i>Food Science</i> (5<sup>th</sup> edition) CBS publishers. ISBN 812390472X</li> <li>3. Griswold R.M (1962, Digitized in 2008) <i>Experimental study of Foods</i> (digitized edition 2008) Houghton Mifflin Publishers</li> <li>4. Deepak Mudgil and Shwetha Barak (2018). <i>Beverages: Processing and Technology</i> ( 1<sup>st</sup> edition ) Scientific Publishers ,ISBN 9387991725,9789387991729</li> <li>5. Matz S.A (2008). <i>Bakery Technology &amp; Engineering</i> (3<sup>rd</sup> edition Reprint) CBS Publishers India. ISBN 0942849302</li> <li>6. MacWilliams (2013). <i>Food Fundamentals</i> (10<sup>th</sup> edition) Pearson Education. ISBN 1292054409,978129205407</li> </ol>

	<p>7. Robert Guy (2001). <i>Extrusion cooking</i> (1<sup>st</sup> edition reprint) Elsevier. ISBN 1855736314</p> <p>8. Minife and Minife( 2012).<i>Cocoa, Confectionery , and chocolate products</i> (3<sup>rd</sup> edition reprint) Springer Netherlands. ISBN 9401179263,97899401179263</p> <p>9. Sanjeev Kumar and Srivastava (2017).<i>Fruit and Vegetable Preservation</i> (3<sup>rd</sup> edition Reprint).International Book Distributing Company.ISBN8123924372,9788123924373</p>	
<b>Prerequisites</b>	12 <sup>th</sup> Science or Food, Nutrition and Dietetics	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<p>Multidisciplinary nature of environmental studies- Definition, scope and importance. Natural resources- Renewable and non-renewable resources and their associated problems. Forest resources- Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forest and tribal people</p> <p>Water resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources- Use and exploitation, environmental effects of extracting and using mineral resources. Food resources- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p>	6

2.	<p>Energy resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources- Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.</p> <p>Ecosystems- Concept, structure and function of an ecosystem. Producers, consumers and decomposers, energy flow in the ecosystem, ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic ecosystems.</p>	6
3.	<p>Biodiversity and its conservation- Introduction, definition, genetic, species, ecosystem diversity and biogeographical classification of India. Value of biodiversity- Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity- Habitat loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India. In-situ and Ex-situ conservation of biodiversity.</p> <p>Environmental pollution- Definition, cause, effects and control measures of air, water, soil, marine, noise and thermal pollution and nuclear hazards. Solid waste management- Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.</p>	6

4.	<p>Social issues and the environment- Unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics- Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.</p> <p>Environment protection acts- Air (Prevention and control of pollution) act, water (Prevention and control of pollution) act, wildlife protection act, forest conservation act, Issues involved in enforcement of environmental legislation, public awareness. Human population and the environment- Population growth, variation among nations, population explosion. Role of Information Technology in environment and human health.</p>	6
5.	<p>Natural disasters- Meaning and nature, types (floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves, global warming, sea level rise, ozone depletion) and effects. Man-made disasters- Nuclear, chemical, and biological disasters, building fires, coal fires, forest fires, oil fires, road accidents, rail accidents, air accidents, and sea accidents.</p> <p>Disaster management- International strategy for disaster reduction at national and global levels; National disaster management framework- Financial arrangements, role of NGOs, community-based organizations and media, central, state, district and local administration, armed forces in disaster response, police and other organizations. Feeding the people struck by the disaster, managing house and dress need during disaster</p>	6

### BND 105 Indian Knowledge System on Foods

CL	CP	L	P
2	0	30	0

<b>Course Name</b>	<b>Indian Knowledge System on Foods 2 (2+0)</b>
<b>Course Description</b>	This course focuses on the Indian food cultures across the states and Union territories. Understand the local household food traditions and understand Indian food anthropology which can be used for the Eat Right Movement.
<b>Objectives</b>	1. To explore and understand the Indian Knowledge system in the context of the diverse Indian food culture.
	2. To understand the concept of Food Anthropology and its importance - regional cuisines, culinary traditions historical, cultural, and social factors that have shaped Indian food practices and traditions over time.
	3. To analyze the Dietary Patterns and Investigate the local, Indigenous ingredients used in traditional Indian culinary practices across different parts of India- Central, Northern, Western, and Eastern India.
	4. To understand the traditions of the food-related customs, rituals, and daily practices in Indian households across various regions.
	5. To promote the rich culinary heritage of India and explore ways to preserve and promote traditional food practices by documenting and recording traditional recipes, cooking methods, and food stories from different regions.
	6. To support the Eat Right Movement and Integrate knowledge of regional food cultures into the Eat Right Movement, promoting healthy eating habits and sustainable food practices.

<b>Reference Books</b>	1. Nambiar, V. (Ed.). (2021). Indian Food Anthropology and the Eat Right Movement- Volume 1. Selective & Scientific Books. ISBN: 978-81-951492-2-3.	
	2. Nambiar, V. (Ed.). (2021). Indian Food Anthropology and the Eat Right Movement- Volume 2. Selective & Scientific Books. ISBN: 978-81-951492-4-7.	
	3. Achaya, K. T. (1994). Indian food: a historical companion. Oxford University Press. ISBN-13978-0195634488	
	4. Sen, C. T. (2014). Feasts and fasts: A history of food in India. Reaktion Books. ISBN-13978-1780233529.	
<b>Webliography</b>	1. <a href="http://iksindia.org">Indian Knowledge Systems :: (iksindia.org)</a>	
	2. <a href="http://ciks.org">Centre for Indian Knowledge Systems (ciks.org)</a>	
<b>Prerequisites</b>	12 <sup>th</sup> Science or Food, Nutrition and Dietetics	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topics</b>	<b>Hours</b>
1	Introduction to Indian Knowledge Systems and its importance as per NEP 2020. Traditional diets and food culture (Food anthropology) and Regional diets of North India (Jammu, Kashmir, Ladakh, Punjab, Haryana, Uttarakhand) and South India (Tamil Nadu, Kerala, Andhra Pradesh, Telangana, Puducherry, Karnataka)	6
2	Traditional diets and food culture (Food anthropology) and Regional diets of Central India (Uttar Pradesh, Madhya Pradesh) and Western India (Gujarat, Maharashtra, Rajasthan, Goa).	6

3.	Traditional diets and food culture (Food anthropology) and Regional diets of anthropology Regional diets of East India (West Bengal, Bihar, Odisha) and	6
4.	Traditional diets and food culture (Food anthropology) and Regional diets of North east India (Assam, Mizoram, Manipur, Meghalaya, Sikkim, Nagaland, Tripura, Arunachal Pradesh)	6
5.	Traditional diets and food culture (Food anthropology) of specific religions of India (Mulsims, Parsi, Buddhist, Sikhs and any other local communities).	6



**BND 106 Computer literacy**

CL	CP	L	P
0	2	0	60

<b>Course Name</b>	<b>Computer literacy Practical</b>
<b>Course Description</b>	The course is designed to introduce students to computer basics and its application for nutritionists and dietitians.
<b>Objectives</b>	1 To know about the various parts of a computer and to understand how it's working.
	2 To learn about word processing, spreadsheets and making presentations
<b>Reference Books</b>	Balagurusamy E., Fundamentals of Computers ( 2009). Tata McGraw Hill Education Private Limited NEW DELHI ISBN <b>9780070141605</b>
<b>Webliography</b>	1. E-Learning Material Computer Application of 1st/2nd semester of all Engineering Branches of Diploma courses of SCTE&VT, Odisha. Ajay Ku. Panda, D. Susmita, Ajit Ku. Behera, Kalpana Panigrahi, Swetalina Das, Published by SCTE&VT, Odisha, Bhubaneswar-12 <a href="https://sctevtodisha.nic.in/en/secretarysctevt@gmail.com,material.sctevt@gmail.com">https://sctevtodisha.nic.in/en/secretarysctevt@gmail.com,material.sctevt@gmail.com</a> 2. Basic Applications of Computers <a href="http://egyankosh.ac.in/handle/123456789/50864">http://egyankosh.ac.in/handle/123456789/50864</a> 3. Computer Basics (Video) <a href="http://hdl.handle.net/123456789/35766">http://hdl.handle.net/123456789/35766</a> 4.
<b>Prerequisites</b>	Nil

Course Plan		
Unit	Topic	Hours
1.	<p>Introduction and Basic Applications of Computer</p> <p>Components of Computer System - Central Processing Unit , Keyboard, mouse and VDU, Other Input devices, Computer Memory</p> <p>Concept of Hardware and Software - Application Software, Systems software</p> <p>Concept of computing, data, and information Applications of IECT</p> <p>Bringing computer to life- Connecting keyboard, mouse, monitor and printer to CPU, Checking power supply</p>	6
	<p>Operating Computer using GUI-Based Operating System :</p> <p>What is an Operating System;</p> <p>Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Selection, Running an Application, Viewing of File</p>	6
	<p>Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.</p>	8
	<p>Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.</p>	6
	<p>Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.</p>	4

2.	Basic of Computer networks; LAN, WAN; Concept of Internet; Understanding the World Wide Web, Web Browsers, Browsing the internet, Using a Search Engine, connectivity related troubleshooting, World Wide Web; Web Browsing softwares, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website	6
	Input Devices: Keyboard, Pointing Devices, Scanning Devices, Optical Recognition Devices, Digital Camera, Voice Recognition System, Data Acquisition Sensors, Media Input Devices	6
	Output Devices: Display Monitors, Printers, Voice Output Systems, Projectors, Terminals	4
	Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes.	6
	Making Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation/handouts.	8

स्वास्थ्यम् सर्वार्थसाधनम्

NCAHP

Since-2021

### BND 107 English For Communication ( Theory )

CL	CP	L	P
2	0	30	

<b>Course Name</b>	<b>English For Communication (Theory)</b>
<b>Course Description</b>	It is a first basic course for developing Communication skills.
<b>Objectives</b>	<ol style="list-style-type: none"><li>1. Understand the significance of communication, the process and different types of communication</li><li>2. Read fluently and comprehend the prescribed texts and write independently required for professional written communication</li><li>3. Converse confidently in English and participate in discussions conducted in English</li></ol>
<b>Reference Books</b>	<ol style="list-style-type: none"><li>1. The above said skills would be developed with the integration of Language Lab software in the English tutorials and with the help of selected texts from the book 'Reflections II -An Anthology of Prose, Poetry and Fiction by Nandini Nayar (Foundation Books) ;</li><li>2. Punishment in kindergarten – A poem by Kamala Das</li><li>3. People who never took a 'No' – Case study of Akio Morita and Henry Ford</li><li>4. The Wonders of new millennium – by Michael David</li></ol>
<b>Prerequisites</b>	12 <sup>th</sup> Science or Food, Nutrition and Dietetics

Course Plan		
Unit	Topic	Hours
1.	Introduction to Communication: Explain the significance of Communication. Discuss the process of communication, 3. Identify different types of communication	5
2.	Reading prescribed texts, narratives and articles: Read fluently and comprehend prescribed texts, .Read the text / poems with understanding and enjoyment, Summarize the given text	10
3.	Writing - Letter ; Report writing, Write business letters effectively Prepare a report of an event /visit with correct usage of grammar and tense. Public Speaking: Draft various kinds of speeches and Vote of thanks .Interact and communicate confidently at professional level. Demonstrate listening skills (with the language lab software) Practice enhanced listening skills, Demonstrate the correct pronunciation with proper stress, intonation and pacing	15



## Second Semester

### BND 201 FOOD MICROBIOLOGY

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>BND 201 FOOD MICROBIOLOGY</b>
<b>Course Description</b>	General Microbiology, Morphology & growth of microorganisms, Microbiology of Plant & Animal based foods, Fermented food & its beneficial effects on Humans
<b>Objectives</b>	1. Obtain knowledge on morphology of microorganisms and types of microscopy
	2. Understand the factors influencing the growth of microorganisms
	3. Apply the preservation principles and methods to preserve the foods from microbial contamination
	4. Explore the beneficial effects of microorganisms in the development of fermented foods
<b>Text Books</b>	1. Frazier C (2024) <i>Food Microbiology</i> , (6th Revised Edition), Science Technology.
	2. Narang, S.P (2014), <i>Food Microbiology</i> , APH Publishing Corporation, New Delhi. 9788176487405
	3. Foster WM (2016), <i>Food Microbiology</i> , CBS Publishers and Distributors Pvt., Ltd, New Delhi. 9788123929125

<b>Reference Books</b>	<p>1. Adams, M. R., &amp; Moss, M. O. (2015). <i>Food microbiology</i>. New Age International (P) Ltd., New Delhi. ISBN-13: 978-8122439756</p> <p>2. Cappuccino, J. G., &amp; Sherman, N. (2008). <i>Microbiology: A laboratory manual</i> (8th ed.). Pearson Education. ISBN-13: 978-0321648785</p> <p>3. Jay, J. M. (2015). <i>Modern food microbiology</i> (4th ed.). CBS Publishers &amp; Distributors. ISBN-13: 978-8123912044</p>	
<b>Webliography</b>	<p>1. Frontiers in Microbiology, Frontiers, <a href="https://www.frontiersin.org/journals/microbiology/sections/food-microbiology/about">https://www.frontiersin.org/journals/microbiology/sections/food-microbiology/about</a></p> <p>2. Food Microbiology Academy, <a href="http://foodmicrobiology.academy">foodmicrobiology.academy</a></p> <p>3. Science.gov, <a href="https://www.science.gov/topicpages/f/fundamental+food+microbiology">https://www.science.gov/topicpages/f/fundamental+food+microbiology</a></p>	
<b>Prerequisites</b>	Basics of Biology, Food Science/ Fundamentals of Nutrition	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<p>Introduction to Microbiology</p> <p>Importance of microbiology for Dieticians - recent examples</p> <p>Morphology and Growth factors of Microorganisms; Definition and History Microscopy, Light and electron Microscopy, Listing other Types. General Morphology of Microorganisms Bacteria, Fungi, Algae, Yeast and Virus Bacteriophage</p> <p>Microbial Biomass, Growth Curve, Definition of Batch and Continuous culture, Factors Affecting Growth Intrinsic Factors, Nutrient Content, pH, Redox Potential, Antimicrobial Barrier and Water Activity.</p> <p>Extrinsic Factors: Relative Humidity, Temperature and Gaseous Atmosphere</p>	15

2.	Microbiology of Plant and animal based foods Outline of Contamination, Spoilage and Preservation of Vegetables and Fruits, Cereals and Cereal Products, Pulses, Nuts and oil seeds, Sugar and Sugar Products	15
	Outline of Contamination, Spoilage and Preservation of Milk and Milk Products, Canned Foods, Meat and Meat Products, Egg and Poultry	
3.	Significance of Microbes in food quality, food safety and standards: Applications of HACCP in Nutrition and Dietetics Beneficial and Harmful Effects of Microorganisms: Fermented Foods–Curd, Cheese, Sauerkraut, Meat, Soy Based Foods, Alcoholic Beverages and Vinegar	15



राष्ट्रीय

सहबद्ध

और

स्वास्थ्य

देख-रेख

वृत्ति

आयोग



स्वास्थ्यम् सर्वार्थसाधनम्

NCAHP

Since-2021

## FOOD MICROBIOLOGY PRACTICAL

Unit	Topic	Hours
1.	Basic lab techniques for food microbiology	2
2.	Bright field light microscopy	2
3.	Hanging Drop Method–Motility of Bacteria	2
4.	Staining of Bacteria–Simple Staining, Gram Staining	4
5.	Sterilization techniques	2
6.	Preparation of common laboratory media, broth and slant	2
7.	Serial dilution and plating techniques– pour plate, streak plate	4
8.	Enumeration of cell counts– colony forming units.	4
9.	Most probable number test	2
10.	Microbial analysis of water	2
11.	Microbial analysis of liquid foods –Milk and Fruit juice	2
12.	Microbial analysis of solid foods	2

## BND 202 FUNDAMENTALS OF BIOCHEMISTRY

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>FUNDAMENTALS OF BIOCHEMISTRY</b>
<b>Course Description</b>	Study of Biochemistry of Major Nutrients, Classification- Structure and Properties of Carbohydrates, Lipids, Amino acids and Proteins, Nucleic acids, Enzymes and Vitamins
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable the students to obtain depth in the study of biochemistry of major nutrients</li> <li>2. To help the students to understand the basic metabolic pathways</li> <li>3. To gain knowledge about the defects in various metabolic pathway</li> </ol>
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Satyanarayana, U., &amp; Chakrapani, U. (2021). <i>Biochemistry</i> (Revised reprint) (6th ed).Elsevier. ISBN-13:978-8131264355</li> <li>2. Nelson, D. L., &amp; Cox, M. M. (2021). <i>Lehninger principles of biochemistry</i> (8th ed.). W.H. Freeman and Company NewYork.ISBN-13 : 978-1319381493</li> <li>3. Dickson, J. K. (2020). <i>Food biochemistry</i>. CBS Publishers &amp; Distributors. ISBN-13: 978-9389396355</li> <li>4. Appling, D. R., Cahill, S. J. A., &amp; Mathews, C. K. (2018). <i>Biochemistry: Concepts and connections</i> (2nd ed). Pearson Education Limited. ISBN-13 : 978-0134641621</li> </ol>

<b>Reference Books</b>	1. Kennelly, P., Botham, K., McGuinness, O., Rodwell, V., & Weil, P. A.(2022). <i>Harper's illustrated biochemistry</i> (32nd ed.).McGraw Hill. ISBN-13: 9781260469943	
<b>Webliography</b>	1. Biochemical Society. (n.d.). Biochemical Society. <a href="https://www.biochemistry.org">https://www.biochemistry.org</a> .	
	2.E-learning.AOAC India. <a href="https://aoac-india.org/e-learning/">https://aoac-india.org/e-learning/</a>	
<b>Prerequisites</b>	<b>Fundamentals of Nutrition, Basics of Chemistry</b>	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Carbohydrates: Introduction, Classification. Structure and Properties of monosaccharides (hexoses and pentoses). Reactions of monosaccharides—oxidation, reduction, and reaction with hydrogen cyanide, hydroxylamine, and phenylhydrazine. Oligosaccharides – Sucrose, maltose,	12
2.	Lipids:Classification—Triglycerides(Fats), Phospholipids and other non-phosphorylated lipids—cerebrosides, gangliosides, sulfolipids. Characterization of fats. Rancidity of fats. Chemistry of Essential fatty acids	9
3.	Amino acids, Peptides and Proteins: Structure and classification of standard amino acids- rare amino acids and non-protein amino acids – physical and electrochemical properties- reactions of amino acids- due to amino groups, carboxyl groups, and R groups – color reactions of amino acids. Peptides- Peptide bond, structure, and biological importance of glutathione and valinomycin.	12

<b>4.</b>	<p>Nucleic acids and Enzymes : Composition and function.</p> <p>Structure and properties of DNA and RNA (t-RNA, m-RNA, and r-RNA), minor RNA types.</p> <p>Classification of enzymes.IUB classification Enzyme kinetics– Michaelis Menten equation. Factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration).</p>	<b>12</b>
<b>PRACTICAL</b>		

Unit	Topic	Hours
<b>1</b>	<p>Good Laboratory Practices</p> <p>Safety measures in Laboratory, Preparation of Molar and Normal solutions, Safety Hazards and Disposal of wastes, Calibration of volumetric glassware- burette, pipette, and measuring cylinder</p>	<b>5</b>
<b>2</b>	<p>Reactions of Monosaccharides, Disaccharides and Polysaccharides :</p> <p>Pentose, Glucose, Fructose, Galactose and Mannose, Sucrose, Maltose, Lactose, Starch, Dextrin and glycogen</p>	<b>5</b>
<b>3</b>	<p>Qualitative analysis of Proteins; Precipitation reactions of proteins, color reactions of proteins, color reactions of amino acids, Color reactions of proteins- Biuret, Xanthoproteic, Millon's</p>	<b>10</b>
<b>4</b>	<p>Qualitative analysis of Lipids : Solubility, Acrolein test, Salkowski test, Lieberman- Burchard test. Demonstration- Characterization of fats- acid number, iodine number, saponification number, and RM number.</p>	<b>10</b>

### BND 203 Nutrition Through Life Cycle

CL	CP	L	P
2	2	30	60

<b>Course Name</b>	<b>BND 203 Nutrition Through Life Cycle</b>
<b>Course Description</b>	The course is designed to introduce students to the concept of meal planning during the various phases of life cycle with emphasis on healthy diet and lifestyle. The students shall be made to understand the nutritional requirements, recommendations, nutrition related problems and concerns of each age group.
<b>Objectives</b>	<p>1 To understand the concept of meal planning and dietary guidelines.</p> <p>2 To learn about the dietary management during various stages of life</p> <p>3. To learn about the nutritional concerns and its management during various stages of life.</p> <p>4. To understand the concept and use of food exchange list and to learn planning and preparation of meals for various stages of life</p>
<b>Reference Books</b>	<p>Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S (2013). Textbook of Nutrition and Dietetics. Phoenix Publishing House Pvt. Ltd. ISBN <b>8188901539</b></p> <p>Wardlaw GM, Hampi JS, DiSilvestro RA (2004). Perspectives in Nutrition, 6th edition. McGraw Hill. ISBN 0072921633, 9780072921632</p> <p>Chadha R and Mathur P eds. Nutrition: A Lifecycle Approach. Orient Blackswan, New Delhi. 2015. ISBN 9788125059301</p> <p>Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. ISBN 9788120417427</p>

	<p>Srilakshmi B. 9th Edition (2023). Dietetics. New Age Publishers.ISBN 9395161841</p> <p>Seth V and Singh K (2006). Diet Planning through the Life Cycle: Part 1 Normal Nutrition. A Practical Manual. Elite Publishing House Pvt. Ltd. New Delhi. ISBN 8193599624</p> <p>Indian Food Composition Tables (2023), NIN, Hyderabad ISBN <b>9352676777</b></p> <p>Dietary Guidelines for Indians A Manual, Revised Edition 2024. ICMR NIN, Hyderabad</p>	
<b>Prerequisites</b>	First semester of nutrition and knowledge of basics of nutrition and food science	
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	<p>Basic concepts of meal planning :</p> <p>EAR and RDA, Concept of Dietary Reference Intakes, Dietary Guidelines for Indians, Meal planning: objectives and principles, Factors affecting meal planning - Nutritional, socio-cultural, religious, geographic, economic, availability of time, energy and resources, Indian meal patterns - vegetarian &amp; non-vegetarian.Food faddism, unhealthy food habits.</p>	<b>6</b>
<b>2.</b>	<p>Nutrition during Adulthood: Reference women and man Nutritional requirements, recommendations, nutrition-related problems and concerns, and Meal planning with emphasis on healthy diet and lifestyle to prevent chronic diseases</p>	<b>3</b>
<b>3.</b>	<p>Nutrition in Pregnancy and Lactation Physiological stages of pregnancy, Physiology of lactation, Nutritional requirements. recommendations, nutrition-related problems, and concerns Meal planning with emphasis on maternal and child health</p>	<b>5</b>

4.	Nutrition for Infancy: Importance of breastfeeding, Exclusive breastfeeding, early initiation, colostrum, Nutritional requirements. recommendations, nutrition-related problems, and concerns, Complementary Feeding – timely introduction of appropriate foods, adequacy, consistency, frequency, utilization and safety, Meal planning with emphasis on exclusive breastfeeding	4
5.	Nutrition during growing years : Nutritional requirements, nutritional guidelines and healthy food choices : Preschool children, School children. Adolescents, Meal planning with emphasis on growth and development and establishment of healthy food habits and physical activity	6
6.	General Diets for Athletes	3
7.	Geriatric Nutrition : Physiological changes during old age, Nutritional requirements, nutritional guidelines, nutritional concerns, and healthy food choices, Meal planning with emphasis on maintenance of good health	3
<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>UNIT ONE</b>		
1.	Introduction to meal planning, Use of food exchange list, Recipe standardization	6
2.	Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for adult man and woman	6
3.	Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for pregnant woman	6

4.	Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for lactating woman	6
5.	Meal Planning (as per nutritional requirements) and preparation of healthy diet and dishes for infants. Planning homemade premixes.	6
6.	Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box dishes for Preschool child	6
7.	Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box for School-age child	6
8.	Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box for adolescents.	6
9.	Planning healthy snacks and beverages for all age groups	12



**BND 204 Psychology and Sociology Applied to Health Care**

CL	CP	L	P
4	0	60	0

<b>Semester</b>	II
<b>Course Name</b>	<b>Psychology and Sociology Applied to Health Care</b>
<b>Course Description</b>	Introduction to psycho-social interventions approach, Social Determinants of Health, Case studies, and Application of Psycho-Social science theories
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To explain and discuss the relationship between Society and Health;</li> <li>• To explain concepts of health and illness from the sociological point of view;</li> <li>• To enumerate the different systems of medical Care and their relation to health-seeking behaviour with reference to India; and</li> <li>• To explain the pattern of utilization of the health system.</li> </ul>
<b>Text Books</b>	<ul style="list-style-type: none"> <li>• Warr, P. B. (2002). <i>Psychology at work</i>. Penguin Books Ltd. ISBN-13 : 978-0141000107</li> <li>• Pasricha, N. (2016). <i>The happiness equation: Want nothing + do anything = have everything</i>. G.P. Putnam's Sons. ISBN-13 : 978-0425277980</li> </ul>
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• Pryce-Jones, J. (2010). <i>Happiness at work: Maximizing your psychological capital for success</i>. John Wiley &amp; Sons. ISBN-13:978-0470749463</li> <li>• Gilbert, D. (2006). <i>Stumbling on happiness</i>. Alfred A. Knopf. ISBN-13: 9780739474556</li> <li>• Levy, P. (2016). <i>Industrial/organizational psychology: Understanding the workplace</i>. (5th edit). Worth Publishers. ISBN-13 : 978-1319014261</li> </ul>

- Rubin, G. (2009). *The happiness project: Or, why I spent a year trying to sing in the morning, clean my closets, fight right, read Aristotle, and generally have more fun.* HarperCollins. ISBN-13 : 978-0061583254
- Breuning, L. G. (2016). *Habits of a happy brain: Retrain your brain to boost serotonin, dopamine, oxytocin, and endorphin levels.* Adams Media. ISBN-13 : 978-1440590504

**Prerequisites**

Basic concepts of Psychology and sociology related to health

**Course Plan**

Unit	Topic	Hours
1.	Introduction to psychology and sociology , Foundational psychological theories and findings in psychology. psycho-social interventions approach: Relationship between Psychology and Sociology, Concept of Health, Concept of Illness, Illness: Sociological View, psychotherapeutic approaches for the treatment and care of persons with acute and chronic physical illness. Role of interdisciplinary approaches in health care.	18
2.	Social determinants of Health: Cultural, systemic, and environmental factors that affect human development. psychological factors influencing health behaviors and health care utilization	15
3.	Chronic Illness and Management : Psychological impact of chronic illness on patients and families. Sociological perspectives on chronic illness management. Case studies: Long-term care and patient support systems	15
4.	Application of Psycho-Social science theories: Social Science theories- Psychoanalytic, Developmental, Interpersonal, Humanistic and Behavioral theories. Behavioral Aspects of Health and Medical Care, Policies to Improve Health Care	12

## BND 205 Techniques of Nutritional Assessment

CL	CP	L	P
0	2	0	60

<b>Course Name</b>	<b>BND 205 Techniques of Nutritional Assessment</b>
<b>Course Description</b>	This course provides a comprehensive knowledge about the methods and approaches for conducting nutrition assessment of individuals and populations throughout the lifecycle. The course is structured into three assessment components: dietary, clinical, anthropometric and biochemical. The topics include in-depth overview of the assessment methods, strengths and limitations of methodology, evaluation and interpretation of assessment data, sources of measurement errors, validity of assessment methods and basic analytical approaches used to interpret assessment data.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To learn the principles and methods of nutritional assessment</li> <li>2. To monitor nutritional status and trends in population groups</li> <li>3. To identify at-risk individuals &amp; groups</li> <li>4. To investigate diet and disease relationships</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Sehgal S. and Raghuvanshi RS (2007) Textbook of community nutrition. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.</li> <li>2. Latham M.C. (1997) Human nutrition in the developing world. Food and Agricultural Organization of United Nations.</li> <li>3. Dahiya, S., Boora, P. and Rani, V. (2013). A manual on community nutrition, Department of Foods and Nutrition, published under ICAR Assistance scheme.</li> </ol>

	<p>4. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. ISBN 9788120417427</p> <p>5. Flamino Fidanza .1991. Nutritional Status Assessment, Springer Science Business Media.</p> <p>6. Beghan I Cap M Dajardan B (1988) A guide to Nutritional Status Assessment WHO Geneva.</p>	
<b>Prerequisites</b>	BND 101, 102 & 202	
<b>Course Plan</b>		
<b>Unit</b>	<b>Practical topics</b>	<b>Credit hours</b>
<b>1.</b>	<ul style="list-style-type: none"> <li>Assessment to be done in atleast 5 individuals</li> <li>Dietary Assessment - Methods of assessing food intake</li> <li>Using Food and Nutrient Databases</li> <li>Accuracy, Precision and Validity of Dietary Assessment</li> <li>Assessing the Intakes of Individuals using Recommended Dietary Allowances</li> </ul>	<b>15</b>
	<ul style="list-style-type: none"> <li>Assessment to be done in atleast 5 individuals</li> <li>Anthropometric Assessment – Anthropometric assessment of children</li> <li>Anthropometric assessment of adults</li> <li>Anthropometric assessment of Elderly</li> <li>Body composition measurements</li> </ul>	<b>15</b>

2.	<ul style="list-style-type: none"> <li>• Assessment to be done in at least 5 individuals</li> <li>• Clinical assessment - Screening in Clinical Assessment - (MUST Tool, SGA)</li> <li>• Medical History and Physical Examination</li> <li>• Assessment of Energy Expenditure and Energy Requirements</li> </ul>	15
	<ul style="list-style-type: none"> <li>• Biochemical Assessment - Assessment of Protein Status</li> <li>• Biochemical Assessment for Anaemia</li> <li>• Target group selection from local hospitals suffering from nutritional deficiencies, tabulation, interpretation and report writing of their tested biomarkers.</li> </ul>	15



### BND 206 Soft Skills and Communication

CL	CP	L	P
2	0	30	0

<b>Course Name</b>	<b>BND 206 Soft skills and communication</b>
<b>Course Description</b>	The academic and career success depends much on communication and presentation skills. As a student, the individual is expected to analyze, prepare, and present the content on different platforms. This course builds awareness, understanding, and frameworks for skill development in the qualities and attributes of presentational formats that involve the voice and the body when used together with technologies to present ideas and concepts that not only inform but also seek to persuade and motivate.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand the structure and processes of effective communication</li> <li>2. To identify various soft skills and relate them with effective communication</li> <li>3. To prepare an action plan to improve the effectiveness of the communication.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Lamerton J (2001) Everything you need to know public speaking. Harper Collins Glasgow.</li> <li>2. Ernest S and Sharon AR (1985) Effective Group Communication-How to get action by working in groups. National Textbook Company, Lincolnwood.</li> <li>3. Vanni F (2014) The Role of Collective Action. Agriculture and Public Goods, 21. DOI 10.1007/978-94-007-7457-5_2, © Springer Science +Business Media Dordrecht.</li> </ol>

	<p>4. Mary S (2010) Book of conflict resolution games quick, effective activities to improve communication, trust, and collaboration. ISBN: 978-0-07-174366-2.</p> <p>Future Research Directions. Group Facilitation.</p> <p>5. <u>Lawrence R. Frey</u> (2005) Facilitating group communication in context: Innovations and applications with natural groups: Facilitating group task and team communication. Hampton Pr.</p>	
<b>Prerequisites</b>	BND 107	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Credit Hours</b>
1.	<p>Communication skills: Need and importance of communication in the present context; Types of communication skills - verbal, non-verbal, and written communication; Types of workplace communication skills - oral presentations, group discussions, public speaking, interviews, extempore presentations, e-mail, memos, business letters, blogs, interoffice memorandums, report writing. Using language for effective communication, techniques of dyadic communication- message pacing and message chunking, self disclosure, mirroring, expressing conversational intent, paraphrasing, vocabulary building- word roots, prefixes, Greek and Latin roots</p>	8

2.	<p>Soft skills : Introduction to soft skills and hard skills. Personality- meaning and definition of personality, theoretical perspectives on personality, behavioural trait and humanistic personality patterns, molding the personality patterns. Personality development - self-perception, self-concept, self-esteem and gender stereotyping, persistence, and changes in personality determinants (physical, intellectual, emotional, social, educational and family), aspirations, achievements and fulfilment. Cosmopolitan culture- presentational etiquettes, formal dressing, formal greetings. stress and conflict management- goal setting, decision making, career planning, resume building, interview skills.</p>	8
3.	<p>Public speaking : Types of speeches - persuasive, informative, and motivational or inspirational speech; Structuring the speech - introduction, body content and conclusion; Effective delivery – voice; modulation, appearance during speeches and delivery; Platform performance - posture, gesture, eye contact, emphasis, pause, voice pitch, overcoming fear and anxiety of public speaking; Visuals in presentation - type of visuals for public speaking, tips for effective use, computer aided visual presentation, body language.</p>	7

4.	Importance of Listening : Listening styles - active & passive and direct & indirect listening, thinking & listening, adjusting listening style to that of speaker, social situations & listening; Listening improvement techniques; listening to audio-video conversations oral presentations for evaluation of body language and communication skills based on group discussions and interviews, role plays and pronunciation exercises	7
----	--	---



### BND 207 Advanced Computer Literacy for Nutritionists

CL	CP	L	P
0	2	0	60

<b>Course Name</b>	BND 207 Advanced Computer Literacy for Nutritionist
<b>Course Description</b>	The course is designed to introduce students to computer basics and its application for nutritionists and dietitians.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To know about internet security and the use of Artificial Intelligence (AI) in nutrition</li> <li>2. To learn about the nutritional concerns and their management during various stages of life.</li> <li>3. To understand the concept and use of a food exchange list and to learn planning and preparation of meals for various stages of life</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Computer Applications in Nutrition &amp; Dietetics An Annotated Bibliography. <i>John Orta</i>, eBook Published 7 December 2018. Routledge, New York DOI <a href="https://doi.org/10.4324/9781315057538">https://doi.org/10.4324/9781315057538</a> eBook ISBN 9781315057538</li> <li>2. Thareja Reena. Fundamentals of Computers.(2019) Oxford University Press; Second edition ISBN 0199499276</li> </ol>
<b>Webliography</b>	<ol style="list-style-type: none"> <li>1. AI nutritionist: Intelligent software as the next generation pioneer of precision nutrition - ScienceDirect</li> <li>2. The application and impact of computer-generated personalized nutrition education: A review of the literature - ScienceDirect</li> </ol>

<b>Prerequisites</b>	The first semester of Bachelor of Nutrition and Dietetics in Honours and basics of computers	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1,</b>	Internet Security Security, Privacy, Ethical Issues & Cyber Law	<b>6</b>
	Use of Artificial Intelligence (AI) for nutritionists and dietitians	<b>6</b>
	Introduction to Web design, Types of Web Pages Web design Pyramid Building web sites Web development process model	<b>6</b>
<b>2.</b>	Use of computers for data analysis	<b>4</b>
	Mobile based apps for diet counseling and diet planning	<b>16</b>
	Meal Planning, Exercise Tracking & Analysis, Patient record management, Menu planning modules, meal or menu plan creation/analysis, Diet analysis spreadsheets and reports, recipe analysis and management, Food intake/diary analysis Indian and international nutrient databases	<b>22</b>
	Interactive Multimedia Nutrition Education	<b>6</b>

**Third Semester**  
**BND 301 Macro Nutrients (Theory)**

CL	CP	L	P
4	0	60	0

<b>Course Name</b>	<b>BND 301 Macro Nutrients (Theory )</b>
<b>Course Description</b>	It is a first basic course in Food chemistry. The course enables students to understand basic principles of Food chemistry revolving around macro nutrients in food environment
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. The subject will focus on the main components in food: water, lipids, carbohydrates and proteins. The subject deals in depth with the relationship between the chemical structure of the components and the reactions and function of the components in food</li> <li>2. The students should be able to explain the relationship between the chemical structure and the properties of the main components in food (proteins, lipids, polysaccharides and water) and be able to explain the relationship between the properties and reactions of these components and the quality and stability of foods. In addition, the students should have acquired a deeper understanding in selected topics within food chemistry</li> </ol>

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Manay, N.S. and Shadaksharswamy, M. (2001). Food facts and principles, II Ed. . New Age International (P)Ltd. Publishers, New Delhi.</li> <li>2. Aurand, L.W. and Woods A.E. (1973). Food chemistry. The AVI Publishing Company, Inc., Westport Connecticut.</li> <li>3. Mondy, N.I. (1980). Experimental food chemistry. AVI Publishing Company, Inc. Westport Connecticut.</li> <li>4. Owen r, Fennema, 1996. Food Chemistry, 3<sup>rd</sup> Edition, Marcel Dekker, Inc., New York, USA</li> <li>5. H.D. Belitz, 2009. Food Chemistry, 4<sup>th</sup> Edition. Springer</li> </ol>	
<b>Prerequisites</b>	The first semester of Bachelor of Nutrition and Dietetics in Honours	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	<p>Properties of foods. Solubility, vapour pressure, boiling point, freezing point, osmotic pressure, viscosity, surface tension, specific gravity, oxidation and reduction.</p> <p>Acids, bases and buffers. Chemical bonding, octet rule, ionic bond, covalent bond, hydrogen bond, polar and non-polar molecules.</p> <p>Colloids, sols, gels, emulsions and foams. Water,- physical problem, free, adsorbed and bound water; Water activity in foods; Molecular mobility and stability</p> <p>Food emulsions: O/W and W/O emulsions; Stability of emulsions; Role of emulsifiers and stabilizers in contributing stability of emulsions- natural and synthetic emulsifiers</p> <p>Composition of foods- classification, structure and properties of carbohydrates, proteins and lipids</p>	<b>15</b>

2.	<p>Carbohydrates: Changes in carbohydrates on cooking, Digestibility, Modified starches, Enzymatic and chemical hydrolysis of Carbohydrates and Dietary fibre</p> <p>Protein in foods: Plant proteins, Milk Proteins, Egg proteins and Meat proteins; processing induced physical, chemical and nutritional changes in proteins</p> <p>Formations of toxins and allergens in protein foods; Functional Properties of proteins; Chemical modification of proteins like acylation, alkylation, phosphorylation, sulphitolysis and esterification</p>	15
3.	<p>Lipids in Foods: Role and functions of fats in food processing; Polymorphism exhibited by fat – crystallization, and consistency of fats – Palm kernel fat, Cocoa butter, and Milk butter</p> <p>Lipid hydrolysis, Auto-oxidation, and Thermal decomposition of fats</p> <p>Methods of Fat extraction from foods: Rendering – wet and dry rendering techniques, Pressing techniques and solvent extraction</p> <p>Chemistry involved in Hydrogenation, Deodorization, Neutralization, and Interesterification of foods; Significance of MCTs in fats; Enzymatic and chemical modification of fats ; Fat replacers – Natural and synthetic and their composition</p> <p>Chemistry of frying – process of oil absorption by foods during foods and effect of hydrocolloids on oil uptake by foods</p> <p>Deterioration of fats – Mechanism underlying hydrolytic rancidity and oxidative rancidity ; formation of lipid oxidation decomposition products; Detection tests for rancidity</p> <p>Antioxidants – role in preventing oxidation; natural and synthetic antioxidants, mechanism of action and synergistic action between antioxidants and chelators in removing prooxidants</p>	15

<p>4.</p>	<p>Effect of processing on fruits and vegetables – effect on Structure and composition</p> <p>Processing effect on the composition of cereals, pulses, and oilseeds.</p> <p>Processing effect on the composition of milk, eggs, meat, and poultry.</p> <p>Chemical changes and nutrient losses during processing – Pasteurization, Caramelization, Baking, Demineralization, Dehydration, Irradiation, Fermentation of plant and animal foods, Freezing, Canning</p> <p>Fortification , Enrichment, and restoration of nutrients – Micronutrient fortification, fortificants and vehicles of fortification; Methods of fortification</p>	<p>15</p>
-----------	--	-----------



### BND 302 Basics of Food Science (Theory)

CL	CP	L	P
3	1	45	15

<b>Course Name</b>	<b>BND 302 Advanced Food Science</b>
<b>Course Description</b>	The course enables students to understand Advances in Food Science.
<b>Objectives</b>	1. Understand the advanced concepts and principles of Food Science. 2. To gain knowledge of novel food processing techniques. 3. Gain both theoretical as well as practical knowledge in handling foods and applying processing principles.
<b>Reference Books</b>	1. Food Processing Technology by P.J Fellows 2. Food Science by Norman. N. Potter. 3. Experimental study of Foods by Griswold R.M. 4. Food Science by Helen Charley. 5. Beverages: Processing and Technology by Deepak Mudgil and Shwetha Barak 6. Bakery Science and Technology by S.A. Matz 7. Food Fundamentals by MacWilliams, John Willy and son"s, New York. 8. Extrusion cooking by Robert Guy. 9. Cocoa, Confectionery , and chocolate products by Minife and Minife 10. Fruit And Vegetable Preservation by Sanjeev Kumar and Srivastava

<b>Prerequisites</b>	The second semester of Bachelor of Nutrition and Dietetics in Honours	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>UNIT I</b>	<p>Sugar – Processing of sugar from sugarcane; Types and grades of sugar and their uses; Stages of sugar cookery &amp; crystallization; Preparation of caramel sauce, Processing of sugar confectionery – Types of sugar confectionery products – fudge , fondant, lollipop, hard-boiled candy, marshmallow, sugar pastes, and nougat,</p> <p>Chocolate confectionery: Processing of cacao beans to nibs; Processing of chocolate; Types of chocolate – Dark, White, Milk chocolate and compound chocolate; Chocolate defects</p>	<b>9</b>
<b>UNIT II</b>	<p>Beverages: Classification of beverages; Processing of Tea- types of tea; Coffee processing – types of coffee; Decaffeination; Processing cola beverages;</p> <p>Processing of cocoa-based flavored drinks</p> <p>Processing of Fruit based beverages: RTS, Squashes, Crushes Nectars, Cordials, Syrups, Concentrates and fruit juice powders</p> <p>Alcoholic beverages: Fruit Wines – Grape wine, port, perry, cider, sherry, ginger wine and Feni; Alcoholic - Brandy, Beer, Whisky</p>	<b>9</b>

<p><b>UNIT III</b></p>	<p>Processing of Bakery Products</p> <p>Breads –Role of ingredients, Processing of Bread, methods of bread mixing, Bread faults and remedies</p> <p>Biscuits – Ingredients, types of biscuits and preparation, defects in biscuit making</p> <p>Processing of cookies - Ingredients, types of Cookies and preparation, defects in Cookie making</p> <p>Processing of Cakes and Muffins: Ingredients and their role, Types of cakes, and types of cake mixing techniques</p> <p>Processing of other bakery products like pizza bases, Doughnuts, Pretzels, Bagels, French Loaf</p>	<p><b>9</b></p>
<p><b>UNIT IV</b></p>	<p>Novel processing Techniques</p> <p>Supercritical fluid extraction and its applications</p> <p>Irradiation of food – theory, application, advantages and disadvantages</p> <p>High pressure processing of foods -theory, application, advantages and disadvantages</p> <p>Ohmic heating and Pulsed electric field processing - theory, application, advantages and disadvantages</p> <p>Pulsed light and Infrared heating - theory, application, advantages and disadvantages</p>	<p><b>9</b></p>
<p><b>UNIT V</b></p>	<p>Processing of Convenience – RTC and RTE foods; Weaning mixes and infant foods</p> <p>Processing pasta, and noodles</p> <p>Extrusion – types of extrusion, types of extruders, Classification of extruded products</p> <p>Processing of snack foods – fried snacks, popped and flaked snacks</p>	<p><b>9</b></p>

<b>Practicals</b>		
1.	Stages of sugar crystallization	1
2.	Preparation of Fudge and fondant	1
3.	Preparation of hardboiled candy and caramel	1
4.	Preparation of chocolate and enrobed products with chocolate	1
5.	Preparation of hot beverages- coffee, tea and malt beverages	1
6.	Preparation of cold Beverages- fruit drinks & milk shakes	1
7.	Processing of Bread	1
8.	Processing of Biscuits and cookies	1
9.	Processing of Pizza and dough nuts	1
10.	Preparation noodles and pasta	1
11.	Preparation of RTE mixes and weaning foods	1
12.	Preparation of popped grains and coating them	1
13.	Preparation of flaked cereal and millet	1
14.	Preparation of extruded snacks.	1
15.	Sensory Evaluation and preparation of scorecard.	1

### BND 303 Public Health Nutrition

CL	CP	L	P
3	1	45	30

Semester	III
Course Name	Public Health Nutrition
Course Description	<ul style="list-style-type: none"> <li>The course aims to focus on the basics of Public Health Nutrition at National level and Global level</li> </ul>
Objectives	<ul style="list-style-type: none"> <li>To understand and define the basic concepts in Public Health Nutrition (PHN)</li> </ul>
	<ul style="list-style-type: none"> <li>To understand the global importance of nutrition across the life cycle and its role in achieving Sustainable Development Goals (SDGs).</li> </ul>
	<ul style="list-style-type: none"> <li>To assess the impact of public policies on community nutrition and global health targets.</li> </ul>
	<ul style="list-style-type: none"> <li>To explore nutritional surveillance systems, for monitoring and evaluating public health nutrition programs.</li> </ul>
	<ul style="list-style-type: none"> <li>To analyze epidemiological data to understand the relationship between diet and community health.</li> </ul>
	<ul style="list-style-type: none"> <li>To explore community nutrition programs to address specific health challenges.</li> </ul>
	<ul style="list-style-type: none"> <li>To emphasize the need for Health Promotion in a diverse population.</li> </ul>

Reference Book	<ul style="list-style-type: none"> <li>Lal, S. (2018). Textbook Of Community Medicine Preventive And Social Medicine With Recent Update. CBS Publishers &amp; Distributors Private Limited. ISBN:938774289X, 9789387742895</li> </ul>
	<ul style="list-style-type: none"> <li>Vir SC (2011). Public Health Nutrition in Developing Countries 2nd Edition (2 Volume Set). Woodhead Publishing India Pvt Ltd. ISBN: 9789388320351.</li> </ul>
Webliography	<ul style="list-style-type: none"> <li>UNICEF. <a href="https://www.unicef.org/">https://www.unicef.org/</a></li> <li>WHO. <a href="http://www.who.int/">http://www.who.int/</a></li> <li>World Food Programme. <a href="http://www.wfp.org/content/about-wfp-">http://www.wfp.org/content/about-wfp-</a></li> <li>WHO. United Nations Decade of Action on Nutrition. <a href="http://www.who.int/nutrition/decade-of-action/en/">http://www.who.int/nutrition/decade-of-action/en/</a></li> <li>Mother, Infant, and Young Child Nutrition and Malnutrition. <a href="http://motherchildnutrition.org/india/overview-india.html">http://motherchildnutrition.org/india/overview-india.html</a></li> <li>Double burden of malnutrition. <a href="http://www.who.int/nutrition/double-burden-malnutrition/en/">http://www.who.int/nutrition/double-burden-malnutrition/en/</a></li> <li>United Nations Development Programme. Sustainable Development Goals. <a href="http://www.undp.org/content/undp/en/home/sustainable-development-goals.html">http://www.undp.org/content/undp/en/home/sustainable-development-goals.html</a></li> <li>Global targets 2025- <a href="http://www.who.int/nutrition/global-target-2025">http://www.who.int/nutrition/global-target-2025</a></li> <li>Improving breastfeeding, complementary foods and feeding practices. <a href="http://www.unicef.org/nutrition/index_breastfeeding.html">www.unicef.org/nutrition/index_breastfeeding.html</a></li> <li>National Guidelines on Infant and Young Child Feeding. <a href="http://www.wcd.nic.in">www.wcd.nic.in</a></li> <li>WHO Health Statistics and Information Systems. Global Health Estimates. <a href="http://www.who.int/healthinfo/global_burden_disease/en/">http://www.who.int/healthinfo/global_burden_disease/en/</a></li> </ul>

	<ul style="list-style-type: none"> <li>• WHO Non-communicable diseases and risk factors. <a href="http://www.who.int/ncds/en/">http://www.who.int/ncds/en/</a></li> <li>• Overview of Non-Communicable Diseases and Related Risk Factors. <a href="https://www.cdc.gov/globalhealth/healthprotection/fetp/">https://www.cdc.gov/globalhealth/healthprotection/fetp/</a></li> </ul>
--	--

### Course Plan

Unit	Topic	Hours
I	<ul style="list-style-type: none"> <li>• Introduction to Public Health Nutrition</li> <li>• What is Public Health Nutrition (PHN)? Roles and responsibilities of public health nutritionists.</li> <li>• Definitions of important concepts: Positive health, Malnutrition (under-nutrition, overweight, obesity, micronutrient malnutrition),</li> <li>• Nutritional status, Nutrition intervention, Food and nutrient supplements, Food substitutes, Nutrition Education</li> </ul>	9
2.	<ul style="list-style-type: none"> <li>• Sectors in Public Health Nutrition</li> <li>• Primary Health Care of the Community and Health Systems of India. National Health Care Delivery System. Determinants of Health Status, Indicators of Health.</li> <li>• Food and Nutrition Security: Food Production, access, Distribution Availability, Losses, Consumption, Dietary patterns and their implications on Nutrition and Health</li> <li>• Nutritional Status: Determinants of Nutritional Status of individuals and populations</li> <li>• Nutrition and Non-nutritional indicators: Sociocultural biological, environmental and economic</li> <li>• Approaches and Strategies for Improving nutritional status and health: Health-based intervention, Food-based intervention, Nutrition education for behaviour change ,</li> <li>• Supplementation and Food fortification</li> </ul>	9

3	<ul style="list-style-type: none"> <li>• Nutrition – A Developmental Priority, Population Dynamics (Local, National, Global), Demographic transition, Population structure, Fertility, Behaviour,</li> <li>• Quality of life, Burden of death and disease (Local, National, Global), United Nations (UN) Decade of Action on Nutrition (2016 - 2025), Nutrition at center stage of Sustainable Development Goals (SDGs), 12 of the 17 Goals require good nutrition to be met – an overview.</li> </ul>	9
4.	<ul style="list-style-type: none"> <li>• Importance of nutrition throughout the life cycle : Role of Nutrition in Achieving Global Targets, Optimal Infant and Young Child Feeding: Significance of the first 1000 days of life, Improving maternal, infant and young child nutrition – WHO Global Targets, Role of dietary risk factors in achieving global targets related to Non-Communicable Diseases (NCDs), maternal and child health, Addressing micronutrient deficiencies</li> </ul>	9
5.	<ul style="list-style-type: none"> <li>• Nutritional Surveillance and Surveillance Systems; Understanding Nutritional Surveillance and its purpose in programme design planning, implementation, operation monitoring, surveillance, and Evaluation Surveillance/reporting system used in ICDS program, Strength &amp; weaknesses, Newer initiatives taken by government to improve ICDS surveillance system. Monthly Program Report and its uses in surveillance, Definitions of terms used in nutritional surveillance, Long term nutrition monitoring , Evaluation of programs impact , Timely warning and intervention systems</li> <li>• Types of nutritional surveillance appropriate to different situations, Indicators, and data sources from existing macro and micro systems of information in India (Origin, objectives, importance, and their use in community nutrition) NNMB, NFHS, NSSO, ICDS, NSS, CENSUS, MICS CES, etc.</li> <li>• Nutrition surveillance for action –cycle of triple A.</li> <li>• Critique of Nutrition surveillance data available in sources like NFHS (National Family Health Surveys) , NNMB (National Nutrition Monitoring Bureau)</li> </ul>	9

	<p><b>Practical*</b></p> <ul style="list-style-type: none"> <li>• Understand the situational analysis of ongoing National Nutrition Program</li> <li>• ICDS</li> <li>• MDM</li> <li>• Urban Primary Health Center</li> <li>• Rural Health Center and Sub Centres</li> </ul>	<b>6</b>
<b>2</b>	<ul style="list-style-type: none"> <li>• Understand the significance of a local event calendar and prepare a calendar for the past three years.</li> <li>• Understand local and national Surveillance data sets (NFHS, NNMB, DLHS) for various age groups (Pregnant, Lactation, children under 5y, Adult man and Adult women),</li> </ul>	<b>6</b>
<b>3.</b>	<ul style="list-style-type: none"> <li>• Assess the nutritional status of populations using Indirect parameters</li> <li>• Prepare a tool to assess the SES of different income groups (LIG, HIG, MIG as per Kuppuswamy scale), (10 subjects/student).</li> <li>• Morbidity profile (last 15 days) (10 subjects/student), and understand ICD 11.</li> </ul>	<b>6</b>
<b>3</b>	<ul style="list-style-type: none"> <li>• Assess the nutritional status of populations using Direct parameters (Primary care setup)</li> <li>• Understand the use of a growth chart as an advocacy tool.</li> <li>• Conduct anthropometric measurements and data analysis in a community setup for children and adults (weight, height, BMI, waist/hip, MUAC), (10 subjects/student) and classify them using Asia Pacific and WHO cutoffs of BMI.</li> <li>• Introduce the WHO Child Growth Standard Analysis and interpretation using WHO Anthro and Anthroplus software.</li> </ul>	<b>6</b>

4	<ul style="list-style-type: none"> <li>• Assess the nutritional status of populations using Direct parameters (Primary care setup)</li> <li>• Dietary Data and its analysis : assess the dietary intakes (10 subjects/student), using 24hDRM and FFQ using standard cups and measures in a community.</li> <li>• Analysis, comparisons with RDA, calculation of consumption units and interpretation using the RDA (NIN, 2024), identifying dietary risk factors from dietary intake data.</li> <li>• Compute dietary diversity score.</li> </ul>	6
5.	<ul style="list-style-type: none"> <li>• Assess the nutritional status of populations using Direct parameters (Primary care setup)</li> <li>• Understanding the Clinical signs and symptoms for various nutritional deficiencies through field visits, power point presentations, videos: <ul style="list-style-type: none"> <li>○ SAM/MAM</li> <li>○ Anemia</li> <li>○ VAD, Xerophthalmia</li> <li>○ IDD</li> <li>○ Water soluble vitamin B-Complex and ascorbic acid</li> <li>○ Zinc and other micronutrients</li> </ul> </li> </ul>	6



### BND 304 Basics of Medical Nutrition Therapy

CL	CP	L	P
2	2	30	60

<b>Course Name</b>	<b>BND 304 Basics of Medical Nutrition Therapy ( Theory)</b>
<b>Course Description</b>	It is a first basic course in therapeutic nutrition. The course enables students to understand basic principles of Medical nutrition Therapy.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1 Understand the concepts and principles of nutrition in basic dietetics.</li> <li>2 Develop the ability to plan and prepare diets for therapeutic conditions</li> <li>3 Apply knowledge of clinical practice in medical nutrition therapy.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Karuse and Mahan (2022); Food and the Nutrition Care Process; Saunders.ISBN0323810268.</li> <li>2. Annalynn Skipper. (2009). Medical Nutrition Therapy Practice . Jones &amp; Barlett Publishers.</li> <li>3. Mary Mariah, Mary K.Russell., Scott .A. Shikora.(2008).Clinical Nutrition for surgical patients. Jones &amp; Barlett Publishers.</li> <li>4. Thomas , Briony. (Eds). (1994). Manual of Dietetics Practice . Oxford : Blackwell Scientific Publication.</li> <li>5. Wardlaw M, Gardon. (1999) Perspectives In Nutrition. (4th ed) . USA : WCB/ McGraw – Hill.</li> <li>6. Zeman J. Frances., Ney M. Denise. (1988). Application of Clinical Nutrition. London :Prentice – Hall International.</li> <li>7. Shills E, Maurice., Olson A, James., Shike, Moshe.(Eds).( 1994) Modern Nutrition in Health and Disease. (8th ed.). USA :Lea &amp; Febige.</li> <li>8. Williams , Rodwell. (1993). Nutrition and Diet Therapy (7th ed.). USA : Mosby Year book. Inc.</li> <li>9. Anderson ,Dibble. ( 1982) Nutrition in Health and Disease (17th ed.) .Philadelphia : J. B. Lippincott Company.</li> </ol>

	<p>10. Alpers ,D., Stenson ,Williams., Denis, Bier. (1995) Manual of Nutrition Therapeutics ( 3 rd ed.) Boston : Little Brown and Company.</p> <p>11. Nambiar VS and Zaveri D (2024). Nutrition Guidance After Mini Gastric Bypass Bariatric Surgery. Adhyayan Publishers and Distributors. ISBN-10 : 8119681169.</p> <p>12. Nambiar VS and Zaveri D (2024).Nutrition Guidelines for Roux-en-Y Gastric Bypass Bariatric Surgery. Adhyayan Publishers and Distributors. ISBN-10 : 8119681215.</p>	
<b>Prerequisites</b>	The second semester of Bachelor of Nutrition and Dietetics in Honours	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Concepts in Basic Dietetics, Growth of dietetics; Purpose and principles of therapeutic diets, Modifications of normal diet. Cultural aspects in diet planning, Role of a dietitian	1
2.	Modified hospital diets ; Consistency and texture modifications , Clear liquid Full liquid diets, Soft diets, Mechanically soft diets, Convalescent diets, Regular diets.Nutrient modifications ▪ Sodium ▪ Fibre ▪ Residue	3
3.	Nutrition and Weight management (Obesity and Underweight) , Concept of energy balance.Body Composition and Fitness. Parameters for assessment, Grades of obesity and underweight, Types of obesity, etiology and pathophysiology of obesity, Medical Nutrition Therapy of weight management, Diet, Exercise, Behavioral modification strategies, Pharmacological treatments Surgical treatments, A brief dietary guideline to states like anorexia nervosa and Bulimia nervosa. FAD Diets. Medical Nutrition Therapy for thyroid related disorders and poly cystic ovarian disease (PCOD)	6  2

4.	Nutritional Status, Immunity and Infections, Immune Systems- Brief Introduction, Nutrients for Immunity, Medical Nutrition Therapy for different types of fevers Food borne : Typhoid, Tuberculosis Vector borne, Malaria,Dengue, Viral fever: -H1N1.Pathophysiology and Medical Nutrition Therapy for HIV.	3
5.	Pathophysiology and Medical Nutrition Therapy of the following conditions: Disorders of the upper Gastrointestinal tract; Gastroesophageal Reflux, Esophagitis, Hiatus Hernia. Disorders of the stomach, Gastritis Peptic ulcers Diseases / Disorders of the Lower Gastrointestinal tract- Pathophysiology and Medical Nutrition Therapy of the following conditions: Constipation and Diarrhea, Celiac Disease and Tropical sprue, Lactose Intolerance Inflammatory Bowel Disease, Crohn's Disease, Ulcerative colitis, Irritable Bowel Syndrome ▪ Diverticular Disease	6
6.	Diseases of the liver: Hepatitis, Cirrhosis, Hepatic failure, Alcoholic liver disease, Liver abscess, Nonalcoholic steatohepatitis (MASLD), Wilson's disease, Liver transplant Diseases of gall bladder: Cholelithiasis, Cholecystitis, Cholestasis Acute and chronic pancreatitis : Liver, Gall bladder, and Pancreas Function tests- a brief introduction	6
7.	Dietary Guidelines; Elimination Diets; Allergen Tests, Food Challenge. Osteoarthritis ; Rheumatoid , arthritis , Gout	3

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	Modified hospital diets: Standardization of recipes for the following: Consistency and texture modifications, Clear liquid, Full liquid diets, Soft diets, Mechanically soft diets, Convalescent diets, and Regular diets. Nutrient modifications ;Sodium, Fibre , Residue	<b>8</b>
<b>2.</b>	Planning and preparation of diets and standardized recipes with the concept of portions and portion control in My Indian Plate (ICMR, NIN 2024) <ul style="list-style-type: none"> <li>• Overweight</li> <li>• Obesity Grade 2</li> <li>• Bariatric surgery</li> <li>• Bulimia /Anorexia Nervosa</li> <li>• Underweight</li> <li>• Thyroid Disorders</li> <li>• PCOS</li> </ul>	<b>10</b>
<b>3.</b>	Nutrition, Immunity, and Infection Planning of Diets for the following conditions: Fevers Foodborne, Typhoid, Tuberculosis, Vector-borne, Malaria, Dengue, Viral fever:-H1N1; COVID; HIV.	<b>6</b>
<b>4.</b>	Diseases / Disorders of the Upper Gastro-Intestinal tract Disease : Planning and preparation of diets for the following conditions: Constipation and Diarrhea, Celiac Disease, and Tropical sprue, Lactose Intolerance, Inflammatory Bowel Disease, Crohn's Disease, Ulcerative colitis, Irritable Bowel Syndrome ▪ Diverticular Disease. GERD	<b>15</b>

5.	Pathophysiology and Medical Nutrition Therapy of the Diseases of Liver, Gallbladder, and Pancreas Planning and preparation of diets for the following conditions: Viral Hepatitis (A and C) Cirrhosis, Hepatic failure, Alcoholic liver disease, Nonalcoholic steatohepatitis , Metabolic dysfunction-associated steatotic liver disease (MASLD), Cholelithiasis Cholecystitis, Acute and chronic pancreatitis	15
6.	Diagnosis and management of food allergies. Planning of diets for the following conditions, Elimination Diets, Food Challenge Pathophysiology and Medical Nutrition Therapy for Rheumatic Disorders Osteoarthritis; Rheumatoid arthritis, Gout	6



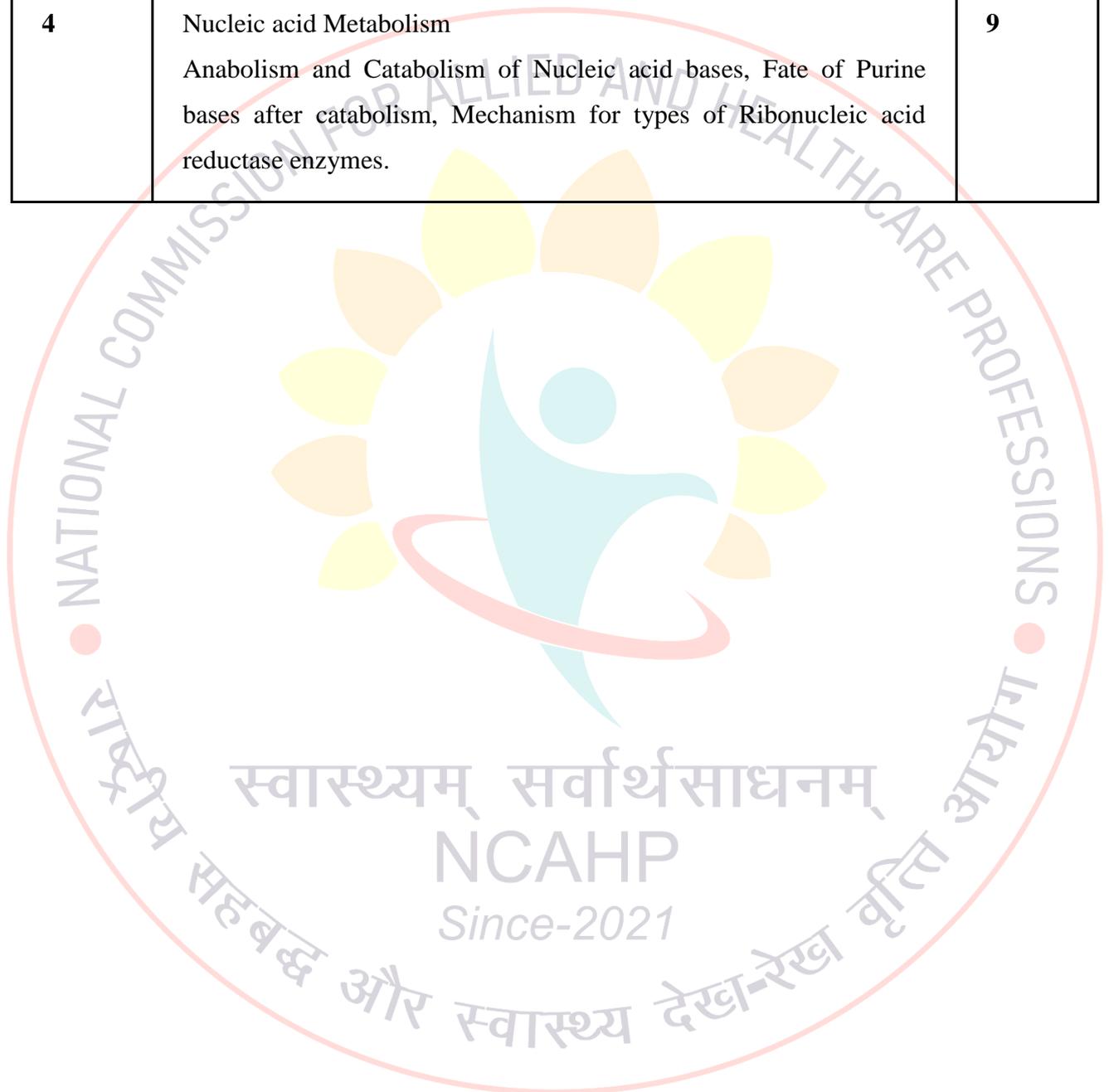
## BND 305 ADVANCED BIOCHEMISTRY

CL	CP	L	P
3	0	45	0

<b>Course Name</b>	<b>BND 305 ADVANCED BIOCHEMISTRY</b>
<b>Course Description</b>	<ul style="list-style-type: none"> <li>• Study of Biochemistry of Major Nutrients, Classification- Structure and Properties of Carbohydrates, Lipids, Amino acids and Proteins, Nucleic acids, Enzymes and Vitamins</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To acquire knowledge on basic concepts of biochemical reactions</li> <li>• To understand the biochemical reactions involved in the metabolism of various nutrients in the body.</li> </ul>
<b>Text Books</b>	<ul style="list-style-type: none"> <li>• U. Satyanarayana, U. Chakrapani (2013) <i>Biochemistry</i> (4th ed).Elsevier.ISBN-13 : 978-8131236017</li> </ul>
	<ul style="list-style-type: none"> <li>• Dean R. Appling, Spencer J. Anthony Cahill, Christopher K. Mathew (2019) <i>Biochemistry concepts and connections</i> (2nd ed). Pearson Education, Limited.</li> </ul>
	<ul style="list-style-type: none"> <li>• JK Dickson (2020) <i>Food Biochemistry</i>, CBS Publishers &amp; Distributors, Pvt. Ltd.ISBN-13 : 978-9389396355</li> </ul>
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• Adams, M. R., &amp; Moss, M. O. (2006 Reprint). <i>Food microbiology</i>.New Age International. ISBN-8122410146.</li> <li>• Cappuccino, J. G., &amp; Sherman, N. A. (2013). <i>Microbiology: A laboratory manual</i>. Pearson Benjamin Cumming. ISBN-13 : 978-0321840226</li> <li>• Jay, M. J. (2005). <i>Modern food microbiology</i> (4th ed.). CBS Publishers &amp; Distributors. ISBN-13 : 978-8123904757</li> </ul>

<b>Webliography</b>	<ul style="list-style-type: none"> <li>Gavin Publishers. <i>Advances in biochemistry and biotechnology</i> (ISSN 2574-7258). <a href="https://www.gavinpublishers.com/journals/details/advances-in-biochemistry-and-biotechnology-issn-2574-7258">https://www.gavinpublishers.com/journals/details/advances-in-biochemistry-and-biotechnology-issn-2574-7258</a></li> <li>Fenteany, G. <i>Biochemistry web</i>. <a href="http://biochemweb.fenteany.com/">http://biochemweb.fenteany.com/</a></li> <li>AOAC India. <i>E-learning</i>. <a href="https://aoac-india.org/e-learning/">https://aoac-india.org/e-learning/</a></li> </ul>	
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>Fundamentals of Biochemistry</li> </ul>	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<p>Carbohydrate Metabolism</p> <p>Types of metabolism: Anabolism and catabolism, compartmentalization of metabolic pathways. Glycolysis and its energetic, Entry of other carbohydrates (fructose, galactose, mannose) into the glycolytic pathway, Fates of pyruvate to lactate, alcohol and acetyl –CoA, TCA Cycle and its energetic, Glyoxalate cycle. Glycogen metabolism- Glycogenesis, Glycogenolysis, Cori cycle, Gluconeogenesis, Hexose monophosphate shunt and its significance, Glucuronic acid pathway</p>	12
2.	<p>Lipid Metabolism</p> <p>Synthesis of Fatty acids- saturated and unsaturated, synthesis of essential fatty acids. Fatty acid <math>\beta</math>-oxidation. Ketone body formation. Biosynthesis and degradation of triglycerides, phospholipids, glycolipids and cholesterol</p>	12

3.	<p>Protein and Amino acid Metabolism</p> <p>General reaction of amino acid degradation- Transamination, deamination and decarboxylation. Ketogenic and glucogenic amino acids. Urea cycle and its significance. Biosynthesis of protein</p>	12
4	<p>Nucleic acid Metabolism</p> <p>Anabolism and Catabolism of Nucleic acid bases, Fate of Purine bases after catabolism, Mechanism for types of Ribonucleic acid reductase enzymes.</p>	9



## BND 306 FOOD PROCESSING AND PRESERVATION

CL	CP	L	P
2	1	30	30

<b>Course Name</b>	<b>BND 306 FOOD PROCESSING AND PRESERVATION</b>
<b>Course Description</b>	Food Processing, Different techniques on Food Processing and Preservation, Standard specifications for food products
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To gain knowledge of the processing methods for various foods</li> <li>2. To understand packaging techniques for different food products.</li> <li>3. To develop marketing skills to promote new food products.</li> </ol>
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Warris, D. S. (2020). <i>Food processing and preservation</i>. CBS Publishers &amp; Distributors. ISBN-13 : 978-9389688597</li> <li>2. Subbulakshmi, G., Udipi, A. S., &amp; Ghurge, S. P. (2021). <i>Food processing and preservation</i> (2nd ed). New Age International Private Limited. ISBN-13 : 978-8122472332</li> <li>3. Sharma, M. (2015). <i>Analytical techniques in food processing</i>. Random Publications. ISBN-13 : 978-9351116073</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Dr. Joshi R.D., Dr. Adapure Nitin (2017) <i>Food Processing , Packaging, Preservation, Irradiation, Allergy and Safety</i>, Agrotech press. ISBN-139789384568689</li> <li>2. Pander S.N., (2015) <i>Handbook of Food Processing Design</i>, Raj Publication. ISBN-13: 9789382983460</li> <li>3. Ruth, S. K. (2017). <i>Food storage and preservation</i>. Navyug Books International. ISBN-13: 9789380731865</li> </ol>

<b>Webliography</b>	1. Ministry of Food Processing Industries. (n.d.). Food processing schemes. Government of India. <a href="https://www.mofpi.gov.in/">https://www.mofpi.gov.in/</a>	
	2. National Agricultural Library. National Center for Home Food Processing and Preservation. U.S. Department of Agriculture. <a href="https://www.nal.usda.gov/research-tools/food-safety-research-projects/national-center-home-food-processing-and-preservation">https://www.nal.usda.gov/research-tools/food-safety-research-projects/national-center-home-food-processing-and-preservation</a> .	
	3. Institute of Food Technologists. (n.d.). Food processing. Institute of Food Technologists. <a href="https://www.ift.org/policy-and-advocacy/advocacy-toolkits/food-processing">https://www.ift.org/policy-and-advocacy/advocacy-toolkits/food-processing</a>	
<b>Prerequisites</b>	Basics of food science	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>I</b>	Traditional and Modern Food Processing Techniques & Food Additives Element and basic rules of food processing. Traditional food processing drying, smoking, freezing, explosive puffing, vacuum packaging, addition of salt, sugar and pickling. Modern food processing techniques- microwave processing, irradiation, evaporation, ohmic heating, hydrostatic pressure treatment and high voltage pulse electric field technique. Food additives definition, need and types of food additives, antioxidants, chelating agents, coloring agents, curing agents, emulsifying agents and flavor enhancers	<b>9</b>
<b>II</b>	Types of Processed Foods Types – Fresh and processed foods, ready to eat and ready to cook foods, extruded, fabricated, value added and designer foods, health and nutrigenics supplements, special functional foods (sports, space, and therapeutic uses), process of product development and standardization, product testing (sensory objective and shelf life evaluation).	<b>6</b>

<b>III</b>	Introduction to Food Preservation Importance of Food Preservation, Types of Food Preservation, Types of Spoilage, Basic Principles of Food Preservation. Vegan Foods and Organic Foods. Preservation by the Use of Low and High Temperature Refrigeration and Freezing Advantages, Factors to be Considered, Difference Between Refrigeration and Freezing, Freeze drying and Freeze concentration, Steps Involved in Freezing Common Foods, storage Canning, Pasteurization and Sterilization Practical	<b>9</b>
<b>IV</b>	Preservation by Using Chemicals and Salts Fermentation Definition, Types of fermentation, Advantages. Common fermented foods, Wine and Cheese making, Tomato processing, General consideration involved in preparation of sauce/ ketchup. Pickling- Principles involved and Types of Pickles- Indian pickles, Vinegar, Salt preservation. Chemical preservatives- Definition, types of Preservatives, Role of Preservation, Permitted Preservatives and FPO Specifications.	<b>6</b>
<b>FOOD PROCESSING AND PRESERVATION PRACTICAL</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1</b>	Stages in sugar cookery, Evaluation of pectin quality, sugar concentration (Brix), pH and acid content	<b>10</b>
<b>2</b>	Preparation of jam, jelly, marmalades, preserves, candied, Tutti fruity, Glazed, Crystallized fruits, Toffees	<b>10</b>
<b>3</b>	Preparation of squashes, fruit juice, and Ready to Serve (RTS)	<b>6</b>
<b>4</b>	Preparation of Tomato sauce, Tomato ketchup, Preparation of pickles	<b>4</b>

### Fourth Semester

### BND 401 Clinical Biochemistry and Pathophysiology

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>Clinical Biochemistry and Patho-physiology</b>
<b>Course Description</b>	<ul style="list-style-type: none"> <li>It is a course that integrates the pathophysiology of therapeutic nutrition and its interrelationship with clinical biochemistry.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To integrate the pathophysiology of diseases with various organ systems.</li> <li>To identify and interpret the clinical manifestation of diseases.</li> </ul>
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>Voet, D., Voet, J., &amp; Pratt, C. W. (2013). Principles of biochemistry (4th ed., International student version). John Wiley &amp; Sons, Inc.</li> <li>Satyanarayana, U., &amp; Chakrapani, U. (2013). Biochemistry (4th ed.). Elsevier.</li> <li>Berg, J. M., Tymoczko, J. L., &amp; Stryer, L. (2012). Biochemistry (7th ed.). W. H. Freeman and Company.</li> <li>Rama Rao, A. V. S. S., &amp; Suryalakshmi, A. (2009). A textbook of biochemistry (11th ed.). UBS Publishers' Distributors Pvt. Ltd.</li> <li>Lehninger, A. L., Cox, M. M., &amp; Nelson, D. L. (2004). Lehninger principles of biochemistry (4th ed.). W. H. Freeman Company.</li> <li>Baynes, J., &amp; Dominiczak, M. (2002). Medical biochemistry. Mosby.</li> <li>Murray, R. K., Granner, D. K., Mayes, P. A., &amp; Rodwell, V. W. (2000). Harper's biochemistry. McGraw-Hill.</li> <li>Stryer, L. (1997). Biochemistry (4th ed.). W. H. Freeman and Company.</li> </ul>

<p><b>Prerequisites</b></p>	<ul style="list-style-type: none"> <li>• Marshall, W. J., &amp; Bangert, S. K. (2008). Clinical biochemistry. Metabolic and clinical aspects (3rd ed.). Churchill Livingstone.</li> <li>• Chatterjee, M. N., &amp; Shinde, R. (1995). Textbook of medical biochemistry (2nd ed.). Jaypee Brothers Medical Publishers (P) Ltd.</li> <li>• Rastogi, S. C. (1993). Biochemistry. Tata McGraw Hill.</li> <li>• Orten, J. M. (1990). Human biochemistry (10th ed.). C. V. Mosby Publishers.</li> <li>• Godkar, P. B., &amp; Godkar, D. P. (2003). Textbook of medical laboratory technology (2nd ed.). Bhalani Publishing House.</li> <li>• Gowenlock, A. H. (Ed.). (1996). Varley's practical clinical biochemistry (6th ed.). CBS Publishers.</li> <li>• Oser, B. L. (Ed.). Hawk's physiological chemistry (14th ed.). Tata McGraw Hill.</li> <li>• Basics of Biochemistry</li> </ul>
<p><b>Course Plan</b></p>	
<p><b>THEORY</b></p>	<p><b>Hours</b></p>
<p><b>UNIT ONE</b> Nutrition and Weight Management, Energy Metabolism, and weight management. Endocrine system physiology, functions, and disorders of the endocrine system Dental Health Pathogenesis and Treatment of Dental Diseases.</p>	<p><b>15</b></p>
<p><b>UNIT TWO</b> Bone Health pathophysiology of diseases associated with the skeletal system Gastrointestinal System Physiology, Functions and disorders of the digestive system. Liver Gallbladder and Pancreas ; Disorders of Liver, Gallbladder and Pancreas.</p>	<p><b>15</b></p>
<p><b>UNIT THREE</b> Cardiovascular System; Physiology, functions and disorders of the circulatory system. Pulmonary System; Physiology, functions and disorders of the respiratory systems.</p>	<p><b>15</b></p>

<p><b>UNIT FOUR</b></p> <p>Cancer; Pathogenesis and clinical manifestation of cancer.</p> <p>Inborn errors of Metabolism; Pathogenesis and clinical manifestation of inborn errors associated with metabolic pathways.</p> <p>Renal system; Physiology, functions, and disorders of the excretory system.</p>	<p><b>15</b></p>
<p><b>PRACTICALS</b></p> <ol style="list-style-type: none"> <li>1. Standardization:</li> <li>2. Preparation of primary standard e.g. succinic acid, for titrating alkali</li> <li>3. Urine analysis</li> <li>4. Qualitative estimation of normal and abnormal constituents of urine</li> <li>5. Routine urine analysis-Biochemical (using multi sticks) and Microscopic examination of urine (demonstration).</li> <li>6. Determination of pH of biological samples - blood, urine, saliva, plasma (demonstration).</li> <li>7. Blood analysis</li> <li>8. Determination of erythrocyte sedimentation rate ( ESR)</li> <li>9. Determination of clotting time and bleeding time</li> <li>10. . Estimation of hemoglobin.</li> <li>11. Estimation of blood glucose</li> <li>12. Quantitative estimation of constituents of serum <ul style="list-style-type: none"> <li>• Bilirubin</li> <li>• Creatinine</li> <li>• Urea</li> <li>• Total proteins</li> <li>• Albumin</li> <li>• cholesterol, HDLc, LDLc.(enzymatic Kit)</li> <li>• Serum Triglyceride, VLDL (enzymatic Kit)</li> <li>• Sodium, potassium, chloride (Using Flame Photometer)</li> </ul> </li> <li>13. Assay of salivary amylase (kit)</li> <li>14. Blood sugar monitoring</li> </ol>	<p><b>30</b></p>

## BND 402 National Health and Nutrition Programs and Policies

CL	CP	L	P
2	2	30	60

<b>Course Name</b>	<b>National Health and Nutrition Programs and Policies</b>
<b>Course Description</b>	National health and nutrition programs to improve health through initiatives like maternal care, disease prevention, food security, and water sanitation, supported by international organizations.
<b>Objectives</b>	To understand the history, development and current state of health and nutrition policies.
	To identify the key health and nutrition programmes, goals, strategies, outcomes, and framework.
	To explain the evaluation of effectiveness and Health Economics of the health and nutrition programmes.
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• Park, K. (2023). Park's textbook of preventive and social medicine. 27th Edition. Banarsidas Bhanot Publishers. Jabalpur. ISBN: 9789382219194.</li> <li>• Vir, S.C. (Ed.) (2011). Public Health Nutrition in Developing Countries 2nd Edition (2 Volume Set). Woodhead Publishing India Pvt Ltd. ISBN: 9789388320351.</li> <li>• Vir, S.C. (Ed.) (2023) Child Adolescent and Women Nutrition in India, Public Policies, Programmes, and Progress. Taylor and Francis. Kindle Edition.</li> </ul>
<b>Webliography</b>	<p><a href="http://nhm.gov.in">RMNCAH+N :: National Health Mission (nhm.gov.in)</a></p> <p><a href="http://education.gov.in">Guidelines on PM POSHAN SCHEME.pdf (education.gov.in)</a></p> <p><a href="http://nhm.gov.in">Anaemia Mukt Bharat :: National Health Mission (nhm.gov.in)</a></p>

Prerequisites		Semester 4
Course Plan		
Unit	Topic	Hours
1.	<ul style="list-style-type: none"> <li>• Universal Health Coverage</li> <li>• Universal health Coverage – World Health Organization</li> <li>• Universal Health Coverage Policies by GOI -National Health Mission</li> <li>• Goals and Objectives ; National Rural Health Mission (NRHM),</li> <li>• National Urban Health Mission (NUHM)</li> </ul>	4
2.	<ul style="list-style-type: none"> <li>• Health Systems in India</li> <li>• National Health and Nutrition Programs and Policies by the Ministry of Health and Family Welfare: Overview, Organograms, programs and their objectives (MAA, JSY, JSSK and others)</li> </ul>	4
3.	<ul style="list-style-type: none"> <li>• Understanding the Principles Health and Nutrition Programme Management</li> <li>• Design</li> <li>• Plan</li> <li>• Implementation,</li> <li>• Operation monitoring,</li> <li>• Surveillance, and</li> <li>• Evaluation</li> </ul>	4

4.	<ul style="list-style-type: none"> <li>• Health Economics</li> <li>• Macroeconomics</li> <li>• Microeconomics</li> <li>• Understand the effectiveness and cost efficiency of Health and Nutrition budgets of the past 5 years compared to the burden of disease, Overnutrition, undernutrition and micronutrient malnutrition</li> <li>• Cost-benefit, Cost-effectiveness, and cost efficiency</li> </ul>	4
5.	<ul style="list-style-type: none"> <li>• <b>National Nutrition Mission of India</b></li> <li>• POSHAN 2.0</li> <li>• National Health and Nutrition Programs and Policies by the Ministry of Women and Child Development : Overview, Organograms, programs and their objectives</li> <li>• Integrated Child Development Services Scheme-</li> <li>• Universalization of ICDS with quality,</li> <li>• ICDS in Mission mode,</li> <li>• Objectives &amp; target groups,</li> <li>• Monitoring system</li> <li>• Mode of implementation,</li> <li>• Administrative setup,</li> <li>• Coverage and compliance,</li> <li>• Impact</li> <li>• PM POSHAN- Mid-Day/ Nutritious Meal Program</li> </ul>	6
6.	<ul style="list-style-type: none"> <li>• National Programs to Combat Micronutrient Malnutrition</li> <li>• Anemia Mukht Bharat (Nutritional Anaemia Control Program,</li> <li>• National Iron Plus Initiative (NIPI, I-NIPI)</li> <li>• National Deworming Campaign</li> <li>• Vitamin A: Vitamin A Prophylaxis Program (VAPP)</li> <li>• Iodine: National Iodine Deficiency Disorders Control Program (NIDDCP),</li> </ul>	4

	<ul style="list-style-type: none"> <li>• Universal Salt Iodization (USI), Double Fortified Salt (DFS)</li> <li>• Diarrhoea Control Program: Role of Zinc, ORS</li> <li>• Fluorosis Control Program</li> </ul>	
7.	<ul style="list-style-type: none"> <li>• National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS)</li> <li>• Rising Burden of Non-Communicable Diseases</li> <li>• Public Health strategies to control NCDs</li> <li>• NPCDCS: Objectives and Key Strategies</li> </ul>	4
<b>PRACTICALS</b>		<b>CREDITS</b>
1.	Critical appraisal of existing interventions and government programs and suggestions for improving the same	20
2.	Field exposure in the operational public nutrition programs, Nutrition rehabilitation centers	20
3.	Budget and cost analysis of nutrition programmes.	20



### BND 403 Micronutrients in Human Nutrition (Theory)

CL	CP	L	P
4	0	60	0

<b>Course Name</b>	<b>Micro Nutrients (Theory)</b>
<b>Course Description</b>	The course enables students to understand basic principles of Food chemistry revolving around micronutrients in the food environment
<b>Objectives</b>	<p>1. The subject will focus on the main components of food: Vitamins, Minerals, and antioxidants. The subject deals in depth with the relationship between the chemical structure of the components and the reactions and function of the components in food</p> <p>2. The students should have acquired a deeper understanding of selected topics within food chemistry of Micronutrients</p>
<b>Reference Books</b>	<p>1. Manay, N.S. and Shadaksharswamy, M. (2001). Food facts and principles, II Ed. . New Age International (P)Ltd. Publishers, New Delhi.</p> <p>2. Aurand, L.W. and Woods A.E. (1973). Food chemistry. The AVI Publishing Company, Inc., Westport Connecticut.</p> <p>3. Mondy, N.I. (1980). Experimental food chemistry. AVI Publishing Company, Inc. Westport Connecticut.</p> <p>4. Owen r, Fennema, 1996. Food Chemistry, 3<sup>rd</sup> Edition, Marcel Dekker, Inc., New York, USA</p> <p>5. H.D. Belitz, 2009. Food Chemistry, 4<sup>th</sup> Edition. Springer</p>
<b>Prerequisites</b>	12 th standard – with Biology, Physics and Chemistry

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	<ul style="list-style-type: none"> <li>• Flavour: Definition, classification, extraction and purification of flavours , Natural and synthetic flavours; Flavour compounds – structure and occurrence of terpenoids, flavonoids, Polyphenols, sulphur compounds and volatile flavour compounds in foods( plants and animal foods)</li> <li>• Analysis of flavor compounds – HPLC,GC and GCMS; Sensory assessment of flavours</li> <li>• Concepts of flavor retention, Flavour modification and Flavour enhancement, taste modification and taste enhancement</li> <li>• Flavours produced during fermentation – wines, fermented milk and meat products</li> </ul>	<b>15</b>
<b>2.</b>	<ul style="list-style-type: none"> <li>• Pigments in Animal foods: structure, function and chemical transformation of hemoglobin and myoglobin; Stability of Myoglobin in cured meats; Role of nitrates and cure accelerators in colour fixation in meat</li> <li>• Pigments in Plant Kingdom: Classification; Structure, physical properties and chemical properties - Chlorophyll, Carotenoids, Anthocyanins, Betalaines</li> <li>• Pigment behavior and colour changes during processing and cooking - Chlorophyll, Carotenoids, Anthocyanins, Betalaines; Effect of various cooking media ( Acid and Alkali) on pigment colour and hue</li> </ul>	<b>15</b>

	<ul style="list-style-type: none"> <li>• Techniques for colour extraction, retention, and estimation - Chlorophyll, Carotenoids, and Anthocyanins</li> <li>• Synthetic colourants- permitted and non- permitted colours; Dyes and Lakes; advantages and disadvantages; safety regulation of food colours; production of synthetic colours –azo coupling</li> </ul>	
3.	<ul style="list-style-type: none"> <li>• Vitamins- Classification, requirements, allowances, toxicity, losses, retention and optimization</li> <li>• Fat Soluble vitamins: A, D E, and K – Structure, General properties, stability, mechanism of degradation; factors affecting absorption and bioavailability</li> <li>• Water Soluble vitamins: Structure, General properties, stability, mechanism of degradation ; factors affecting absorption and bioavailability – Thiamin, Riboflavin, Niacin, Ascorbic acid, Vitamin B6, Folic acid, Biotin, Vitamin B12(Cyanocobalamin)</li> </ul>	15

4.	<ul style="list-style-type: none"> <li>• Nutritional aspects of minerals, mineral composition of foods, chemical, and functional properties in foods</li> <li>• Macrominerals – types, sources, requirements, allowances, absorption and bioavailability of minerals like calcium, phosphorous, magnesium, sodium, potassium, chloride and sulphur</li> <li>• Microminerals - types, sources, requirements, allowances, absorption and bioavailability of minerals like Iron, Zinc, Copper, Molybdenum, Selenium, Iodine, Chromium, and Manganese</li> <li>• Toxicity of macrominerals and microminerals; Losses of minerals – Leaching, Retention and optimization</li> <li>• Chemistry of Antinutritional factors – saponins, phytic acid, Hemagglutinins and Lectins</li> <li>• Effect of enzymes on food in processing – Types and their role in processing</li> </ul>	15
----	--	----



## BND 404 Functional Foods and Nutraceuticals

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>BND 404 Functional Foods and Nutraceuticals</b>
<b>Course Description</b>	An advanced course to learn the concepts of Functional foods and Nutraceuticals, Categorization, Probiotics, Prebiotics, and Synbiotics ; Functional nature of nutraceuticals, and Regulatory aspects.
<b>Objectives</b>	To learn the development of functional foods along with the types of functional foods
	To understand the category of nutraceuticals based on sources, mechanism of action and chemical nature.
	To analyze the health benefits of foods of different biotics origin
	To acquire the skills i1. identification of foods of bioactive compounds with functional efficiency
	To be aware of the National and International regulatory aspects of Functional foods
<b>Text Books</b>	Gibson, G. R., & Williams, M. C. (2000). <i>Functional foods: Concept to product</i> . CRC Press. ISBN-13: 9780849308512
	Wildman, R., Wallace, T. C., & Wildman, R. E. C. (2016). <i>Handbook of Nutraceuticals and Functional Foods</i> (2nd ed). CRC Press. ISBN-13 : 978-1498770637
	Schmidl, M. K., & Labuza, T. P. (2000). <i>Essentials of functional foods</i> . Aspen Publishers Inc., U.S. ISBN-13 : 978-0834212619

<b>Reference Books</b>	Webb G.P (2011), <i>Dietary Supplements and Functional Foods</i> (2nd ed). Wiley-Blackwell	
	Balamurugan, V., Fatima, S. M., & Velurajan, S. (2019). A guide to phytochemical analysis. <i>International Journal of Advance Research and Innovative Ideas in Education</i> , 5(1), 236–245.	
	Nijhawan, R. (2024). <i>Food Safety and Standards Act, 2006, Rules &amp; Regulations-- ILBCO</i> (25th ed). ILBCO INDIA.978-8194507123	
	Hasler,C.M. (2005). <i>Regulation of Functional Foods and Nutraceuticals</i> . Wiley-Blackwell.ISBN-13: 9780813811772	
<b>Webliography</b>	MDPI. Nutraceuticals & functional foods. <i>Foods</i> . <a href="https://www.mdpi.com/journal/foods/sections/Nutraceuticals_Functional_Foods">https://www.mdpi.com/journal/foods/sections/Nutraceuticals_Functional_Foods</a>	
	Westminster University. (n.d.). Centre for nutraceuticals. <i>Westminster University</i> . <a href="https://www.westminster.ac.uk/research/groups-and-centres/centre-for-nutraceuticals">https://www.westminster.ac.uk/research/groups-and-centres/centre-for-nutraceuticals</a>	
<b>Prerequisites</b>	Basics of Food Science and Nutrition	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Introduction to Functional Foods and Nutraceuticals Definition, History, Classification- designer foods and pharma foods, Nutritional Supplements, Health effects of functional foods, Stages involved in development of functional foods.	12
2.	Categorization of Nutraceuticals Classification - Based on food source, mechanism of action and chemical nature isoprenoid, phenolic substances, fatty acids and structural lipids, terpenoids–saponins, tocotrienols and simple terpenes, carbohydrates and amino acid based derivatives, isoflavones	12

3.	<ul style="list-style-type: none"> <li>• Probiotics, Prebiotics and Synbiotics</li> <li>• Probiotics: Concept, Human gastro intestinal tract and its microbiota, Classification of Probiotics, role of probiotics in health and diseases</li> <li>• Prebiotics: Oligosaccharides, Dietary fiber, Resistant Starch, Gums, Spirulina as bioactive components.</li> </ul>	9
4.	<ul style="list-style-type: none"> <li>• Functional nature of Nutraceuticals and Regulatory Aspects</li> <li>• Polyphenols: Flavonoids, Catechins, Isoflavones, Tannins: Phytoestrogens, Phytosterols, Glucosinolates, Pigments, Organo sulphur compounds, proteins and peptides, Conjugated linoleic acid, Omega 3 Fatty acids, Bioactive compounds: Saponins, Hemagglutinins, Resveratrol, Kaempferol, Quercetin, Cinnamaldehyde, Lutoline, Capsaicin, Piperine, Gingerol, Eugenol, Rosemarinic acid, Apigenin, Thymoquinone.</li> <li>• Regulatory aspects- International and national regulatory aspects of functional, foods in India.</li> </ul>	12



## Functional Foods and Nutraceuticals Practical

Unit	Topic	Hours
1.	Preparation of Sample	4
2.	Methods of Extraction	6
3.	Qualitative analysis of Primary metabolites	3
4.	Qualitative analysis of Secondary metabolites	3
5.	Qualitative analysis of Vitamins	4
6.	Determination of Total Phenols and Flavonoids	4
7.	Development of Functional food products	6



### BND 405 Advanced Dietetics

CL	CP	L	P
3	1	45	30

<b>Course Name</b>	<b>BND 405 Advanced Dietetics</b>
<b>Course Description</b>	It is an Advanced Course in therapeutic nutrition. The course will enable students to expand their knowledge on the complex impact of nutrition on human health. This course will focus on advanced nutritional principles and their application in various health conditions.
<b>Objectives</b>	<p>1 Develop skills in planning, preparation, and evaluation of various therapeutic diets.</p> <p>2 Develop the ability to apply , integrate the principles of medical nutrition therapy in combination of clinical disorders.</p> <p>3 Understand the principles of planning therapeutic diets for advanced clinical disorders in hospital settings.</p>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Raymond, Janice L., and Morrow, Kelly. (2022). Krause and Mahan's Food and the Nutrition Care Process (16th ed.). St. Louis, MO: Elsevier.</li> <li>2. Skipper, Annalynn. (2009). Advanced Medical Nutrition Therapy Practice. Jones &amp; Bartlett Learning.</li> <li>3. Marian, Mary, Mary K. Russell, and Scott A. Shikora. (2008). Clinical Nutrition for Surgical Patients. Jones &amp; Bartlett Learning.</li> <li>4. Thomas, B. (Ed.). (1994). Manual of dietetics practice. Blackwell Scientific Publication.</li> <li>5. Wardlaw, G., &amp; Hampl, J. S. (1999). Perspectives in nutrition (4th ed.). McGraw-Hill Education.</li> <li>6. Zeman, F. J., &amp; Ney, D. M. (1988). Applications of clinical nutrition. Prentice-Hall International.</li> <li>7. Shils, M. E., Olson, J. A., Shike, M., &amp; Ross, A. C. (Eds.). (1994). Modern nutrition in health and disease (8th ed.). Lea &amp; Febiger.</li> </ol>

	<p>8. Williams, S. R. (1993). Nutrition and diet therapy (7th ed.). Mosby Year Book, Inc.</p> <p>9. Anderson, L., &amp; Dibble, M. V. (1982). Nutrition in health and disease (17th ed.). J. B. Lippincott Company.</p> <p>10. Alpers, D. H., Stenson, W. F., Bier, D. M., &amp; Taylor, B. E. (Eds.). (1995). Manual of nutritional therapeutics (3rd ed.). Little, Brown and Company.</p>	
<b>Prerequisites</b>	12 th standard - HSc, ICSC with Science ( Biology and Chemistry/ Food, Nutrition and Dietetics) who has completed the first year of BSc Nutrition and Dietetics.	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<ul style="list-style-type: none"> <li>• Cardiovascular Diseases</li> <li>• Hypertension</li> <li>• Hyperlipidemia</li> <li>• Atherosclerosis</li> <li>• Ischemic Heart Disease (Compensated and Decompensated)</li> <li>• Cardiac Function tests</li> <li>• Congestive Heart failure</li> <li>• Rheumatic Heart Disease</li> </ul>	10
2.	<ul style="list-style-type: none"> <li>• Diabetes Mellitus and Metabolic Disorders</li> <li>• Introduction and Classification of Diabetes Mellitus</li> <li>• Metabolic syndrome, Prediabetes and other disorders and its dietary management.</li> <li>• Medical Nutrition Therapy (MNT) for Type 1 Diabetes, type 2 Diabetes and Gestational Diabetes.</li> <li>• Pharmacotherapy in Different types of Diabetes and its relationship with diet.</li> </ul>	10

	<ul style="list-style-type: none"> <li>• MNT for persons with diabetes in special conditions.</li> <li>• vi Complications of Diabetes Mellitus (Acute and Chronic) and its Management.</li> <li>• vii Education and Counseling in Diabetes</li> </ul>	
3.	<ul style="list-style-type: none"> <li>• Renal Diseases</li> <li>• Functional Units in the Kidney</li> <li>• Etiology ; Clinical findings and medical nutrition therapy of different stages of renal disease - Glomerulonephritis; Nephrotic Syndrome; Acute Renal Failure; Chronic Kidney Disease; Renal Replacement Therapy; Renal Transplant; Renal Calculi.</li> <li>• Protein Requirements, Electrolyte and fluid Balance with the progression of renal disease.</li> <li>• Medical Nutrition Therapy, protein, sodium, potassium, phosphorus Exchange, Acid-Base Balance in renal disease.</li> </ul>	8
4.	<ul style="list-style-type: none"> <li>• Enteral and Parenteral Nutrition Basic Principles; Formulations; Conditions, Indications, Contraindications, Management of complications.</li> </ul>	5
5	<ul style="list-style-type: none"> <li>• Medical Nutrition Therapy of a range of pulmonary disease - bronchitis, asthma, chronic Obstructive Pulmonary Disease.</li> </ul>	5
6.	<ul style="list-style-type: none"> <li>• Food and Drug Interactions of commonly used medications in various disease conditions and the dietary guidelines.</li> <li>• Effect of Nutritional Status and Nutritional Deficiencies on the efficacy of drug utilization in the body.</li> </ul>	5

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>Cardiovascular Diseases</b>	Planning Diets for the following conditions: <ul style="list-style-type: none"> <li>• Hypertension</li> <li>• Hyperlipidemia</li> <li>• Atherosclerosis</li> <li>• Ischemic Heart Disease (Compensated and Decompensated)</li> <li>• Congestive Heart failure</li> </ul>	<b>6</b>
<b>Diabetes Mellitus and Metabolic Disorders</b>	Planning diets for the following Conditions: <ul style="list-style-type: none"> <li>• Metabolic syndrome, Prediabetes and other disorders</li> <li>• Type 1 Diabetes, type 2 Diabetes and Gestational Diabetes.</li> <li>• Complications of Diabetes Mellitus ( Acute and Chronic) and its Management.</li> <li>• Education and Counseling in Diabetes</li> </ul>	<b>7</b>



<p><b>Renal Diseases</b></p>	<p>Planning diets for the following Conditions: Glomerulonephritis; Nephrotic Syndrome; Acute Renal Failure; Chronic kidney Disease; Renal Replacement Therapy; Renal Transplant; Renal Calculi.</p> <p>Focus on Protein Requirements, Electrolyte and fluid Balance with the progression of renal disease.</p> <p>Development of protein, sodium, potassium, and phosphorus Exchange in renal disease.</p>	<p>7</p>
<p><b>Enteral and Parenteral Nutrition</b></p>	<p>Market survey of Enteral Formulations; Demonstration of preparation of enteral feeds.</p> <p>Basic orientation for parenteral feeds in a clinical setting.</p>	<p>2</p>
<p><b>Pulmonary Disease</b></p>	<p>Planning diets for the following Conditions: Range of pulmonary disease - bronchitis, asthma, Chronic Obstructive Pulmonary Disease.</p>	<p>4</p>
<p><b>Cancer</b></p>	<p>Understand the role of the registered dietitian in the oncology setting, Nutrition screening and assessment in oncology, Understand how caloric needs of cancer patients are affected by the treatment phase (pretreatment, during treatment, post-treatment), Describe how different types of cancer treatment (including chemotherapy, radiation, surgery, and immunology) affect food intake</p>	<p>6</p>

### BND 406 Food Safety and Standards

CL	CP	L	P
2	0	30	0

<b>Semester</b>	<b>IV</b>
<b>Course Name</b>	BND 406 Food Safety and Standards
<b>Course Description</b>	<p>This subject is important because the student must know, classify, apply, develop and systematize the main hygiene and sanitation applications to enhance their application as a health professional for the exit profile, such as:</p> <ul style="list-style-type: none"> <li>• Life Sciences (in areas related to Nutrition and Dietetics);</li> <li>• Public Health and/or Community Nutrition;</li> <li>• Management and Quality Control in Public and Collective Catering</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the factors that threaten the safety of foods</li> <li>• To understand safe preparation, holding and storage of foods</li> <li>• To understand food safety laws</li> </ul>

<b>References/ Text Books</b>	<ul style="list-style-type: none"> <li>• Roday S. (2017) Food Hygiene and Sanitation, 2nd Edition, Tata Mc Graw Hill Publication. ISBN: 978-0070700208</li> <li>• Food Safety and Standards (Licensing &amp; Registration of Food Businesses) Regulations, 2011. (<a href="http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html">http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html</a>)</li> <li>• Food Safety &amp; Standard Act, 2006 (<a href="http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html">http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html</a>)</li> <li>• <a href="http://www.who.int/news-room/fact-sheets/detail/food-safety">http://www.who.int/news-room/fact-sheets/detail/food-safety</a></li> </ul>	
<b>Prerequisites</b>	<b>Semester 4</b>	
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	<p>Food hygiene concepts</p> <p>Importance of food hygiene and sanitation in a</p> <ol style="list-style-type: none"> <li>Community setting,</li> <li>Hospital setting and</li> <li>Food businesses</li> </ol> <p>Selection and purchase of food</p> <ol style="list-style-type: none"> <li>Receiving and storing food safely</li> <li>Preparing and holding food safely</li> <li>-serving safe food</li> <li>storing cooked food safely</li> <li>Personal Hygiene</li> </ol>	<b>6</b>

2.	<p>Food safety and contaminants -biological, physical or chemical nature.</p> <ol style="list-style-type: none"> <li>a. Importance in food security and associate different contaminants with risks and relevance to food safety and food safety.</li> <li>b. Precautions against contamination</li> <li>c. Risk Analysis</li> <li>d. Know and define risk analysis</li> <li>e. HACCP system, characterize each phase and apply the system to case studies – collective restoration</li> </ol>	6
3.	<p>Storage temperatures; relative humidity of the environment; presence and concentration</p> <ol style="list-style-type: none"> <li>a. Identify temperatures in food processing and conservation;</li> <li>b. Identify the humidity reference values;</li> <li>c. Identify the importance of air quality in food hygiene.</li> <li>d. Importance of water and sanitation as an important element in food, hygiene and health promotion.</li> <li>e. Strengthening sustainable WASH programming (UNICEF / WHO guidelines)</li> </ol>	6
4.	<p>Pest control and waste management</p> <ol style="list-style-type: none"> <li>a. Insect, rodent and bird infestation</li> <li>b. Use of pesticides and Integrated pest management</li> <li>c. Waste disposal- Solid waste, Liquid waste, ETP</li> </ol>	6
5.	<p>Food Standards -Legal and regulatory documents related to food safety</p> <ol style="list-style-type: none"> <li>a. Codex</li> <li>b. FSSAI</li> <li>c. Food Hygiene and Safety Audits</li> <li>d. Define audit and phases of an audit</li> </ol>	6

### Fifth Semester

#### 501 Research Methodology and Statistics (Theory)

CL	CP	L	P
4	0	60	0

<b>Semester</b>	<b>V</b>
<b>Course Name</b>	Research Methodology and Statistics (Theory)
<b>Course Description</b>	It is a course which is an introduction to Research Methods and Statistics at the Graduation level
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand different types of research.</li> <li>2. To develop the ability to identify and apply appropriate research and statistical methods for research.</li> <li>3. To be able to develop appropriate tools for data collection and appropriate style of documenting Bibliography.</li> <li>4. To be able to prepare a research proposal.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Research methodology: methods and techniques (C R Kothari), New age international publishers</li> <li>2. W. W. Daniel, C. L. Cross. Biostatistics: A Foundation for Analysis in the Health Science, 10/e., Wiley, 2013</li> </ol>
<b>Prerequisites</b>	12th standard - HSc, ICSC with Science ( Biology and Chemistry) who has completed Second year of BSc Nutrition and Dietetics

## Course Plan

Unit	Topics	Hours
1.	<p>Introduction to research methodology: What is Research, importance of research, Steps in research</p> <p>Types of research - Qualitative and Quantitative research, cross-sectional and longitudinal research with examples from papers.</p> <p>Variables and levels of measurements - Independent and Dependent variables; Categorical Variables: nominal and ordinal Scale; Continuous variables; Interval ratio scale; Primary Data, Secondary data</p> <p>Methods of Data Collection: Questionnaire and Interview techniques and development; Dietary data Collection - FFQ and Dietary Data collection techniques; Merits, Demerits and suitability in specific studies.</p>	30
2	<p>Report writing ; Proposal writing;</p> <p>Types of research papers - Interpretation and presentation</p> <p>Referencing and reviewing literature using search engines and indexed peer reviewed journals.</p> <p>Bibliography - styles and detailing.</p> <p>Statistics : calculation of measures of central tendency and dispersion ; understanding various tests and their interpretation with the help of examples from paper ; T test, ANOVA, Chi square, Pearson's Correlation, Regression analysis, Levels of significance</p> <p>Use of technology in statistical analysis, google forms, excel based data coding and compilation; use of SPSS software.</p>	30

## BND 502 Sports Nutrition

CL	CP	L	P
2	2	30	60

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	<b>BND 502 Sports Nutrition 4 (2+2)</b>
<b>Course Description</b>	This course covers the principles of sports nutrition, focusing on the role of diet in athletic performance, recovery, and overall health. Students will explore the nutritional needs of athletes, the impact of various nutrients, dietary strategies for different sports, and the latest research in the field.
<b>Objectives</b>	1 To learn the fundamental principles of sports nutrition.
	2 To identify the nutritional requirements of athletes in various sports.
	3 To assess the role of macro and micronutrients in athletic performance and recovery.
	4 To develop individualized nutrition plans for athletes.
	5 To understand the psychological and physiological aspects of eating disorders in athletes.
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Kang J and Barnett S R N(2022) Nutrition and Metabolism in Sports, Exercise and Health (2nd Edition). Routledge publishing company.</li> <li>2. Maughan R J and Burke L M(2023) Sports Nutrition: Enhancing Athletic Performance" (3rd Edition). CRC Press</li> <li>3. Dunford M J, Doyle A and Kalman D M(2021) Nutrition for Sport, Exercise, and Health (2nd Edition)Cengage Learning</li> <li>4. Burke L and Deakin V (2022) Clinical Sports Nutrition (6th Edition) McGraw-Hill Education</li> </ol>

	<ol style="list-style-type: none"> <li>5. Ryan M (2020) Sports Nutrition for Endurance Athletes (3rd Edition). VeloPress</li> <li>6. William D. McArdle, F I K and Victor L K (2020)Sports and Exercise Nutrition (5th Edition). Wolters Kluwer</li> <li>7. Austin K G and Seebohar B(2021)Performance Nutrition for Athletes. Human Kinetics</li> <li>8. Heather Hedrick Fik and Alan E. Mikesky(2015) Practical Application in Sports and Nutrition. Fourth Edition. Jones &amp; Bartlett Learning, Burlington, MA 01803.</li> <li>9. <a href="http://www.eatright.org/fitness">www.eatright.org/fitness</a></li> <li>10. <a href="http://www.nutritionist-resource.org">www.nutritionist-resource.org</a></li> <li>11. <a href="http://www.sportsoracle.com">www.sportsoracle.com</a></li> <li>12. <a href="http://www.nutritionaustralia.org">www.nutritionaustralia.org</a></li> <li>13. <a href="http://www.acsm.org/nutrition">www.acsm.org/nutrition</a></li> <li>14. <a href="http://www.sportsnutrition society.org">www.sportsnutrition society.org</a></li> <li>15. <a href="http://www.sportsdietitians.com">www.sportsdietitians.com</a></li> </ol>
<p><b>Prerequisites</b></p>	<p>Following prerequisites are recommended to ensure that the students have the foundational knowledge necessary to understand and apply the concepts discussed in the course sports nutrition. The typical pre-requisites are:</p> <ol style="list-style-type: none"> <li>1. Understanding of basic nutrition, food science and biochemistry</li> <li>2. Knowledge about human anatomy and exercise physiology</li> <li>3. Knowledge about dietetics including dietary assessment, nutrition counselling and meal planning.</li> </ol>

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Credit Hours</b>
<b>1.</b>	<p>Sports nutrition and physical fitness</p> <p>Overview of sports nutrition, Definition and scope, training and exercise, nutrition guidelines and principles. Basic nutrients for sports persons. Physical fitness - principles, types and components      Techniques and methods of measuring physical fitness</p>	<b>6</b>
<b>2.</b>	<p>Body composition and energy balance concept</p> <p>Body composition in different physiological conditions and factors affecting it and methods of assessing body composition. Energy –energy concept and factors affecting energy and methods of measuring energy intake and expenditure and concept of energy balance.</p>	<b>6</b>
<b>3.</b>	<p>Nutrient metabolism and fluid management</p> <p>Macronutrients in Sports Nutrition - Carbohydrates: Types, role, timing, and loading strategies. Proteins: Requirements, sources, timing, and muscle protein synthesis, Fats: Types, roles, and their use as energy during exercise. Micronutrients and Hydration. Key vitamins and minerals for athletes, Electrolyte balance and its importance - Hydration strategies and fluid replacement</p>	<b>8</b>

4.	<p>Nutritional Strategies for Training and Competition</p> <p>Pre-exercise nutrition - Intra-exercise nutrition - Post-exercise recovery nutrition and special considerations for different sports (endurance, strength, team sports, etc). Sports nutrition products - supplements related to energy metabolism - weight reduction, Botanical and herbal supplement. Ergogenic aids and their efficacy - Safety, regulations, and ethics.</p> <p>Special nutritional consideration for women athletes, young teen athletes, athletes with diabetes, vegetarian athletes.</p> <p>Specific nutrition for gymnastics and weight lifters, skiers and cyclists, swimming and skating. Addressing eating disorders and disordered eating in athletes.</p>	6
5.	<p>Emerging Trends and Research in Sports Nutrition, ethics and Professional Practice</p> <p>Advances in sports nutrition research - Current trends in dietary practices among athletes. Future directions in sports nutrition. Professional responsibilities of a sports nutritionist- Ethical considerations in sports nutrition counselling. Working with a multidisciplinary team (coaches, trainers, medical staff).</p>	4
<b>Unit</b>	<b>Practical</b>	<b>Credit Hours</b>
	<ol style="list-style-type: none"> <li>1. Development of methodology for collection of data on nutritional status</li> <li>2. Development of methodology for collection of data on physical fitness</li> <li>3. Clinical and dietary assessment techniques for athletes</li> <li>4. Clinical and dietary assessment techniques for group activities</li> <li>5. Assessment of nutritional status of athletes</li> <li>6. Assessment of nutritional status of group activities</li> </ol>	60

	<p>7. Creating and evaluating nutrition plans for athletes</p> <p>8. Planning diet for energy dense and high protein recipes</p> <p>9. Planning diet for fat recipes for athletes</p> <p>10. Planning diet for athletes and endurance sports</p> <p>11. Planning nutritional requirements for sports injuries</p>	
	<p>12. Assessment of physical fitness of athletes</p> <p>13. Assessment of physical fitness of group activities</p> <p>14. Assessment of body composition of athletes and performed sports activities.</p> <p>15. Development and standardization of tool for physical fitness.</p> <p>16. Assessment of physical fitness of men athletes using standard tool</p> <p>17. Assessment of physical fitness of women athletes using standard tool.</p> <p>18. Use and practice of ergonomic Ft for assessment of energy expenditure.</p> <p>19. Market survey of commercially available sports supplements.</p> <p>20. Visit to a sports academy and fitness centres.</p>	

## BND 503 Tools and Techniques for Nutrition Counselling

CL	CP	L	P
1	3	15	90

<b>Semester</b>	<b>V</b>
<b>Course Name</b>	BND 503 Tools and Techniques for Nutrition Counselling
<b>Course Description</b>	The course is designed to introduce students to the concept of nutrition counseling and provide internship in hospital setups for experiential learning.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1 To enable the students to learn about diet counseling skills</li> <li>2. To provide practical learning experiences with patients through case studies</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Mahan, L.K. and Escott-Stump, S. (2021): Krause's Food Nutrition and Nutrition Care Process, 16th Edition, Elsevier Pvt. Ltd. ISBN 032381025X</li> <li>2. Wardlaw GM, Hampi JS, DiSilvestro RA (2004). Perspectives in Nutrition, 6th edition. McGraw Hill. ISBN 0072921633,</li> <li>3. Anita Jatana. Daphne JK, Harita Shyam, Priyanka Rohtagi, Kajal Pandya Reptho Apollo Clinical Nutrition Handbook.(2022). Jaypee Brothers ISBN 978-9354650895</li> </ol>

	<p>4. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.</p> <p>5. Srilakshmi B. 9th Edition (2023). Dietetics. New Age Publishers. ISBN 939516184</p>
<b>Prerequisites</b>	Understanding of Basics of medical nutrition therapy and advanced dietetics

### Course Plan

Unit	Topic	Hours
1.	<p>Introduction to Dietary Counseling ;            Definition, Expectations, goals, scope and limits Counseling Responsibilities and Role of Nutrition Counselor            Ethical code and responsibility.            Characteristics of an effective counselor            Skills and attributes of the nutrition educator or counselor</p> <ol style="list-style-type: none"> <li>Cultural Competency</li> <li>Client's Perspective</li> <li>Informed Negotiation</li> <li>Empathy and Rapport</li> </ol>	2

2.	<p>Stages of Diet Counseling:</p> <p>Stage I: problem exploration and clarification,</p> <p>Stage II: Developing new perspectives and setting goals,</p> <p>Stage III: Implementation follow up and evolution</p> <p>Stages of Change: Precontemplation, Contemplation, Preparation, Action, Maintenance, Relapse</p>	3
3.	<p>Behaviour Change Models</p> <ol style="list-style-type: none"> <li>1. Behaviour change and factors affecting the ability to change</li> <li>2. Models for behaviour change <ol style="list-style-type: none"> <li>a. Health Belief Model</li> <li>b. Social Cognitive Theory</li> <li>c. Theory of Planned Behaviour</li> <li>d. Transtheoretical Model of Change</li> </ol> </li> <li>3. Models for educational program development <ul style="list-style-type: none"> <li>Cognitive behavioral therapy (CBT)</li> <li>Acceptance and commitment therapy (ACT)</li> <li>Motivational interviewing (MI)</li> </ul> </li> <li>4 . Different approaches of counselling- <ol style="list-style-type: none"> <li>a. Psychoanalytical approach</li> <li>b. Cognitive- Behavioural approach</li> <li>c. Humanistic approach (Client centred therapy and Gestalt therapy)</li> </ol> </li> </ol>	4

4.	<p>Facilitating Change:</p> <p>Expressing empathy</p> <p>Understanding cultural factors</p> <p>Developing discrepancy</p> <p>Avoiding arguments and defensiveness</p> <p>Rolling with resistance</p> <p>Supporting self efficacy</p>	
5.	<p>Different types of counselling methods</p> <ol style="list-style-type: none"> <li>1. Types of Counselling <ol style="list-style-type: none"> <li>a. Multicultural counselling</li> <li>b. Motivational counselling</li> <li>c. Directive counselling</li> <li>d. Guided counselling</li> </ol> </li> <li>2. Conditions during diet counselling sessions, components of first session and follow-up visits, Group counselling</li> <li>3. Not ready to change Vs. Unsure about change counselling Sessions</li> </ol>	3
6.	<p>Resistance Behaviour and Strategies to modify them</p> <ol style="list-style-type: none"> <li>a. Reflecting</li> <li>b. Shifting Focus</li> <li>c. Agreeing with a twist</li> <li>d. Reframing</li> <li>e. Ending the Sessions</li> </ol> <p>Ready to change Counselling Sessions</p> <ol style="list-style-type: none"> <li>a. Setting Goals</li> <li>b. Action Plan</li> </ol>	3

## Practicals

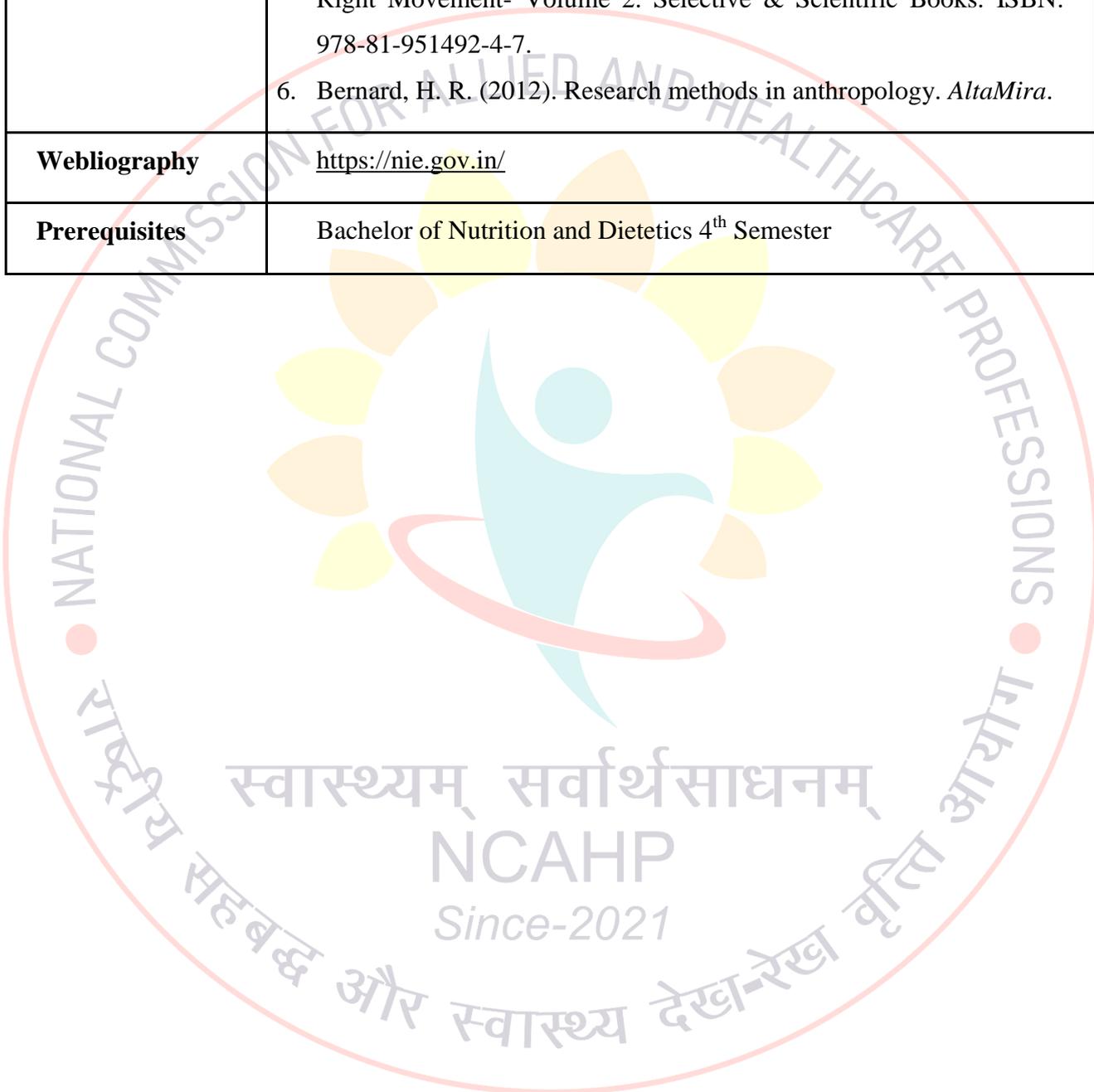
1	<p>Development of IEC materials and patient counselling</p> <p>1.Preparation of different types of models like cardboard models/wax models of various food items like chapati, bhakri, fruits, vegetables and other various food groups and use of diet atlas</p> <p>2.Development of innovative IEC material like brochure, posters, cards, puzzle, games, calendar for imparting key messages / information.</p> <p>3.Use of social networking sites to impart nutrition knowledge in community</p> <p>4.Planning, preparation, implementation, testing of IEC material for a target group alongwith feedback.</p>	30
2.	<p>Use of online applications like Ntuitive Calculator, Diet Cal,</p>	10
3.	<p>Planning and making diet charts for patients using nutrition education resources and apps for various diseases and special conditions.</p>	20
4.	<p>Case Studies in Dietary Counselling in Hospital/clinical settings.</p>	30

## BND 504 Nutritional Epidemiology and Anthropology

CL	CP	L	P
4	0	60	0

<b>Semester</b>	<b>V</b>
<b>Course Name</b>	BND 504 Nutritional Epidemiology and Anthropology
<b>Course Description</b>	The course covers the principles and methods used to study disease patterns in populations. Topics include disease transmission, risk factors, study designs, and data analysis. It's crucial for understanding public health challenges and designing interventions to improve community health.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand the epidemiology of important nutrition deficiency disorders in India</li> <li>2. To develop skills on various study designs to assess, understand and treat various health and nutritional deficiency disorders</li> <li>3. To understand anthropology and its importance for interpreting dietary intakes, nutritional status, food choices and cultural environment.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Bonita, R., Beaglehole, R., &amp; Kjellström, T. (2006). Basic epidemiology. World Health Organization.</li> <li>2. Norell, S. E. (1995). <i>Workbook of epidemiology</i>. Oxford University Press, USA. Moon, G., &amp; Gould, M. (2000). <i>Epidemiology: an introduction</i>. McGraw-Hill Education (UK).</li> <li>3. Chrzan, J., &amp; Brett, J. (Eds.). (2017). <i>Research Methods for Anthropological Studies of Food and Nutrition: Volumes I-III</i> (Vol. 1). Berghahn Books.</li> </ol>

	<p>4. Nambiar, V. (Ed.). (2021). Indian Food Anthropology and the Eat Right Movement- Volume 1. Selective &amp; Scientific Books. ISBN: 978-81-951492-2-3.</p> <p>5. Nambiar, V. (Ed.). (2021). Indian Food Anthropology and the Eat Right Movement- Volume 2. Selective &amp; Scientific Books. ISBN: 978-81-951492-4-7.</p> <p>6. Bernard, H. R. (2012). Research methods in anthropology. <i>AltaMira</i>.</p>
<b>Webliography</b>	<a href="https://nie.gov.in/">https://nie.gov.in/</a>
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics 4 <sup>th</sup> Semester



## Course Plan

Unit	Topic	Hours (60 hours)
1	<ol style="list-style-type: none"> <li>1) Introduction to Epidemiology</li> <li>2) Definition, uses, branches of Epidemiology</li> <li>3) Epidemiology and public health nutrition :               <ol style="list-style-type: none"> <li>a. Causation of diseases based on nutritional deficiencies</li> <li>b. Natural history of disease based on nutritional deficiencies</li> <li>c. Health status of populations</li> <li>d. Evaluating interventions</li> </ol> </li> </ol>	7
2	<ol style="list-style-type: none"> <li>1. Measurements in Health and Disease with a focus on nutrition</li> <li>2. Definitions of diagnostic criteria: Measuring disease frequency, Population at risk, Incidence and prevalence, Case fatality</li> <li>3. Interrelationships of the different measures :</li> <li>4. Mortality- Death rates, Infant mortality, Child mortality rate, Maternal mortality rate, Adult mortality rate, Life expectancy, Age-standardized rates.</li> <li>5. Morbidity -Disability, Health determinants, indicators, and risk factors</li> </ol>	8
3	<ol style="list-style-type: none"> <li>1. Types of studies : Observational epidemiology- Descriptive studies, Ecological studies, Cross-sectional studies, Case-control studies, Cohort studies. Examples of importance studies related to health and Nutrition in each category</li> <li>2. Experimental epidemiology- Randomized controlled trials, Field trials, Community trials</li> <li>3. Potential errors in epidemiological studies               <ol style="list-style-type: none"> <li>a. Random error</li> <li>b. Sample size</li> <li>c. Systematic error</li> <li>d. Selection bias</li> </ol> </li> </ol>	8

	<ul style="list-style-type: none"> <li>e. Measurement bias</li> <li>f. Confounding</li> </ul> <p>Other key concepts</p> <ul style="list-style-type: none"> <li>a. The control of confounding</li> <li>b. Validity</li> <li>c. Ethical issues</li> </ul>	
4	<p>Epidemiology and prevention: with a focus on chronic DRNCDs</p> <ul style="list-style-type: none"> <li>1. Preventive potential</li> <li>2. Causation framework</li> <li>3. Levels of prevention <ul style="list-style-type: none"> <li>a. Primordial prevention</li> <li>b. Primary prevention <ul style="list-style-type: none"> <li>I. Population strategy</li> <li>II. High-risk individual strategy</li> </ul> </li> <li>c. Secondary prevention</li> <li>d. Tertiary prevention</li> </ul> </li> <li>4. Screening <ul style="list-style-type: none"> <li>a. Types of screening</li> <li>b. Criteria for screening</li> </ul> </li> </ul>	7
5	<p>Communicable diseases: epidemiology surveillance and response</p> <p>The burden of communicable disease</p> <p>Epidemic and endemic disease :Epidemics, Endemic diseases, Emerging and re-emerging infections</p> <p>Chain of infection</p> <ul style="list-style-type: none"> <li>a. The infectious agent</li> <li>b. Transmission</li> <li>c. Host</li> </ul>	8

	<p>Environment</p> <ol style="list-style-type: none"> <li>a. Investigation and control of epidemics</li> <li>b. Investigation</li> <li>c. Identifying cases</li> <li>d. Management and control</li> <li>e. Surveillance and response</li> </ol>	
6	<p>Environmental and occupational epidemiology</p> <ol style="list-style-type: none"> <li>1. Environment and health</li> <li>2. Impact of exposure to environmental factors</li> <li>3. Evaluation of preventive measures</li> <li>4. Exposure and dose <ol style="list-style-type: none"> <li>a. General concepts</li> <li>b. Biological monitoring</li> <li>c. Interpreting biological data</li> <li>d. Individual versus group measurements</li> <li>e. Population dose</li> <li>f. Dose–effect relationships</li> <li>g. Dose–response relationships</li> </ol> </li> <li>5. Assessing risk <ol style="list-style-type: none"> <li>a. Risk assessment</li> <li>b. Health impact assessment</li> <li>c. Risk management</li> <li>d. Environmental health impact assessment</li> <li>e. Measuring past exposure</li> <li>f. Healthy worker effect in occupational studies</li> </ol> </li> <li>6. Epidemiology of the main foodborne diseases <ol style="list-style-type: none"> <li>a. Identify the relevance of public health epidemiology and nutritional epidemiology in the context of food-borne diseases.</li> </ol> </li> </ol>	8

7	<p>Anthropology and Management of Nutrition Health and Disease</p> <ol style="list-style-type: none"> <li>1. Types of anthropology             <ol style="list-style-type: none"> <li>a. Physical</li> <li>b. Sociocultural</li> <li>c. Psychological</li> <li>d. Linguistic</li> <li>e. Cultural anthropology</li> </ol> </li> <li>2. Its role in the prevention and treatment of disease</li> </ol>	7
8	<p>Methods of assessing anthropology and its relevance in food and nutrition</p> <ol style="list-style-type: none"> <li>1. Ethnographic Research Methods             <ol style="list-style-type: none"> <li>a. Mixed Methods</li> <li>b. Observations</li> <li>c. In depth Interviews</li> <li>d. Transect Walk</li> </ol> </li> <li>2. Critical Medical Anthropology             <ol style="list-style-type: none"> <li>a. Medical ecological approach to understand biomedicine, public health and global political economic structures which focus on Health care systems</li> <li>b. Micro level</li> <li>c. Intermediate level</li> <li>d. Macrosocial level</li> </ol> </li> <li>3. Indian Food and Nutrition Anthropology for combating health and disease</li> </ol>	7

### BND 505 Food Analysis

CL	CP	L	P
2	2	30	60

<b>Semester</b>	<b>v</b>
<b>Course Name</b>	<b>FOOD ANALYSIS</b>
<b>Course Description</b>	This course is designed to give the students knowledge about food chemistry and analysis
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1 · To gain knowledge regarding modern methods of food analysis</li> <li>2 To understand various physical, chemical and quality characteristics of foods.</li> <li>3. To gain insight into techniques used for the analysis microbial quality of foods</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Owen R. Fennema (1996) Food Chemistry Third Edition Edited by University of Wisconsin Madison. ISBN 0-8247-9346-3 (cloth : alk. paper). — ISBN 0-8247-9691-8 (paper : alk. paper) <a href="https://ipapasca.unpak.ac.id/pdf/Food%20Chemistry%20by%20Fennema%203rd%20Ed.pdf">https://ipapasca.unpak.ac.id/pdf/Food%20Chemistry%20by%20Fennema%203rd%20Ed.pdf</a></li> <li>2. Peter C.K. Cheung and Bhavbhuti M. Mehta (2015) Handbook of Food Chemistry. Edited. Springer Heidelberg New York Dordrecht London <i>Since-2021</i> ISBN <a href="https://earthwormexpress.com/wpcontent/uploads/2021/10/Handbook_of_Food_Chemistry.pdf">978-3-642-36604-8</a> <a href="https://earthwormexpress.com/wpcontent/uploads/2021/10/Handbook_of_Food_Chemistry.pdf">https://earthwormexpress.com/wpcontent/uploads/2021/10/Handbook_of_Food_Chemistry.pdf</a></li> </ol>

3. D. Belitz, W. Grosch, and P. Schieberle (2009) Food Chemistry edited. ISBN 978-3-540-69933-0 e-ISBN 978-3-540-69934-7 DOI 10.1007/978-3-540-69934-7. Springer Heidelberg New York Dordrecht London.  
<https://tech.chemistrydocs.com/Books/Food%20Chemistry/Food-chemistry-by-H.D.Belitz-W.Grosch-&-P.Schieberle-4th-revised-and-extended-ed..pdf>
4. J. M. Deman, J.M. Finley, W.J. Hurst and C. Y. Lee (2018) Principles of Food Chemistry. Springer Heidelberg New York Dordrecht London. ISBN 978-3-319-63605-4
5. L.H. Meyer (2004). Food Chemistry. CBS Publishers. ISBN-13 **978-8123911496**
6. Sahin S. and Sumnu S.G. (2006) Physical Properties of Foods (Food Science Text Series). Springer-Verlag New York Inc. ISBN-13. 978-0387307800
7. Vaidya G. (2022) Textbook of Food Chemistry. Book Rivers publications. ISBN-13 : 978-93-5515-315-9 .
8. 8. Kontogiorgos V. (2021) Introduction of Food Chemistry. Springer Nature. ISBN -978-3-030-85644-1
9. Iqbal S.A. (2008). **Food Chemistry**. Discovery Publishing Pvt.Ltd.
10. AOAC (2023) Official Methods of Food Analysis. Association of Official Analytical Chemists Inc. Suite 400, 2200 Wilson Boulevard, Arlington, Virginia, USA.
11. FSSAI (2023) Manual of Methods of Food Analysis: Cereals and Cereals Products. Food Safety and Standards Authority of India, Ministry of Health And Family Welfare Government of India New Delhi.  
<https://fssai.gov.in/upload/uploadfiles/files/Manual%20on%20Cereal%20and%20Cereal%20Products.pdf>

	<p>12. FSSAI (2016) Manual of Methods of Food Analysis: Oil and Fats. Food Safety and Standards Authority of India, Ministry of Health And Family Welfare Government of India New Delhi.</p> <p>13. Raghuramulu N. Nair K.M. and Kalyanasundaram (2003) A manual of Laboratory Techniques. NIN, Hyderabad-500007.</p> <p>14. Yadav P. Food Analysis and Quality Control A Practical Manual. ©Vedpal Yadav, Lecturer in Food Technology, Government Polytechnic, Mandi Adampur, Hisar, Haryana, India-125052. <a href="https://gpadampur.wordpress.com/wp-content/uploads/2011/11/6-2-faqc-practicals-08022014.pdf">https://gpadampur.wordpress.com/wp-content/uploads/2011/11/6-2-faqc-practicals-08022014.pdf</a></p> <p>15. Sharma S. (2007) Experiments and Techniques in Biochemistry. Galgotia Publications Pvt Ltd.</p> <p>16. N. Siva Subramanian, P. Ushasree and G. Naveen Kumar Reddy (2022). Textbook of Food Analysis, Unique Pub International (UPI).</p>
<b>Prerequisites</b>	<b>Bachelor of Nutrition and Dietetics 4<sup>th</sup> Semester</b>

### Course Plan

Unit	Topic	Hours
1.	Need and importance of food analysis	1
2.	Physical Properties of Food: <ul style="list-style-type: none"> <li>• Hydrogen ion concentration</li> <li>• oxidation-reduction potentials</li> <li>• adsorption</li> <li>• isoelectric points of proteins</li> <li>• Specific Gravity/Density</li> <li>• Specific Heat Capacity</li> <li>• Surface Tension</li> </ul>	8

	<ul style="list-style-type: none"> <li>• Viscosity</li> <li>• plasticity</li> <li>• Refractive Index</li> <li>• Filth</li> <li>• Particl Size</li> </ul>	
3.	<p>Chemical Properties :</p> <ul style="list-style-type: none"> <li>• Moisture</li> <li>• Water Activity</li> <li>• Protein</li> <li>• Fat</li> <li>• Volatile Oil</li> <li>• Crude Fiber</li> <li>• Dietary Fiber</li> <li>• Total Ash</li> <li>• Acid Insoluble Ash</li> <li>• Sulphated Ash</li> <li>• Reducing and Non-Reducing Sugars</li> <li>• Starch</li> </ul>	7
4.	<p><b>Important food quality attributes</b></p> <p>Sensory quality - colour, texture, flavor and taste</p> <p>Microbiological quality nutritional quality evaluation for food products.</p> <p>Food Adulteration</p> <p>Shelf life studies</p>	5
5.	<p>Physical and Chemical Properties of Oils and Fats:</p> <ul style="list-style-type: none"> <li>• Acid Value and Free Fatty Acids</li> <li>• Unsaponifiable Matter</li> <li>• Melting Point</li> <li>• Solid-liquid Ratio</li> <li>• Specific Gravity</li> <li>• Titre Value</li> </ul>	6

	<ul style="list-style-type: none"> <li>• Colour</li> <li>• Iodine Value</li> <li>• Saponification Value</li> <li>• Acetyl Value and Hydroxyl Value</li> <li>• Reichert-Meissl (RM) Value</li> <li>• Polenske Value</li> <li>• Rancidity</li> </ul>	
6.	Colloidal chemistry of foods : sols, gels, foams, and emulsions.	3
<b>Practical</b>		
1.	Physical examination of various food grains.	2
2.	Detection of adulteration: Milk, turmeric powder, pure ghee, wheat flour, khoa.	2
3.	Determination of the Moisture content in food sample.	2
4.	Determination of the acid insoluble ash in food sample.	2
5.	Determination of fat content in food sample.	2
6.	Determination of the Crude fibre content in food sample.	4

7.	Determination of the Protein Content in food sample.	4
8.	Calculation of carbohydrate content of food sample on the basis of principle of proximate composition	2
9.	Determination of quality of fats/oils	6



## BND 506 EMERGING CONCEPTS IN NUTRITION

CL	CP	L	P
2	0	30	0

<b>Semester</b>	V
<b>Course Name</b>	<b>BND 506 EMERGING CONCEPTS IN NUTRITION</b>
<b>Course Description</b>	Investigation, discussion and presentations of emerging concepts in nutrition.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To orient students with current concepts in Human Nutrition</li> <li>2. To Know about the Emerging trends in Nutrition</li> </ol>
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Singh P. Kumar Y, Singh A (2024). Futuristic Trends in Food Science, Nutrition and Technology. P.K. Publishers and Distributors. Delhi, ISBN-10 : 8119428625</li> <li>2. Sterling, R. A. (2024). <i>Space medicine and nutrition: A comprehensive guide for future healthcare</i>. Independently Published. ISBN-13 : 979-8879788242</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Andjelkovic, M., Paal, P., Kriemler, S., Mateikaite-Pipiriene, K., Rosier, A., Beidleman, B. A., Derstine, M., Pichler-Hefti, J., Hillebrandt, D., Horakova, L., Jean, D., &amp; Keyes, L. E. (2024). Nutrition in Women at High Altitude: A Scoping Review-UIAA Medical Commission Recommendations. <i>High altitude medicine &amp; biology</i>, 25(1), 9–15. <a href="https://doi.org/10.1089/ham.2023.0047">https://doi.org/10.1089/ham.2023.0047</a></li> <li>2. NASA. (2012). <i>NASA: Space food and nutrition educator guide</i>. BiblioGov. ISBN-13: 9781288291038</li> </ol>
<b>Prerequisites</b>	4 <sup>th</sup> semester in Nutrition and Dietetics in Honours

## Course Plan

Unit	Topic	Hours
1.	Artificial Intelligence applications in Nutrition and Dietetics : Merits and Demerits of the applications of AI nutrition and dietetics, AI sources related to nutrition, Career opportunities by using AI in Dietetics	8
2.	Nutrigenomics and Nutrigenetics : Nutrigenomics- Definition of nutrigenomics, gene expression – transcription, translation, post translational modification, nutrition in the omics era- elementary concepts on epigenetics, transcriptomics, proteomics, metabolomics; genetic variation and nutritional implications. Nutrition and Gene Expression and Nutrigenomics and Complex Diseases : Nutrient control of gene expression – amino acids, nucleotides, basic concepts of nutrigenomics and complex diseases – diabetes, cancer and obesity, Personalized Nutrition and Precision Nutrition	8
3.	Microbiome and Nutrition : Human gastrointestinal tract and its microbiota, functions, concept of probiotic, prebiotics and synbiotics; applications of probiotics in human nutrition	6
4.	Emerging trends in Nutrition : What's Next in Feeding a Growing Global Population, Human milk oligosaccharides( HMO), Chrono Nutrition and Nano Nutrition	4
5.	New technology in Nutrition Research and Practice Application of food tech and smart health care to clinical nutrition service Telemedicine, mobile, wearable devices and clinical nutrition services	4

## Semester VI

### BND 601 Social Behaviour Change Communication/ Nutrition Health Promotion

CL	CP	L	P
3	1	45	30

<b>Semester</b>	<b>VI</b>
<b>Course Name</b>	BND 601 Social and Behaviour Change Communication
<b>Course Description</b>	<p>This course aims to teach various theories of Social and Behaviour Change Communication (SBCC) or Communication for Development (C4D), which will enhance communication skills and essentials of nutrition health promotion.</p> <p>The course aims to teach communication strategies to promote positive behaviours which are needed to address the most serious health issues in the world at individuals, groups, or communities</p>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand and apply theories and methods of social and behavior change communication</li> <li>2. To learn about the evolution of health promotion and its role in promoting the SDGs</li> <li>3. To gain skills in planning, conducting and evaluating Health promotion programs in different settings</li> <li>4. To understand and apply theories and methods of social and behavioral change communication</li> </ol>

	<ol style="list-style-type: none"> <li>5. To learn about the evolution of health promotion and its role in promoting the SDGs</li> <li>6. To gain skills in planning, conducting and evaluating Health promotion programs in different settings</li> </ol>
<p><b>References</b></p>	<ol style="list-style-type: none"> <li>1. Glanz K, Rimer BK. Theory at a glance: A guide for health promotion practice. NIH, National Cancer Institute. 2nd ed. 2005.</li> <li>2. Kristal AR, Glanz K, Curry SJ, Patterson RE. How can stages of change be best used in dietary interventions? J Am Diet Assoc. 1999;99:679-684.</li> <li>3. STEPS: A framework for surveillance: The WHO STEP wise approach to Surveillance of noncommunicable diseases (STEPS), Noncommunicable Diseases and Mental Health World Health Organization, Geneva, 2003</li> <li>4. Social and Behavior Change Communication (SBCC) Training for Information, Education, and Communication (IEC) Officers, USAID, 2013.</li> <li>5. Sallis JF, Owen N, Fisher EB. Ecological models of health behavior. In: Glanz K, Rimer BK, Viswanath K (eds). Health Behavior and Health Education: Theory, Research, and Practice. 4th edition. San Francisco, CA: Jossey-Bass. 2008. pp 465-485.</li> </ol>

6. Spahn JM, Reeves RS, Keim KS, Laquatra I, Kellogg M, Jortberg B, Clark NA. State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change. *J Am Diet Assoc.* 2010;110(6):879-91.
7. Boynton PM and Greenhalgh T, Hands-on guide to questionnaire research, Selecting, designing, and developing your questionnaire, *BMJ*, 328, 2004, 1312- 1315.
8. Health Promoting Schools: A framework for action, ISBN 978 92 9061 447 0 World Health Organization, Geneva, 2009
9. Lytle LA, Perry CL. Applying research and theory in program planning: An example from a nutrition education intervention. *Health Promotion Practice.* 2001;2(1):68-80.
10. Healthy workplaces: a model for action For employers, workers, policy-makers and practitioner, WHO, 2010
11. Simons-Morton BG, Greene WH, Gottlieb NH. (Chpt 8) Evaluation. In: *Introduction to Health Education and Health Promotion*, 2nd Ed. Prospect Heights, IL: Waveland Press. 1995:218-241.
12. Field guide to designing communication strategy, WHO publication-2007.
13. Designing a health communication strategy, John Hopkins University-Centre for Communication programmes.

	<p>14. Michael Favin and Marcia Griffiths 1999, Nutrition tool kit-09-Communication for Behaviour change in Nutrition projects. Human Development Network-The World Bank-1999</p> <p>15. Hubley J (1993) Communicating Health. London: Teaching Aids at Low Cost, London, UK.</p> <p>16. Health education: theoretical concepts, effective strategies and core competencies: a foundation document to guide capacity development of health educators/World Health Organization. Regional Office for the Eastern Mediterranean, 2012.</p>
Pre requisites	5 <sup>th</sup> semester in Nutrition and Dietetics in Honours

NATIONAL

COMMISSION FOR ALLIED AND HEALTHCARE PROFESSIONS

PROFESSIONS

राष्ट्रीय

स्वास्थ्यम् सर्वार्थसाधनम्

NCAHP

Since-2021

सहबद्ध

और स्वास्थ्य देख-रेख वृत्ति आयोग

### BND 602 Sustainable Food Systems

CL	CP	L	P
3	1	45	30

#### Course Plans

Unit	Topics	45 hours
1	<p>Food Systems                      Overview Defining Food Systems (production to consumption including food waste)                      Food system development paradigm                      Global and National Food Systems                      Industrial Food System                      Local Food System and nutrition anthropology (Tailoring food systems investments to specific context).                      Overview of food value chains in India for various food groups.                      Spatial typology for food system analysis- GIS mapping for food vulnerability</p>	7
2.	<p>Sustainable diets                      Importance of food systems approach for meeting SDG goals and improving diet quality and health                      Sustainable diets for all: A key to meeting the SDGs                      Impact of Biodiversity, Environment and Climate on Sustainable diets                      Impact of Equity and fair trade on Sustainable diets                      Eco-friendly local and seasonal foods                      Cultural heritage, skills (Food Anthropology)                      Food and Nutrient needs, Food security – (availability, accessibility, affordability, utilization and stability).</p>	6
3.	<p>Healthy Diets                      Understanding dietary diversity                      Guidelines for measuring household and individual dietary diversity Household Dietary diversity score (HDDS), Women's Dietary diversity score (WDDS), Minimum acceptable diets (MAD), Minimum Dietary diversity (MDD).</p>	6

4.	<p>Promoting Nutrition Sensitive Agriculture</p> <p>Overview of nutrition sensitive agriculture</p> <p>Horticulture and healthy diets</p> <p>Shift incentives toward the foods that are most lacking in diets globally (fruits, vegetables, legumes)</p> <p>Innovations in biofortification, newer technologies for producing nutritious foods including grow your own food (Terrace/kitchen gardening, hydroponics etc.)</p> <p>Implement environmentally sound production practices</p> <p>Future of food Shaping a climate smart global food system</p>	6
5.	<p>Climate smart agriculture (CSA) and agriculture produce certification</p> <p>Overview climate change and Food and Nutrition Security</p> <p>Principles of CSA</p> <p>Mitigation of GHG from agriculture</p> <p>Adaptation of agricultural practices to climate change</p> <p>Sustainable maintenance</p> <p>Achieving the triple win of CSA</p> <p>Increased productivity</p> <p>Enhanced resilience</p> <p>Reduce emissions</p> <p>CSA and the world bank group</p> <p>Livable planet – achieving net zero emissions in agri-food systems</p> <p>Role of government: public sector leveraging its investment to incentivize private sector to include improved nutrition amongst its goals and its alignment with other social goal.</p> <p>Identifying the gaps that exist and need to be closed in the knowledge available to countries in selection of investment choices and priorities for food systems in the national nutrition context</p>	8
6.	<p>Food environments</p> <p>Understanding physical, economic, political and socio-cultural contexts in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food.</p> <p>Urban diets and food systems: Trends, challenges and opportunities for policy action.</p> <p>Rural diets and food systems: Trends, challenges and opportunities for policy action</p>	6

7.	Animal Husbandry/livestock/fisheries- for sustainable diets Extension approaches for climate resilient livestock farming Livestock, fisheries and and sustainable food systems – a complex relationship Trade & Taxation Policies to Promote nutritious, sustainable and healthy diets	6
	<b>Practical</b>	
	Visit farms, markets and food processing units to prepare food value chains in India for various food groups.	6
	Understand local food vulnerability using available GIS maps.	4
	Prepare a tool and assess Food security – (availability, accessibility, affordability, utilization and stability)- in urban and rural households- data analysis and interpretation.	4
	Assess household and individual dietary diversity Household Dietary diversity score (HDDS) in urban and rural households- data analysis and interpretation.	4
	Assess Women's' Dietary diversity score - in urban and rural households- data analysis and interpretation (WDDS)	4
	Assess Minimum acceptable diets (MAD), Minimum Dietary diversity (MDD) for children - data analysis and interpretation (WDDS)	4
	Develop a tool and assess food environment in urban and rural households- data analysis and interpretation.	4

### BND 603 Field Practice in Public Health Nutrition

CL	CP	L	P
1	3	15	90

<b>Semester</b>	<b>VI</b>
<b>Course Name</b>	BND 603 Field Practice in Public Health Nutrition 4 (1+3)
<b>Course Description</b>	Public health nutrition and program management for enhancing public health practice in India. An exploration of program management with a practical, hands-on approach through case studies, class exercises, and field visits.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand key components of program management including program design, implementation, monitoring and evaluation, sustainability and scaling up.</li> <li>• To learn the applicatory use of various methodologies and tools for the successful management of programs.</li> <li>• To provide exposure in field settings about the functioning of government programs at the sub-national level.</li> <li>• To explore program management with a practical, hands-on approach through case studies, class exercises and field visits.</li> <li>• To connect all aspects of the curriculum including seminars, course works, project experience to establish an understanding, appreciation and working knowledge of public health practice and analyze how their chosen area of intervention or study enhanced public health practice in India.</li> </ul>

Reference Books	
	1. Schmets G, Rajan D, Kadandale S, editors. Strategizing national health in the 21st century: a handbook. Geneva: World Health Organization; 2016
	2. United Nations Development Programme 2009. Handbook on planning, monitoring and evaluating for development results. UNDP New York USA
	3. MWCD 2018. Guidelines for Implementation of ICT-RTM System. POSHAN Abhiyaan. Ministry of Women and Child Development, Government of India
	4. Global Nutrition Report March, 2016. How to Make SMART Commitments to Nutrition Action
	5. Sustainability Report. 2013. The Program Sustainability Assessment Tool. Washington University, St Louis, MO. <a href="http://www.sustaintool.org">http://www.sustaintool.org</a>
	6. World Health Organization 2011. Beginning with the end in mind. Planning pilot projects and other programmatic research for successful scaling up. World Health Organization Expand Net
	7. CORE Group. Nutrition Working Group. Nutrition Program Design Assistant: A Tool for Program Planners. Reference Guide. Washington, DC: 2010
	8. The International Training and Education Center for Health (I-TECH) 2008. Technical Implementation Guide. Rapid Evaluation. I-TECH, Washington, USA
	9. United Nations. Statistical Institute for Asia & the Pacific (SIAP). Results-Based Management: Logical Framework Approach. SIAP Chiba, Japan 2007
	10. World Health Organization. Drinking and Driving: A Road Safety Manual. Module 4: How to evaluate the program

	11. Karabi et al. BASICS II. 2004. Using 'Essential Nutrition Actions' to Accelerate Coverage with Nutrition Interventions in High Mortality Settings. Published by the Basic Support for Institutionalizing Child Survival Project (BASICS II) for the United States Agency for International Development. Arlington, Virginia, 2004.
	12. Save the children. Monitoring, Evaluation, Accountability, and Learning (MEAL). Programme Frameworks, Objectives and Indicators
	13. Management, Leadership & Partnership for District Health. WHO 2004 (Module 2)
<b>Webliography</b>	<a href="https://www.logframer.eu/content/results-based-management-rbm">https://www.logframer.eu/content/results-based-management-rbm</a>
	<a href="http://www.fao.org/investment-learning-platform/background/en/">http://www.fao.org/investment-learning-platform/background/en/</a> <a href="http://www.fao.org/Results-based%20Management%20Investment%20Learning%20Platform%20(ILP)%20Food%20and%20Agriculture%20Organization%20of%20the%20United%20Nations">http://www.fao.org \Results-based Management _ Investment Learning Platform (ILP) _ Food and Agriculture Organization of the United Nations</a>
	<a href="https://www.fantaproject.org">https://www.fantaproject.org</a>
	<a href="https://usaidlearninglab.org/events/advanced-project-management-training-course">https://usaidlearninglab.org/events/advanced-project-management-training-course</a>
	<a href="https://www.who.int/hiv/strategic/me/en/">https://www.who.int/hiv/strategic/me/en/</a>
	<a href="https://www.who.int/roadsafety/projects/manuals/alcohol/4-How%20to.pdf">https://www.who.int/roadsafety/projects/manuals/alcohol/4-How%20to.pdf</a>

## Course Plan

Unit	Topic	Hours
1.	<p>Nutrition and Health Program Planning at Sub-National Level</p> <p>Understanding the sub-national level: local, district or regional level situation through the use of available data sets; understanding the local nutrition health delivery systems for Essential Nutrition Actions (ENA), decentralization &amp; governance</p> <p>Strategizing at the sub-national level</p> <p>Concept, need, and importance, fostering increased community participation</p> <p>Bottom-up, inter-sectoral, multi-stakeholder collaboration at the sub-national level (Management, Leadership &amp; Partnership for District Health)</p> <p>Issues to consider during planning</p> <p>social determinants, socio-cultural context, scale up &amp; sustainability</p>	5
2.	<p>Result-based Model for Nutrition Program Management</p> <p>Results Based Management (RBM) – basic concepts, core principles and best practices</p> <p>RBM as a tool for managing the implementation of strategy; logical framework approach</p> <p>Understanding the link between resources and results – inputs and activities leading to outputs, outcomes, and impact</p>	2
3.	<p>Scaling up and Sustainability of Programs</p> <p>Program sustainability – definition, importance, assessment</p> <p>Sustainability Action Plan – tools, agencies, organizations, resources, timeframe</p> <p>Scaling up nutrition and health service interventions – participatory process involving key stakeholders</p> <p>Tailoring and testing the intervention according to the socio-cultural and institutional settings</p> <p>Assessing and documenting the process of implementation, surveillance changes</p>	3

4.	<p>Nutrition / Health Program Design</p> <p>Gather and synthesize information on the nutrition and health situation</p> <p>Determine initial program goals and objectives (SMART objectives)</p> <p>Review existing nutrition and health services, their coverage, utilization &amp; identify gaps</p> <p>Preliminary program design – determining interventions based on priority areas, program approaches to deliver these interventions, replicability and sustainability</p> <p>Importance of programme frameworks for programme design, monitoring and evaluation</p> <p>Types of monitoring; ICT based real time monitoring</p> <p>Process, impact and outcome evaluation</p>	5
	<b>Practical</b>	<b>Credits</b>
1.	<p>Situational Analysis – Crucial Step in the Planning Cycle</p> <ol style="list-style-type: none"> <li>1. Organizing and conducting situational analysis / need assessment – setting priorities based on tracking the local nutrition health targets met and rapid needs assessment based on available data gaps</li> <li>2. Designing and Pretesting appropriate survey tools – Quantitative and Qualitative tools – their description, advantages and challenges:</li> <li>3. Structured interviews <ol style="list-style-type: none"> <li>a. Semi-structured interviews with key informants</li> <li>b. Open / informal in-depth interviews</li> </ol> </li> </ol>	15
2.	<p>Planning – Strategic and Operational</p> <ol style="list-style-type: none"> <li>1. Setting goals and objectives - formulating strategic objectives on the basis of SMART criteria</li> <li>2. Planning at local level (decentralized environment)</li> <li>3. Issues to consider while planning at sub-national level</li> <li>4. Selecting appropriate study design and sampling framework and sample size</li> <li>5. Steps in operational planning</li> <li>6. Mapping the stakeholders of health and nutrition delivery services and involving them in participatory program planning (Triple A approach)</li> </ol>	25
3.	<p>Implementation, Monitoring and Evaluation</p> <ol style="list-style-type: none"> <li>1. Execution of implementing plans &amp; their monitoring</li> <li>2. Identifying output, outcome, impact indicators for discussion for evaluation</li> <li>3. Identify risks, threats, issues, and tasks – tools and methodology</li> <li>4. Reporting progress and performance and disseminating results to stakeholders</li> </ol>	25

4.	<p>Field Exposure</p> <p>The students will be placed in an government, NGO or donor/bilateral agency in a nutrition/health related program</p> <ol style="list-style-type: none"> <li>1. Conduct situational analysis of the selected program/community from the management, anthropological, epidemiological and IEC perspective</li> <li>2. Students will do a critique on an existing health nutrition programme with a focus on studying the inter and intra-sectoral linkages in planning and implementation.</li> <li>3. The students will conduct formative research using qualitative and participatory research tools to assess the nutrition health perceptions of health services providers, clients, and the community.</li> <li>4. Students will critique the IEC materials and techniques in the relevant health and nutrition programmes of the government or NGO.</li> <li>5. The students will plan, implement, and evaluate a focused intervention covering the above components in consultation with the field agency</li> <li>6. The students will analyze the data manually and using the computers and submit a report.</li> <li>7. The class will carry out selected components of the above (as feasible) in urban as well as rural/ tribal settings</li> </ol>	25
----	---	----

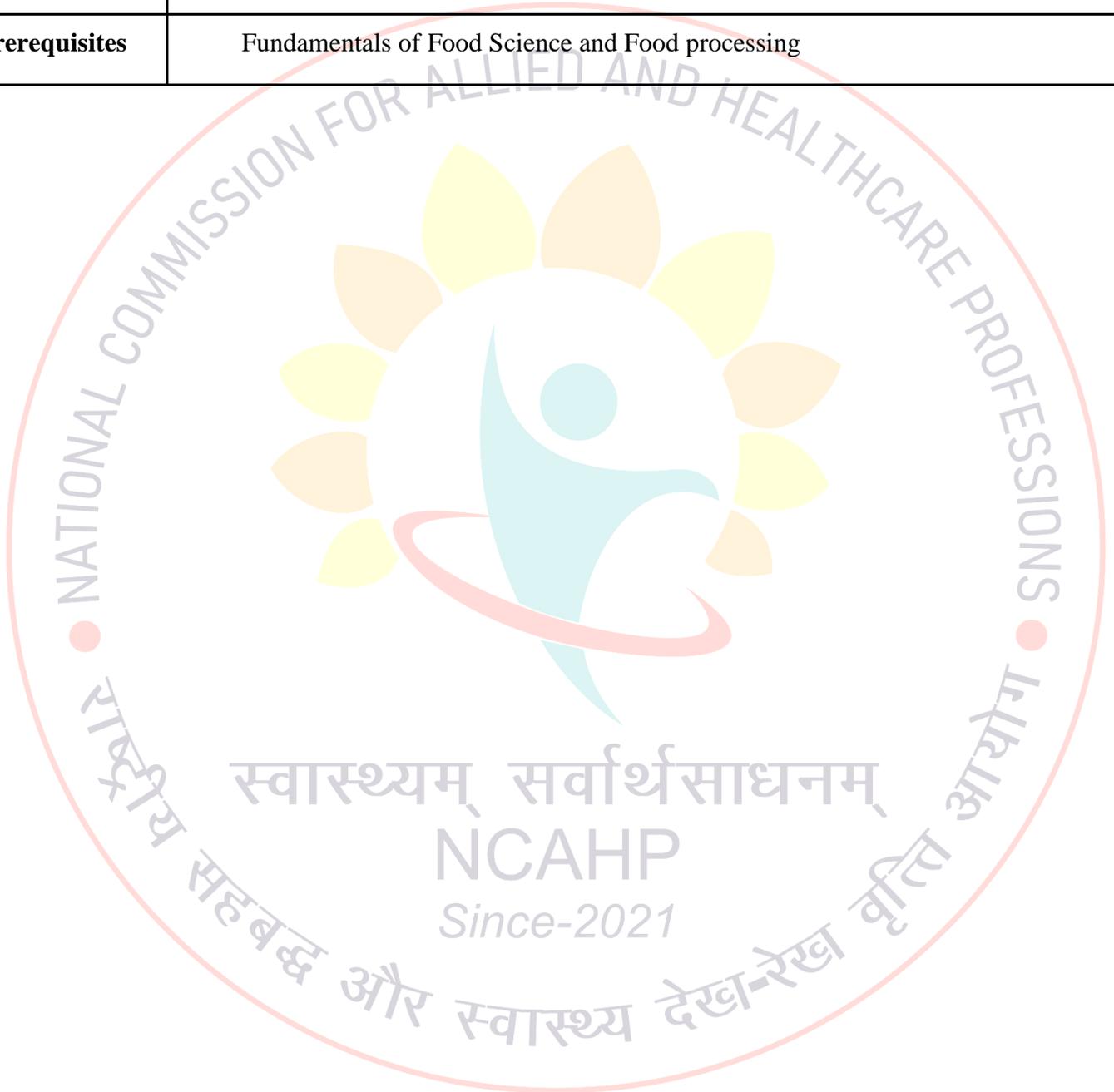


## BND 604 FOOD PRODUCT DEVELOPMENT

CL	CP	L	P
2	4	30	120

<b>Semester</b>	<b>VI</b>
<b>Course Name</b>	<b>BND 604 FOOD PRODUCT DEVELOPMENT</b>
<b>Course Description</b>	Introduction to Food Production and processing of foods, Criteria for selection of raw materials for food processing, Principles and stages involved in product development, Sensory, Chemical and Microbial evaluation, Packaging, Labeling and Food Standards and Marketing of Food Products
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To gain insights on production and processing of foods</li> <li>2. To learn about quality management considerations</li> <li>3. To develop new marketable, nutritionally and economically viable food products</li> <li>4. To gain knowledge about packaging of foods, packaging materials and systems of labeling, testing and evaluation of packaged foods.</li> <li>5. To develop entrepreneurship skills for setting up small scale food industries</li> </ol>
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Potter, N. M. (2007). <i>Food science</i> (5th ed). CBS Publ &amp; Dist Pvt Ltd India. ISBN-13 : 978-8123904726</li> <li>2. Fuller, G. W. (2015). <i>New food product development</i> (2nd ed.). CRC Press. ISBN-13 : 978-0849316739</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Lawless, H. T., &amp; Heymann, H. (2010). <i>Sensory evaluation of foods</i> (2nd ed.). Springer.</li> <li>2. Jaiswal, P. K. (2020). <i>Food quality and safety</i> . CBS Publishers and Distributors Pvt. Ltd. ISBN 13:978-8123917757</li> </ol>

<b>Webliography</b>	1. Ministry of Food Processing Industries. <i>Government of India.</i> <a href="https://www.mofpi.gov.in/">https://www.mofpi.gov.in/</a>
	2. Food Research Lab. New product development service. <i>Food Research Lab.</i> <a href="https://www.foodresearchlab.com/what-we-do/new-product-development-service/">https://www.foodresearchlab.com/what-we-do/new-product-development-service/</a>
<b>Prerequisites</b>	Fundamentals of Food Science and Food processing



## Course Plan

Unit	Topic	Hours
1.	<p>Criteria for Raw Material Selection and Product Development</p> <p>Criteria for selection of raw materials for food processing. Manufacture of food - small scale, large scale, manual, automated and computerized.</p> <p>Principles and stages involved in product development, Sensory, chemical and microbiological evaluation of processed foods. Convenience Foods, Extruded foods, Health foods. Nutritional supplements, RTS, and RTE foods</p> <p>Definition, classification, characterization, factors influencing product development- Social and health concerns, generation and screening of ideas for new product development, impact of technology and marketing.</p>	12
2.	<p>Packaging, Labeling and Food Standards</p> <p>Definition, Principles, Classification Packaging methods and materials for packaging conventional and innovative packaging techniques. Food labeling, Recent trends in packaging materials and labeling. Food Safety and Standards Act, 2006 (FSSAI) and HACCP for processed and packed foods.</p>	9
3.	<p>Marketing of Food Products</p> <p>Product Cost Calculation, Product Specifications, Marketing Strategies, Advertising Methods, Consumer Behavior and Food Acceptance</p>	9

## FOOD PRODUCT DEVELOPMENT PRACTICAL

Unit	Topic	Hours
1.	Cereal and Pulse based foods	18
2.	Ready to Serve (RTS), Fruit juices, Squash, Jams and Preserves	18
3.	Pickles, Ketchup, Sauce	12
4.	Weaning Foods	12
5.	Health Foods and Nutritional Supplements	12
6.	Convenience foods	18
7.	Selection of a product, preparation, standardization and quality cooking	12
8.	Selection of packaging material, labeling, cost calculation and marketing	12
9.	Presentation of report	6
<b>Total hours</b>		<b>120</b>



## BND 605 Case Study Reviews ( Practical)

CL	CP	L	P
0	4	0	120

<b>Semester</b>	<b>VI</b>
<b>Course Name</b>	Case Study Reviews ( Practical )
<b>Course Description</b>	It is an advanced applied course in therapeutic nutrition. The course enables students to apply principles of Medical nutrition Therapy in clinical conditions through Case Study Reviews.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To comprehend case study methodology and guidelines for researchers.</li> <li>2. To document case studies and read case study reports .</li> <li>3. To apply the key methodological considerations in relation to the design, planning, analysis, interpretation and reporting of case studies.</li> <li>4. To Identify the key issues of the case, analyze the case using relevant MNT Principles, concepts and recommend a course of action for that particular case.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Billon, W. (2006). <i>Clinical nutrition case studies</i> (4th ed.). Wadsworth.</li> <li>2. Douglas, P. (2016). <i>Dietetic and nutrition case studies</i> (1st ed.). Wiley-Blackwell.</li> <li>3. Emery, E. Z., &amp; Jones, E. (2011). <i>Dietetic and nutrition case studies</i>. Jones &amp; Bartlett Publishers.</li> <li>4. Mahan, K. L., &amp; Stump, S. E. (2012). <i>Food and the nutrition care process</i> (13th ed.). Saunders Elsevier.</li> <li>5. Skipper, A. (2009). <i>Medical nutrition therapy practice</i>. Jones &amp; Bartlett Publishers.</li> <li>6. Mariah, M., Russell, M. K., &amp; Shikora, S. A. (2008). <i>Clinical nutrition for surgical patients</i>. Jones &amp; Bartlett Publishers.</li> </ol>

	<p>7. Thomas, B. (Ed.). (1994). <i>Manual of dietetics practice</i>. Blackwell Scientific Publications.</p> <p>8. Wardlaw, M., &amp; Gordon, D. (1999). <i>Perspectives in nutrition</i> (4th ed.). WCB/McGraw-Hill.</p> <p>9. Zeman, J. F., &amp; Ney, M. D. (1988). <i>Application of clinical nutrition</i>. Prentice Hall International.</p> <p>10. Shils, M. E., Olson, J. A., &amp; Shike, M. (Eds.). (1994). <i>Modern nutrition in health and disease</i> (8th ed.). Lea &amp; Febiger.</p> <p>11. Williams, R. (1993). <i>Nutrition and diet therapy</i> (7th ed.). Mosby Year Book, Inc.</p> <p>12. Anderson, D., &amp; Dibble, M. (1982). <i>Nutrition in health and disease</i> (17th ed.). J. B. Lippincott Company.</p> <p>13. Alpers, D., Stenson, W., &amp; Bier, D. (1995). <i>Manual of nutrition therapeutics</i> (3rd ed.). Little, Brown and Company.</p>
<p><b>Prerequisites</b></p>	<p>12th standard - HSc, ICSC with Science ( Biology and Chemistry) who has completed the Second year ( 4 Semester) of BSc Nutrition and Dietetics</p>



## Course Plan

Unit	Topics	Hours
1.	<p>Identification and collection of case studies with advanced complications</p> <p>A. Diabetes and Cardiac care                      B. Renal                      C. Pediatric                      D. Hepatic                      E. Critical care                      F. Respiratory.                      G. Cancer</p>	40
	<p>Disease Specific Scientific Review &amp; Analysis</p> <p>i. Metabolic Health &amp; Disease                      ii. Women's Health                      iii. Diabetes                      iv. Cardiovascular disease                      v. Geriatric nutrition                      vi. Pediatric nutrition                      vii. Renal health</p>	40
	<p>Case study discussions and presentations</p> <p>i. Standardized protocol for case study presentations                      ii. Various methods used for case study presentations                      iii. Simulations exercises                      iv. Mock sessions                      v. Group discussions</p> <p>. Presentations on the Meta analysis of the literature review collected.</p>	40

## Semester VII

### BND 701 Information Technology in Nutrition and Dietetics (Theory and Practical)

CL	CP	L	P
0	0	0	0

<b>Semester</b>	<b>VII</b>
<b>Course Name</b>	Information Technology in Nutrition and Dietetics ( Theory and Practical)
<b>Course Description</b>	It is a course which relates to integration of technology in application of principles of therapeutic nutrition. The course enables students to be twenty-first century ready to improve accuracy and efficiency.
<b>Objectives</b>	<ol style="list-style-type: none"><li>1. Demonstrate knowledge of the role and relevance of information and communication technology in the area of nutrition and healthcare.</li><li>2. Comprehend the concepts of healthcare information management system</li><li>3. Apply various technology assisted tools and common software used for assessment and analysis of dietary intake and nutritional status.</li><li>4. Integrate the principles of communicating and disseminating nutrition and health related information to varied target groups in the community using technology.</li></ol>

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Mahan, L. K. (2014). <i>Food &amp; nutrition care process</i> (14th ed.). Cengage Learning.</li> <li>2. Giblin, L. (2010). <i>Skill with people</i> (Revised ed.). Skill with People.</li> <li>3. Hacker, D., &amp; Sommers, N. (2012). <i>A writer's reference</i> (8th ed.). Bedford/St. Martin's.</li> <li>4. Nandi, C. (2009). <i>Principles of communication</i>. Reference Press.</li> <li>5. Michie, S., van Stralen, M. M., &amp; West, R. (2011). <i>ABC of behavior change theories: An essential resource for researchers and diet practitioners</i>. Silverback Publishing.</li> <li>6. Johns, M. L. (2010). <i>Health information management technology: An applied approach</i>. Cengage Learning.</li> <li>7. Microsoft Office Excel, PowerPoint, and Access Software.</li> <li>8. Nutritionist Pro. (n.d.). <i>Dietcal: Tutorials and demonstrations</i>. Nutritionist Pro.</li> </ol>
<b>Prerequisites</b>	12th standard - HSc, ICSC with Science ( Biology and Chemistry) who has completed the Third year of BSc Nutrition and Dietetics



## Course Plan

Unit	Theory	Hours
1	<p>Introduction to Information Technology in Healthcare</p> <p>i. Overview of computer systems, networks and computer based application process</p> <p>ii. Areas of ICT in health education, research, referral and data management- case studies from each area</p> <p>iii. Significance of information systems for health care impact on quality of care, economics and efficiency of health institutions.</p> <p>iv. Initiatives and goals of eHealth, mHealth and telemedicine; barriers to implementation.</p> <p>v. Basics of developing mobile applications and electronic health modules research trends and examples of application in healthcare institutions</p>	15
2	<p>Information System in Health Systems and Dietetic Practice</p> <p>i. Introduction to the methods of health information processing</p> <p>ii. Health Information management theory and practice</p> <p>iii. Technology assisted dietary assessment IPSAS (Interactive Portion Size Assessment System) and the SCRAN24 (Self-Completed Recall and Analysis of Nutrition), electronic diet recall protocols</p> <p>iii. Designing electronic questionnaires, google forms and conducting surveys using the tools; reporting and discussing results.</p> <p>iv. Essentials of report writing, ethics, plagiarism and copyright issues</p>	15

	<p><b>PRACTICAL</b></p> <p>Application of Software for Research and Dietary Analysis</p> <p>A. Training in working with tools and resources/ softwarei. Basic MS office toolsMicrosoft OfficeExcel, Powerpoint, MS Access</p> <p>i. Literature Review and bibliographyMendeley, TurnItIn, Easybib, Purdue Owl</p> <p>ii. Nutritional StatusWHO Anthro Plus</p> <p>iii. Dietary AnalysisNutritionist Pro, DietCal</p> <p>B. Presentation of the results</p>	<p><b>30</b></p>
	<p><b>Nutrition Communication using Media</b></p> <p>i. Dietetic Practice using social media- LinkedIn, YouTube, Facebook, twitter, Pinterest</p> <p>ii. Designing websites, writing blogs, creating infographics, recipe videos and nutrition podcasts- (Project based learning)</p> <p>iii. Writing for magazines/ newspaper articles, catering to general population</p> <p>i. Research posters- what makes a good poster, how to add content and tables, design templates and examples of effective posters</p>	<p><b>30</b></p>

## BND 702 Entrepreneurship in Nutrition and Dietetics

CL	CP	L	P
3	1	45	30

<b>Semester</b>	<b>VII</b>
<b>Course Name</b>	Entrepreneurship in Nutrition and Dietetics
<b>Course Description</b>	A fundamental outcome of entrepreneurship is the creation of new value, usually through the creation of new products and services, which may lead to the creation of a new business entity. The objective of this course is to demonstrate and understand that exploiting a new opportunities in the field of nutrition and dietetics.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To facilitate the student in identification and exploration of entrepreneurial opportunities and basic understanding about business economics.</li> <li>2. To support the students in the development of knowledge and skill related to success in entrepreneurial activities in the field of nutrition and dietetics.</li> <li>3. To teach about Leadership and social entrepreneurship.</li> <li>4. To upscale Dietetics, Public Health Nutrition or Food Sciences and quality learnings to Food Industry Formulations and regulations.</li> </ol>

	5. To understand the trends, challenges, opportunities, and future needs of the dietetic workforce.
	6. Upscaling food product development to Food business, Issues, and concerns in Food Service Management.
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Chowdhry Ajay. Just Aspire: Notes on Technology, Entrepreneurship and the Future. Harper Collins India. 2023.</li> <li>2. HBR's 10 Must Reads on Startups and Entrepreneurship (Featuring Bonus Article "Why the Lean Startup Changes Everything" by Steve Blank). Harvard Business Review Press. 2018.</li> <li>3. Vishal Gupta. Research Handbook on strategic Entrepreneurship. Edward Elgar Publishing Ltd. 2023.</li> <li>4. KP Sudheer and Sangeetha K Prathap. Introduction to Entrepreneurship Development in Food Processing. CRC Press. 2021.</li> </ol>
<b>Prerequisites</b>	Semester 6



## Course Plan

Unit	Topic	45 Hours
I	<p>Introduction to Entrepreneurship</p> <p>a) Definition of Entrepreneurship and Business.</p> <p>b) Evolution of entrepreneurship in today's economy</p> <p>c) Definition of success, entrepreneurial attributes, traits, skills for success</p> <p>d) Understand the needs of target markets related to food service, dietetics, public health, and potentially viable business ideas.</p>	3
2	<p><b>Types of Entrepreneurship</b></p> <p>a) Small business entrepreneurs</p> <p>b) Large company entrepreneurs</p> <p>c) Scalable startup entrepreneur</p> <p>d) Researcher Entrepreneur</p> <p>e) Hustler Entrepreneur</p> <p>f) Innovative Entrepreneurs</p> <p>g) Social Entrepreneurs</p> <p>h) Trading/Marketing/Manufacturing Entrepreneurs</p> <p>i) Lifestyle Entrepreneurs</p> <p>j) Intrapreneurs</p>	7
3	<p>Skills for Entrepreneurship</p> <p>a) State the skills required to be an entrepreneur: Budgeting, communication, time management, problem solving, creative thinking, leadership, management, decision making, networking, collaboration, public speaking</p> <p>b) Other requirements for an entrepreneur: assets, values and attitudes, qualities, roles demands</p> <p>c) Barrier to entrepreneurship.</p>	7

	d) Examples of successful traits of successful business/entrepreneurs in the area of nutrition and dietetics (Local/national and global).	
4	<p>Customer identification</p> <p>a) Environmental scan</p> <p>b) Competitive assessment</p> <p>c) Marketing strategies - 3 Cs of Marketing (company, customers, and competitors).</p> <p>d) How to have a Successful Marketing Plan?</p> <p>e) Components of a Successful Marketing Plan</p> <p>f) Examples of marketing strategies in the area of nutrition and dietetics (Local/national and global).</p> <p>g) SWOT analysis of Brands</p>	7
5.	<p>Dietitians as an entrepreneur</p> <ol style="list-style-type: none"> <li>1. Establishing – making a mark</li> <li>2. Practice roles</li> <li>3. Overcoming the challenges through holistic approach</li> <li>4. Dealing with nutritional non-compliance</li> <li>5. Skills and competencies required for working in wellness Settings</li> </ol> <p>Food Industry Formulations and Regulations</p> <p>Standard for professional practice and code of ethics overview of Registration, documentation and patents in the area of food service, Nutrition and Dietetics IP and University Tech Transfer Compliances and Approvals</p>	7

6.	<p>Business Plans</p> <p>a) Formulation of business plan: meaning, contents, significance, network analysis, common errors in business plan formulation.</p> <p>b) Generating business ideas : Locating business ideas, Expanding the ideas, Size the potential market for potential viable idea, Validating the opportunity, Develop initial sales, profit, competitive landscape and future growth for potential viable business idea, Match potential viable idea to personal assessment profile</p> <p>c) Feasibility analysis</p> <p>d) Examples of startups and successful business in the area of food service, nutrition and dietetics (Local/national and global).</p>	7
7	<p>Entrepreneurship Development Programmes (EDP):</p> <p>a) Examples and details of local, national and International EDPs</p> <p>b) Funding opportunities for Start-ups: Government &amp; Private.</p> <p>c) Incentives and Subsidies for Women Entrepreneurs</p> <p>d) National Innovation and Start-up Policy for Students and Faculty</p>	7
1	<p><b>Practical*</b></p> <p>a) Self-evaluation with regard to entrepreneurial interest, intent, and capabilities.</p> <p>b) Elevate of personal leadership style.</p> <p>c) Evaluate personal traits, skills, attitudes and assess the drive necessary to be a successful entrepreneur.</p> <p>d) Identify personal strengths and weaknesses and compare with profiles of successful small business owners.</p>	15 hours

	<p>e) Develop personal growth plans to address weaknesses and capitalize on</p> <p>f) Strengths in order to increase their potential to succeed in small business.</p> <p>g) Identify external market conditions in the field of nutrition and dietetics (Local/national and global)</p>	
<b>2</b>	<p>Steps to prepare a business plan in the area of nutrition and dietetics Preparing a Business Plan and strategy</p> <p>a) Opportunity identification and selection: need, identification, opportunity selection, steps in setting up a small enterprise.</p> <p>b) Formulation of business plan: meaning, contents, significance, network analysis,</p> <p>c) Common errors in business plan formulation.</p> <p>d) Financial aspects and Management Strategies of Start-ups</p>	<b>15 hours</b>



### BND 703 Nutrition in Critically ill

CL	CP	L	P
2	2	30	60

#### Instructor in charge

M.Sc. and / Ph.D. in Foods and Nutrition or equivalent

<b>Course Description</b>	The course shall enable the student to apply medical nutrition therapy in critical illness
<b>Objectives</b>	Learn about optimal and timely nutrition intervention in critically ill patients.
<b>Text Book and References</b>	<ol style="list-style-type: none"> <li>1. Al-Dorzi H.M., &amp; Arabi Y.M. (2023). Nutrition for critically ill patients. Schmidt G.A., &amp; Kress J.P., &amp; Douglas I.S.(Eds.), <i>Hall, Schmidt and Wood's Principles of Critical Care, 5th Edition</i>. McGraw Hill.</li> <li>2. Mehta Y, Sunavala JD, Zirpe K, Tyagi N, Garg S, Sinha S, Shankar B, Chakravarti S, Sivakumar MN, Sahu S, Rangappa P, Banerjee T, Joshi A, Kadhe G. Practice Guidelines for Nutrition in Critically Ill Patients: A Relook for Indian Scenario. <i>Indian J Crit Care Med</i>. 2018 Apr;22(4):263-273. a. doi: 10.4103/ijccm.IJCCM_3_18. PMID: 29743765; PMCID: PMC5930530.</li> <li>3. Walker RN, Heuberger RA. Predictive equations for energy needs for the critically ill. <i>Respir Care</i>. 2009;54(4):509–521.</li> </ol>
<b>Prerequisites</b>	BND 405 Advanced Dietetics

Unit	Topic	Hours
1	Nutrition support practice: Challenges and opportunities 1. Role of Nutrition therapy in improving clinical outcomes in critical illness	6
2.	Early Indicators of malnutrition in ICU, Energy and Protein requirements for critically ill, Complications of nutrition support: Refeeding syndrome, overfeeding, hyperglycemia, Enhanced Recovery after surgery	12
3.	Nutrition support in Burn, Trauma, and Critically ill patients Absorption, metabolism, and sterilization of micro and macronutrients, Nutritional status and body composition of Burn, Trauma, and Critically ill patients,. Criteria for implementation of nutrition support, Principles of prescription (Route and amount), Composition of nutrition support formulas for Burn, Trauma, and Critically ill patients, Post ICU Management	12

Practical		
Unit	Topic	Hours
1.	Enteral nutrition formulations-1	5
2.	Enteral nutrition formulations- 2	5
3.	Nutrition Screening	5
4.	Case studies in Burn patients. for nutritional planning.	15
5.	Case studies in Trauma patients. for nutritional planning.	15
6.	Case studies in Critically ill patients. for nutritional planning.	15

## BND 704 Management and Administration in Dietetics Services

CL	CP	L	P
2	2	30	60

### Instructor in charge

M.Sc. and / Ph.D. in Foods and Nutrition or equivalent

<b>Course Description</b>	The course shall enable the students to learn protocol of provision and preparation of healthy and therapeutic diets to the hospital dieted patients as per medical conditions in a hospital.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>Understand the food production process</li> <li>Comprehend different kitchen objectives</li> <li>Analyse different methods of food production</li> <li>Describe the planning process in food production unit</li> <li>Discuss food production in hospital</li> </ul>
<b>Text Book and References</b>	<ol style="list-style-type: none"> <li>1. Drummond, Karen E. and Lisa M. Brefere. 2013. Nutrition for Foodservice and Culinary Professionals. New Jersey: Wiley.</li> <li>2. Sethi, Mohini and Surjeet Malhan. 2018. Catering Management: An Integrated Approach. New Delhi: New Age International Private Limited.</li> <li>3. Puckett, Ruby Parker. 2012. Foodservice Manual for Health Care Institutions. San Francisco: Jossey Bass Publishers.</li> </ol>
<b>Prerequisites</b>	BND 405 Advanced Dietetics

Unit	Topic	Hours
1	Hospital Food Service Management - Principles and Techniques of Effective Management, Leadership and Managerial Abilities. Tools of Food Management - Organizational Chart of the Food Service Team in Hospital.	5
2	Human Resource Management - Recruitment & Selection, Induction, Training, Performance Appraisal, Leadership, Communication, Employee Benefits, and Laws Governing Food Service Establishment.	5
3.	Physical Facilities and Layout – Size and Type of Kitchen, Design of Kitchen, Ventilation, Lighting, Flooring, Carpets, Wall Covering and Sample Layout of Kitchen. Storage Area and Equipment Required	5
4.	Food Materials Management - Purchasing of Food Materials, Receiving & Storing – Importance of Receiving Raw Materials	5
5.	Hospital Food Production – Menu Planning for Patients and Process of Food Production. Different Methods of Holding Foods for Service.	
6.	Sanitation and Hygiene - Environmental Hygiene & Sanitation, Safe Food Handling Practices, Personal Hygiene.	5

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Analyse on-site and off-site catering management in a Hospital	10
2.	Classify the patients in a hospital as per their dietary requirements	10
3.	Analyse different types of food production procedures in hospitals	10
4.	Give a brief outline of an organizational chart for a food service team in hospitals.	10
5.	Describe the important types of commercial food production equipment.	10
6.	Plan and prepare type of menu is generally followed in schools and hospitals	10



### BND 705 Nutrition in Emergencies

CL	CP	L	P
2	1	30	30

<b>Semester</b>	<b>VII</b>
<b>Course Name</b>	<b>BND 705 Nutrition in Emergencies 3</b>
<b>Course Description</b>	This course delves into the critical role of nutrition during emergencies, equipping students with the knowledge and skills to address nutritional needs in crises such as natural disasters, conflicts, and pandemics. It covers the assessment of nutritional needs, the planning and implementation of nutrition interventions, and the management of malnutrition in crisis settings
<b>Objectives</b>	<ul style="list-style-type: none"> <li>. To understand the impact of emergencies on nutritional status.</li> <li>. To learn methods for assessing and monitoring nutritional needs in crisis situations.</li> <li>. To gain knowledge of emergency nutrition programs and interventions.</li> <li>. To develop skills for managing malnutrition and food insecurity in emergencies</li> <li>. To familiarize with international standards and guidelines for nutrition in emergencies</li> </ul>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Watson, F., &amp; Sandoz, Y. (Eds.). (2020). Emergency Nutrition: Principles and Practice in Humanitarian Response. Oxford University Press.</li> <li>2. Wilkinson, C, &amp; Whitehead, C. (2019). Nutrition in Emergencies. CABI Publishing</li> <li>3. The Sphere Project. (2018).The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. 4th Edition. Practical Action Publishing.</li> </ol>

	<p>4. World Health Organization. (2013).Management of Severe Acute Malnutrition in Children: Working Towards Results at Scale. WHO.</p> <p>5. World Food Programme &amp; United Nations Children's Fund. (2017). Food and Nutrition in Emergencies: An Approach to Effective Interventions. WFP &amp; UNICEF. A comprehensive guide to planning and implementing nutrition interventions in emergencies, including food aid, supplementary feeding, and micronutrient supplementation.</p> <p><a href="https://www.who.int/nutrition/topics/nut_emergencies/en/">https://www.who.int/nutrition/topics/nut_emergencies/en/</a>(<a href="https://www.who.int/nutrition/topics/nut_emergencies/en/">https://www.who.int/nutrition/topics/nut_emergencies/en/</a>)</p> <p><a href="https://www.unicef.org/nutrition/emergencies">https://www.unicef.org/nutrition/emergencies</a>](<a href="https://www.unicef.org/nutrition/emergencies">https://www.unicef.org/nutrition/emergencies</a>)</p> <p><a href="https://spherestandards.org/">https://spherestandards.org/</a>](<a href="https://spherestandards.org/">https://spherestandards.org/</a>)</p> <p><a href="http://www.fao.org/emergencies/resources/documents/emergency-prevention-system-for-food-safety/en/">http://www.fao.org/emergencies/resources/documents/emergency-prevention-system-for-food-safety/en/</a>](<a href="http://www.fao.org/emergencies/resources/documents/emergency-prevention-system-for-food-safety/en/">http://www.fao.org/emergencies/resources/documents/emergency-prevention-system-for-food-safety/en/</a>)</p> <p><a href="https://www.nutritioncluster.net/">https://www.nutritioncluster.net/</a>](<a href="https://www.nutritioncluster.net/">https://www.nutritioncluster.net/</a>)</p> <p><a href="https://www.wfp.org/emergencies">https://www.wfp.org/emergencies</a>](<a href="https://www.wfp.org/emergencies">https://www.wfp.org/emergencies</a>)</p> <p><a href="https://www.actionagainsthunger.org/nutrition">https://www.actionagainsthunger.org/nutrition</a>](<a href="https://www.actionagainsthunger.org/nutrition">https://www.actionagainsthunger.org/nutrition</a>)</p> <p><a href="https://reliefweb.int/topics/nutrition">https://reliefweb.int/topics/nutrition</a>](<a href="https://reliefweb.int/topics/nutrition">https://reliefweb.int/topics/nutrition</a>)</p> <p><a href="https://www.ifrc.org/nutrition">https://www.ifrc.org/nutrition</a>](<a href="https://www.ifrc.org/nutrition">https://www.ifrc.org/nutrition</a>)</p> <p><a href="https://www.usaid.gov/glob">https://www.usaid.gov/glob</a></p>
<p><b>Pre requisites</b></p>	<p>Following prerequisites are recommended to ensure that the students have the foundational knowledge necessary to understand and apply the concepts discussed in the course nutrition in emergencies. The typical pre-requisites are:</p> <ol style="list-style-type: none"> <li>1. Understanding of basic nutrition and dietetics</li> <li>2. Knowledge about Public Health Nutrition or Community nutrition</li> <li>3. Knowledge about Food Security and Policy, biostatistics and epidemiology.</li> </ol>

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Credit Hours</b>
<b>Unit - I</b>	<p>Introduction to Nutrition in Emergencies</p> <p>Definition and types of emergencies (natural disasters, conflicts, pandemics). Impact of emergencies on food security and nutrition.</p> <p>Assessment of Nutritional Needs in Emergencies - Rapid nutrition assessments and surveys. Indicators of nutritional status (anthropometry, biochemical, clinical, dietary)</p>	<b>7</b>
<b>Unit - II</b>	<p>Emergency Nutrition Programs and Interventions</p> <p>Nutritional requirements in emergency-affected populations. Types of nutrition interventions: general food distribution, supplementary feeding, therapeutic feeding –</p> <p>Micronutrient interventions and prevention of micronutrient deficiencies. Mobilization and distribution of resources - local resources, general fund and social funds.</p>	<b>8</b>
<b>Unit III</b>	<p>Managing Malnutrition in Emergencies</p> <p>Classification and management of acute malnutrition (SAM and MAM). Community-based Management of Acute Malnutrition (CMAM). Role of ready-to-use therapeutic foods (RUTF) and supplementary foods.</p>	<b>7</b>

<b>Unit IV</b>	<p>Food Security and Livelihoods in Emergencies</p> <p>Strategies for food security and livelihood support - Importance of water, sanitation, and hygiene (WASH) in nutrition. Coordination and collaboration with humanitarian organizations. Overview of international guidelines (Sphere standards, WHO, UNICEF). Ethical considerations and cultural sensitivity in emergency nutrition.</p>	<b>8</b>
<b>Unit</b>	<p><b>Practical</b></p> <ol style="list-style-type: none"> <li>1. Techniques of nutritional assessment.</li> <li>2. Conducting a mock rapid nutrition assessment using assessment tools and data collection techniques</li> <li>3. Practice in anthropometric measurements (weight, height, MUAC)</li> <li>4. Calculating and interpreting nutritional indicators (BMI, z-scores)</li> <li>5. Developing a plan for a general food distribution program</li> <li>6. Planning supplementary and therapeutic feeding programs</li> <li>7. Analyzing case studies of past emergencies</li> <li>8. Discussing challenges and solutions in implementing nutrition programs</li> <li>9. Role-playing scenarios in emergency response coordination</li> <li>10. Communication strategies with affected populations and stakeholders</li> <li>11. Creating culturally appropriate nutrition education materials for emergencies</li> <li>12. Designing public awareness campaigns on nutrition and hygiene</li> </ol>	<b>Credit Hours</b> <b>30</b>

## BND 706 Applied Dietetics/Internship Project

CL	CP	L	P
0	4	0	120

### Focus areas, impact, and outcomes :

#### Basic research:

Basic research focusing on the bioavailability of nutrients, understanding Indigenous foods, and nutrient-gene interactions to improve the food supply for better health and improved individualized nutritional recommendations.

#### Outcomes:

Collaborations with Central Food Technological Research Institute (CFTRI), National Institute of Nutrition (NIN), and other Institutes of the country that have produced novel functional foods and supplements.

#### Applied research:

Applied research in appetite and satiety mechanisms exploring how people can be more successful in maintaining a healthy body weight. To engage with Sports Authority of India (SAI) to explore the influence of diet and fluid interventions on athlete participation, well-being, performance etc

#### Outcomes:

To well-being and performance of sports person by nutritional intervention will be enhanced

#### Clinical nutrition research:

Application of innovative approaches to prevent, manage, and cure diet-related diseases and medical conditions.

#### Outcomes:

The development and implementation of innovative evidence-based practice will improve the nutritional status of the population across the lifecycle.

## Semester VIII

### BND 801 Internship in Hospital /Experiential Learning (6 months)

Name of the program	Bachelor of Nutrition and Dietetics (Honours)
Course Title	Internship
Academic year	Fourth year /VIII Semester
Semester	VIII Semester
Number of Credits	14
Course Prerequisite	Students should know and possess skills in planning and demonstrating the therapeutic diet for the required.
Course Synopsis	This module provides students with an opportunity to integrate and apply acquired knowledge and technical skills in actual clinical settings.

## Internship Guidelines

The aim is to enable all Bachelors in Nutrition and Dietetics (Honors) students to be licensed to practice as professionals in Nutrition and Dietetics.

Expected Competencies:

### Key competencies

Expected Key competencies expected include:

- I. Ability to identify patients that require nutrition assessment.
- II. Ability to use the nutrition assessment tools available.
- III. Have the technical practice of medical nutrition.

### General competencies

General competencies expected include:

- I. Communication and listening skills.
- II. Nutrition counseling.
- III. Identifying, and evaluating medical family genetic history, social information, nutritional, and medication history. Physical information and laboratory data.
- IV. Accurate measurement and recording of the anthropometric measures using appropriate
- V. equipment/tools in accordance with the available Standard Operating Procedures (SOPs).
- VI. Interpretation and application of the biochemical measures.
- VII. Nutrition physical and assessment skills.
- VIII. Counselling skills.
- IX. Have good interpersonal relationships; team player.
- X. Organizing, planning, and coordinating skills.
- XI. Training skills.
- XII. Skills in research methodology, data analysis, and interpretation.
- XIII. Development of Information, education and Communication (IEC) materials.
- XIV. Documentation and report writing skills.
- XV. Leadership skills.

### **Nutrition Screening**

Provides a mechanism to identify patients who would benefit from nutrition assessment

The intern is expected to:

- I. Screen patient/client to determine whether they are nutritionally compromised, or at nutrition risk.
- II. Assign a nutrition status or risk of malnutrition for each patient after completing the evaluation and assessment.
- III. Use assigned nutrition status or risk levels to prioritize nutritional interventions.

### **Anthropometric**

- I. The intern should be able to carry out all the anthropometric measurements such as:
- II. Weight.
- III. Height.
- IV. Mid Upper Arm Circumference (MUAC).
- V. Head circumferences.
- VI. Arm span, waist circumference, skin fold.
- VII. The intern should be able to analyze and interpret the measurements.
- VIII. Use the results to counsel and educate the client/patient.

### **Biochemical Assessment**

- I. The intern should be able to understand, interpret, and apply the results of the biochemical parameters in the nutritional management of diseases.
- II. The intern should also be able to assess vital signs; blood pressure, and random blood sugar.

### **Clinical Signs**

- I. The intern should be able to observe and identify signs and symptoms of nutritional deficiencies and apply them in the nutritional management of the condition.

### **Dietary Assessment**

The intern should be able to take dietary history using the standard tools.

- An intern should be able to assess:
- Taste change(s).
- Eating and feeding problems.

- Nausea.
- Vomiting.
- Diarrhoea.
- Constipation.
- Food intolerances, adverse reactions and/or allergies.
- Food-drug interactions.
- Unhealthy dietary behaviours.
- Eating disorders.
- Socioeconomic, religious, ethnic, and cultural background.
- Lifestyle practices

After the intern has gone through the above processes he/she should be able to interpret, analyze, and plan the nutrition intervention. They should be able to diagnose and plan dietary intervention.

### **Nutrition Therapy Process**

#### **The Clinical Nutritionist**

- Participates with other healthcare team members and the patient in planning and implementing suitable diet therapy intervention(s) through the exchange of information and education.
- Actively participates in interdisciplinary team meetings, ward rounds, discharge planning conferences, peer reviews, performance improvement activities, and other relevant activities to monitor and share findings and recommendations with team members.
- Educates the interdisciplinary team members on the role of nutrition in health and disease and the role of the clinical dietician in giving nutrition guidance.
- Provides consultation and training to other appropriate health care programs and services.
- Initiates or participates in nutrition research.

### **Nutrition Counselling**

- The Clinical Nutritionist initiates nutrition counseling consistent with the patient's current diet or nutrition therapy needs, recording intervention, and counseling in the medical record.
- These include the patient's level of comprehension and the clinician's assessment of the patient's readiness to learn, expected compliance, and identification of respective barriers.
- Provides nutrition counseling to patients when food-drug interaction significantly alters the patient's food selection.
- Evaluate and document progress toward desired outcomes and/or goals.
- Initiates health maintenance nutrition education.
- Evaluates and implements alternate method(s) or system(s) for nutrition education, as appropriate.
- Monitors, evaluates, and documents individualized nutrition therapy plans.
- Refers or schedules patients for follow-up in the Out Patient Nutrition Clinic or inpatient and outpatient group education activities
- Evaluate educational materials for content, reading level, and other pertinent factors.
- Employs application of technology in nutrition intervention, when appropriate.
- Documents findings utilizing established practice guidelines and quality improvement and assessment indicators.

### **Nutrition Education**

- Conduct nutrition education sessions as an essential component of medical nutrition therapy and services helping individuals establish and maintain healthy lifestyles, good food habits, and attitudes.

### **Interdisciplinary Care Team Planning**

- Be an active member of the interdisciplinary care planning team so that medical nutrition therapy is integrated into the patient's care plans as needed.

### **Working within multidisciplinary healthcare teams**

- Teamwork and collaboration are central to modern healthcare delivery. By working alongside physicians, nurses, therapists, and other healthcare professionals, dietitians leverage their specialized knowledge to create integrated care plans tailored to each patient's unique needs.
- Examples of collaboration:
  - Dietitians and physicians: Develop nutrition plans for chronic conditions or recovery.
  - Dietitians and nurses: Monitor dietary intake and assess nutritional needs.
  - Dietitians and therapists: Address the nutritional aspects of mental health, eating disorders, and other complex needs.

### **Support of Patient Care Programmes**

Programs and services with a nutrition component are supported by a Clinical Nutritionist. These include, but are not limited to:

- Outpatient Clinics/Department.
- Trauma and Emergency.
- Long-Term Patients.
- Primary Health Care Centres.
- Specialized units and Clinics e.g. ICU & HDU, Diabetes, Renal Unit, burns unit, oncology, and others.

### **Course Outcomes**

Select a writing practice from the acquired skills as a clinical nutritionist and Dietitian

Demonstrate an attitude of professionalism when working with colleagues and other health professional staff of the hospital

Utilize skills in record keeping, organizing Material, Presentation of case studies and Effective communication.

Analyse and develop the ability to work independently and as a team member to perform critical thinking and problem-solving skills in different domains.

Design, evaluate, and implement new methods or protocols in different cases.

Evaluate the relationship between nutrition data and pathologic process, and how nutrition data relates to health and disease.

Develop the ability to work independently and as a team member to perform critical thinking and problem-solving skills in different domains.

## Supervised Practice Work

Content	Competencies
<b>Department Orientation</b>	<p>Define the role of dietitian in hospitals</p> <p>Outline the functioning of the dietary department in a hospital and learn about its working schedules and plans.</p> <p>List and summarize the knowledge about the maintenance of the patient's case file and how the details are entered/registered in it.</p>
<b>Food Service Area</b>	<p>Interpret the therapeutic and normal diet settings in the kitchen</p> <p>Interpret acquiring skills in food procurement quality maintenance and patient food service</p> <p>Acquire skills in :</p> <ul style="list-style-type: none"> <li>• Menu system</li> <li>• Personnel management</li> <li>• Food supply, procurement, and control</li> <li>• Food production</li> <li>• Foodservice distribution</li> <li>• Financial management</li> </ul>
<b>Medicine (3 cases)</b>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counseling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>

<p><b>Nephrology and Urology</b></p> <p><b>(3 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counseling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Cardiology</b></p> <p><b>(3 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counseling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Gastroenterology</b></p> <p><b>(3cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>

<p><b>Oncology</b></p> <p><b>(2 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Neurology</b></p> <p><b>(3 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Obstetrics gynaecology</b></p> <p><b>(2cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>

<p><b>Paediatrics</b></p> <p><b>(2 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Surgery</b></p> <p><b>(2cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</li> </ul>
<p><b>Intensive care unit</b></p> <p><b>(3 cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</li> </ul>

<p><b>Multi- speciality clinics(1case)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</li> </ul>
<p><b>Psychiatry/Rehabilitation (2cases)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</li> </ul>
<p><b>Dialysis (1case)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate the assessment of nutritional status among patients.</li> <li>• Interpret and apply dietary interventions in disease condition of the patients.</li> <li>• Explain and develop the dietary counselling given to the patients.</li> <li>• Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</li> </ul>

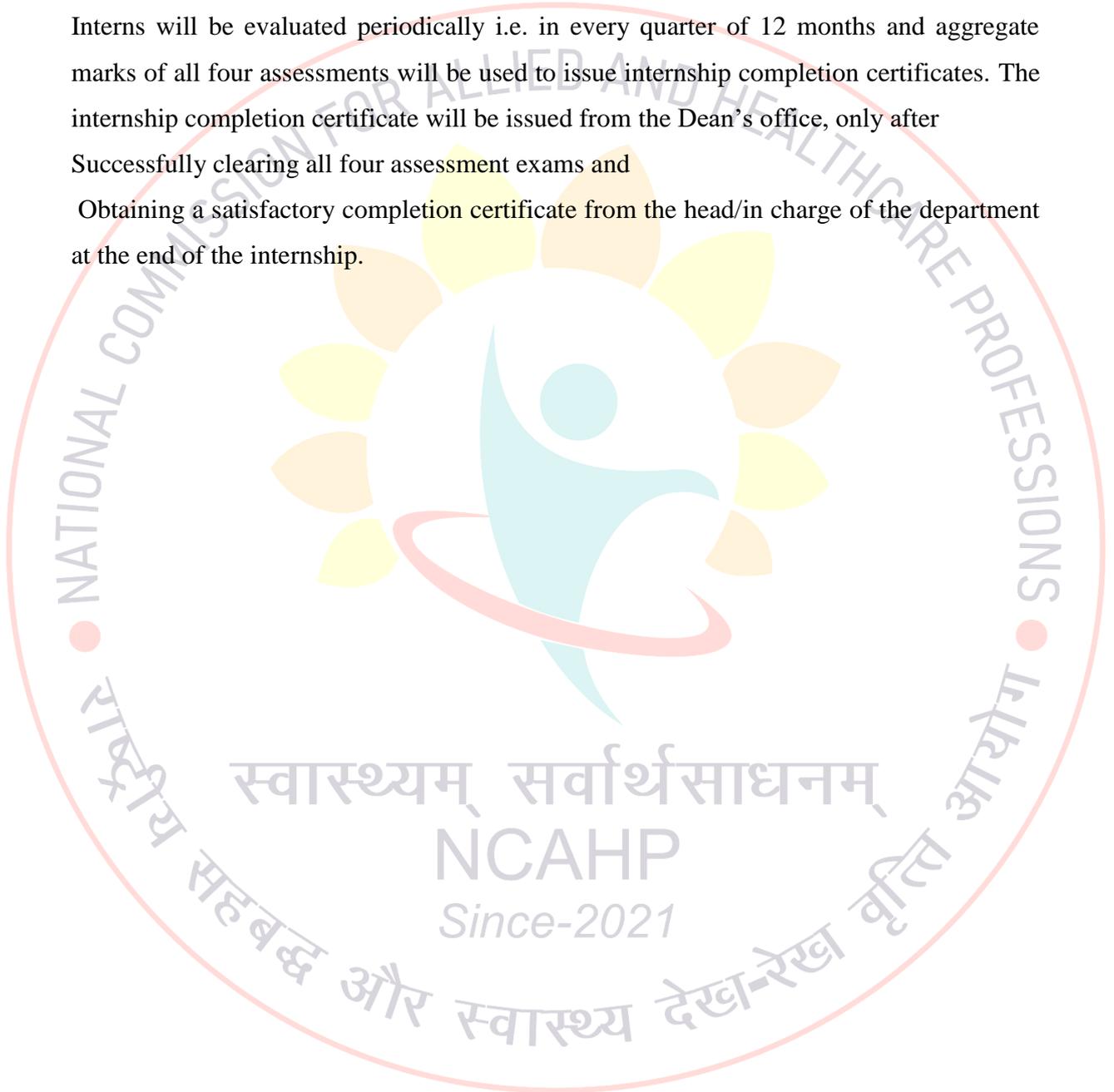
**Learning Strategies:** Small group discussion (SGD), Problem-Based Learning (PBL), Case Based Learning (CBL), Clinics, seminars.

**Formative Assessment:** Quiz, Viva, Clinical assessment (OSCE, OSPE, WBPA), Clinical Log Book

Interns will be evaluated periodically i.e. in every quarter of 12 months and aggregate marks of all four assessments will be used to issue internship completion certificates. The internship completion certificate will be issued from the Dean's office, only after

Successfully clearing all four assessment exams and

Obtaining a satisfactory completion certificate from the head/in charge of the department at the end of the internship.



## BND 802 Research and Trends in Nutrition and Dietetics

CL	CP	L	P
0	4	0	120

<b>Semester</b>	<b>VIII</b>
<b>Course Name</b>	<b>BND 802 Research and Trends in Nutrition and Dietetics</b>
<b>Course Description</b>	This course will provide an introduction to the research process, responsible conduct in research, and explore major types of study design in nutrition. Students will examine the literature to evaluate evidence about nutrition problems and interventions. Students will search and exchange the information from journals, books and reports for exchange of ideas in issues related to Nutrition and Dietetics.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To develop understanding regarding the principles of research design, methodology, and analysis</li> <li>2. To develop responsible conduct in research, including ethical considerations and plagiarism avoidance</li> <li>3. To developing critical thinking and problem-solving skills to approach complex nutrition-related issues</li> <li>4. To communicate scientific information to various audiences</li> </ol>

<b>Reference Books</b>	<p>Vegrove JA., Hodson L., Sharma S. and Lanham-New SA. (2015). Nutrition Research Methodologies (The Nutrition Society Textbook). Wiley-Blackwell; 1st edition. Starks TP. (2006). Trends in Nutrition Research. Nova Science Publishers Inc 1st edition. Pounis G. (2018). Analysis in Nutrition Research: Principles of Statistical Methodology and Interpretation of the Results. Academic Press Inc. Nelson M. (2020). Statistics in Nutrition and Dietetics. Wiley-Blackwell Chrzan J. and Brett J.(2017). Research methods for anthropological studies of food and nutrition. Berghahn Books Sreelathak NT. and Sreelatha K. (2021) Research ethics and plagiarism. Ess Ess Pubns.</p>	
<b>Prerequisites</b>	Completion of 6th Semester	
<b>Course Plan</b>		
<b>Unit</b>	<b>Practical</b>	<b>Credit Hours</b>
<b>I</b>	<p>Research Process and Responsible Conduct</p> <ul style="list-style-type: none"> <li>Principles of research design, methodology, and analysis</li> <li>Ethical considerations for research studies and concept, factors and solutions related to plagiarism</li> <li>Identification of complex nutrition-related issues</li> </ul>	<b>30</b>
<b>II</b>	<p>Study Design and Evaluating Evidence in Nutrition</p> <ul style="list-style-type: none"> <li>Different types of study designs, such as observational studies, experimental studies, and quasi-experiments etc.</li> </ul>	<b>30</b>

	<ul style="list-style-type: none"> <li>• Strengths and limitations of each design</li> <li>• Quality evaluation of research studies</li> <li>• Reviewing the literature on nutrition-related topics</li> <li>• Analysis and interpretation of the findings of research studies</li> </ul>	
<b>III</b>	<p>Literacy skills to search relevant and reliable sources</p> <ul style="list-style-type: none"> <li>• Reliable databases, journals, and other sources to locate scientific evidences and information</li> <li>• Evaluation of the credibility and reliability of information sources</li> </ul>	<b>30</b>
<b>IV</b>	<p>Knowledge translation to various audiences</p> <ul style="list-style-type: none"> <li>• Principles of knowledge translation</li> <li>• Group discussion on perspectives related to nutrition-related issues with peers</li> </ul>	<b>30</b>



### BND 803 Scientific Writing in Nutrition and Dietetics

CL	CP	L	P
0	2	0	60

<b>Semester</b>	<b>VIII</b>
<b>Course Name</b>	<b>BND 803 Scientific Writing in Nutrition and Dietetics</b>
<b>Course Description</b>	<p>This course will provide students with the skills and knowledge necessary to effectively communicate scientific information related to nutrition and dietetics through written reports, articles, and other forms of scientific writing. Students will learn to identify and critically evaluate research studies, write clear and concise abstracts, introduction sections, methods, results, discussions, and conclusions, as well as prepare tables, figures, and references. The course will also cover strategies for editing and revising scientific writing, as well as strategies for communicating scientific information to various audiences.</p>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To identify the importance of scientific writing in nutrition and dietetics</li> <li>2. To critically evaluate and interpret research studies in nutrition and dietetics</li> <li>3. To write a clear and concise manuscript</li> <li>4. To develop presentation and communication skills to effectively present a research paper at scientific forum</li> </ol>

<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• Heard SB. (2016). The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career. Princeton University Press.</li> <li>• Wheatley D. (2021) Scientific Writing And Publishing. Cambridge University Press.</li> <li>• Prasann K. and Bharti PK. (2020) Scientific writing and research quality. Discovery Publishing House.</li> <li>• Pounis G. (2018). Analysis in Nutrition Research: Principles of Statistical Methodology and Interpretation of the Results. Academic Press Inc.</li> <li>• Nelson M. (2020). Statistics in Nutrition and Dietetics. Wiley-Blackwell</li> <li>• Sreelathak NT. and Sreelatha K. (2021) Research ethics and plagiarism. Ess Ess Pubns.</li> </ul>	
<b>Prerequisites</b>	Completion of 6th Semester	
<b>Course Plan</b>		
<b>Unit</b>	<b>Practical</b>	<b>Credit Hours</b>
<b>1.</b>	Introduction to Scientific Writing 1. Overview of scientific writing in nutrition and dietetics 2. Importance of clear communication in science 3. Types of scientific writing (e.g., research articles, review articles, case reports)	. <b>30</b>
<b>2.</b>	Research Study Evaluation 1. Identifying key components of a research study e.g., background, objectives, methods, results, conclusions 2. Critically evaluating research studies e.g., study design, population selection, data analysis	<b>30</b>

<p><b>3.</b></p>	<p><b>Writing a Clear and Concise Scientific Manuscript</b></p> <ol style="list-style-type: none"> <li>1. Abstract and introduction section including background information, research question</li> <li>2. Methodology comprising appropriate study design, participant recruitment models</li> <li>3. Results covering effective data presentation</li> <li>4. Discussion describing implications of findings</li> <li>5. Conclusion including summary of findings</li> <li>6. Preparing effective tables, figures, and correct references</li> <li>7. Strategies for editing scientific writing e.g., grammar, syntax, clarity and concision</li> </ol>	<p><b>30</b></p>
<p><b>4.</b></p>	<p><b>Presentation and communication skills for scientific forum</b></p> <ol style="list-style-type: none"> <li>1. Synthesis, interpretation, and communication of research results for professional audiences</li> <li>2. Oral and poster presentations</li> </ol>	<p><b>30</b></p>



## 4.2 Masters in Nutrition and Dietetics

### Eligibility for admission:

Bachelor of Nutrition and Dietetics in Honours or equivalent from a recognised university with a minimum 5.5 CGPA

### Duration of the course

The Masters in Nutrition and Dietetics is of two years duration.

Duration of the course: 2 years or 4 semesters.

Total hours –**1725 Hours**

### Medium of instruction:

English shall be the medium of instruction for all the subjects of study and examination.

### Attendance:

A candidate has to secure a minimum

1. 75% attendance in theoretical
2. 80% in Skills training (practical) for qualifying to appear for the final examination.

### Credit details:

1 hour lecture per week - 1 credit

2 hours of tutorials per week - 1 credit

2 hours of clinics per week - 1 credit

## Curriculum Outline

### Masters in Nutrition and Dietetics

[2 years program]

#### Proposed Scheme

Year	Semester	Hours
1	1	345
1	2	420
2	3	660
2	4	300
<b>Total</b>		<b>1725</b>

#### Credit details:

One credit implies one hour of lecture per week two hours of laboratory/practical per week or two hours of

clinics per week or two hours of Research projects per week

A semester is considered to have 15 weeks. For example,

1 credit course = 15 hours of lectures per semester

3 credits course = 45 hours of lectures per semester

0.5 credit course = 15 hours of practical/laboratory.

CL	CP	L	P
1	1	15	60

**CL: Credit for Lecture**

**CP: Credit for Practical**

**L: Hours for Lecture**

**P: Hours for Practical**

## Curriculum Outline

### First Semester

SI.no	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
MND 101	Advanced Human Nutrition and Metabolism	4	0	4	60	0	60
MND 102	Advanced Pathophysiology and Clinical Biochemistry	4	0	4	60	0	60
MND 103	Preventive & Therapeutic Dietetics	3	1	4	45	30	75
MND 104	Research Methodology for Dietetics and Public Health	4	0	4	60	0	60
MND 105	Biostatistics	2	2	4	30	60	90
<b>TOTAL</b>		<b>17</b>	<b>3</b>	<b>20</b>	<b>255</b>	<b>90</b>	<b>345</b>

## Second Semester

SI.no	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
MND 201	Nutrition Assessment Methods & Applications for Dietitians	2	2	4	30	60	90
MND 202	Advances in Enteral and Parenteral Nutrition	2	2	4	30	60	90
MND 203	Advances in Public Health Nutrition	3	1	4	45	30	75
MND 204	Nutrition and Immunity	2	0	2	30	0	30
MND 205	Innovation in Food product development	1	3	4	15	90	105
MND 206	Scientific writing skills	2	0	2	30	0	30
<b>TOTAL</b>		<b>12</b>	<b>8</b>	<b>20</b>	<b>180</b>	<b>240</b>	<b>420</b>

### Third Semester

Sl.no.	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
MND 301	Intellectual Property Rights	2	0	4	30	0	30
MND 302	Precision Nutrition	4	0	4	60	0	60
MND 303	Institutional Food Service Management and Quantity Cookery	1	5	6	15	150	165
MND 304	Advanced Communication Skills for Nutrition Practice	1	3	4	15	90	105
MND 305	Internship	0	10	10	0	300	300
<b>TOTAL</b>		<b>08</b>	<b>18</b>	<b>20</b>	<b>120</b>	<b>540</b>	<b>660</b>

#### Fourth Semester

Sl.no.	Course Titles	Credits			Hours /Semester (15 weeks)		
		Theory	Practical	Total	Theory	Practical	Total
MND 401	Dissertation	0	20	20	0	600	600
<b>TOTAL</b>		<b>0</b>	<b>10</b>	<b>10</b>	<b>0</b>	<b>600</b>	<b>600</b>



## First Semester

### MND 101 Advanced Human Nutrition and Metabolism

CL	CP	L	P
4	0	60	0

<b>Semester</b>	I
<b>Course Name</b>	<b>MND 101 Advanced Human Nutrition and Metabolism</b>
<b>Course Description</b>	Proper nutrition is the crux of human health along with safe water, sanitation, immunization etc. Adequate knowledge about this core course on macro and micronutrients in totality will enable the students to handle a population's nutrition situations and how to apply the knowledge for sustainable handling to induce better health and productivity.
<b>Objectives</b>	To provide in-depth understanding related to macro and micronutrients
	To impart knowledge about specific requirements of these nutrients as per age, sex, and physiological conditions for meaningful handling of normal and disease situations.
	To gain detailed knowledge of the digestion, absorption and metabolism of carbohydrates, protein, fat, vitamins and minerals, as well as energy balance and metabolism.
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Wildman REC and Medeiros DM (2000) <i>Advanced Human Nutrition</i>. CRC Press, Boca Raton, Florida.</li> <li>2. Bamji MS, Rao NP and Reddy V (2003) <i>Textbook of Human Nutrition</i>. 2<sup>nd</sup> Edition, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.</li> <li>3. Eastwood MA (1997) <i>Principles of Human Nutrition</i>. London ; Chapman &amp; Hall.</li> </ol>

4. FAO (2004) *Human Energy Requirements -Report of a Joint FAO/WHO/UNU Expert Consultation*. Technical Report Series 1. Food and Agriculture Organization, Geneva.
5. FAO (2007) *Protein and Amino Acid Requirements - Report of a Joint FAO/WHO/UNU Expert Consultation*. Technical Report Series 1. Food and Agriculture Organization, Rome.
6. Berdanier, CD and Zempleni, J (2009) *Advanced Nutrition: Macronutrients, Micronutrients and Metabolism*. CRC Press, New York.
7. Groff J L and Gropper S (2012) *Advanced Nutrition and Human Metabolism*. 7<sup>th</sup> Edition, Yolanda Cossio, New York.
8. Summathi S (2017) *Food Chemistry and Nutrition*. BS Publication, Hyderabad.
9. Ross A C, Caballero B, Cousins RJ, Tucker KL and Ziegler TR (2012) *Modern Nutrition in Health and Disease*. 11<sup>th</sup> Edition, LWW, Philadelphia.
10. Whitney EN & Rolfels CR (2019) *Understanding Nutrition*. 15<sup>th</sup> Ed., West Publishing Company, USA.
11. Stipanuk MH and Caudill MA (2013) *Biochemical, Physiological and Molecular Aspects of Human Nutrition*. 3<sup>rd</sup> Edition, Elsevier Pub.
12. <https://www.nutritionintl.org>
13. <https://www.who.int>
14. <https://www.hsph.harvard.edu/nutritionsource>
15. <http://www.nin.res.in>

**Prerequisites: Bachelor of Nutrition and Dietetics (Honors) (4-year program)**

<b>Course Plan</b>		
<b>Unit</b>	<b>Practical topics</b>	<b>Credit hours</b>
<b>1.</b>	<p>Carbohydrates</p> <p>Structural features, types, functions, sources, requirements, of carbohydrates; chemistry and characteristics of dietary and functional fibers, role of dietary fibre; resistant starch and fructo-oligosaccharides in various physiological disorders; Glycemic response to carbohydrates; digestion, absorption, transport, and distribution of carbohydrates.</p>	<b>13</b>
<b>2.</b>	<p>Fats</p> <p>Structure and biological importance; digestion absorption, transport and storage; lipids, lipoproteins, and cardiovascular disease risk; integrated metabolism in tissues; regulation of lipid metabolism; brown fat thermogenesis; deficiency disorders of lipids and essential fatty acids; role of omega-3 and omega 6 fatty acids in physiological disorders.</p>	<b>13</b>
<b>3.</b>	<p>Proteins</p> <p>Functional categories; protein structure and organization; digestion and absorption; amino acid metabolism; protein turnover; synthesis and catabolism of tissue proteins; evaluation of protein quality; protein deficiency/malnutrition; body composition, energy balance.</p>	<b>14</b>

4.	<p>Regulatory nutrients and water</p> <p>Functions, absorption, requirement, sources, deficiency, toxicity, metabolism and excretion of fat-soluble vitamins - A, D, E and K and water-soluble vitamins- thiamine, riboflavin, niacin, pyridoxine, folate, B<sub>12</sub>, ascorbic acid, pantothenic acid and biotin; functions and mechanisms of action, digestion, absorption, transport, excretion, adequate intake, requirements, deficiency, toxicity of macro minerals - calcium and phosphorus and micro minerals – iron, zinc, sodium, copper, cobalt, selenium and chromium; water and electrolyte balance - functions and distribution of water in body; electrolyte composition of body fluids and electrolyte balance.</p>	20
----	---	----



## MND 102 Advanced Pathophysiology and Clinical Biochemistry

CL	CP	L	P
4	0	60	0

<b>Semester</b>	1
<b>Course Name</b>	<b>MND 102 Advanced Pathophysiology and Clinical Biochemistry</b>
<b>Course Description</b>	It is a course that integrates the advanced concepts of the pathophysiology of disease with clinical biochemistry.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To comprehend Normal Biochemistry, Disease Pathogenesis, Etiology, Clinical Signs &amp; Symptoms, Diagnostic Tests, and Complications of the healthy &amp; diseased conditions.</li> <li>2. To identify and understand the importance and use of diagnostic tests in the prognosis of disease processes.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Baynes, J., and Dominiczak. M. (2002). Medical Biochemistry. London : Mosby</li> <li>2. Thabrew, I. and Ayling. R.M. (2001). Biochemistry for Clinical Medicine. New Delhi: Replika Press Pvt Ltd.</li> <li>3. Guyton, A.C., and Hall. J.E. (1996). Textbook of Medical Physiology (9thed.). Bangalore: Prism Books Pvt. Ltd.</li> <li>4. Cotran, R.S., Kumar, V., Robbins, S.L., and Schoen.F.J. (Ed.). (1994). Robbins Pathologic Basis of Disease (5thed.). Bangalore: Prism Books Pvt Ltd.</li> <li>5. Devlin, T.M. (2002). (Ed.). Textbook of Biochemistry with Clinical Correlations.(5thed.). New York: Wiley-Liss.</li> </ol>
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics (Honors) (4-year program)

Course Plan	
THEORY	Hours
<p><b>UNIT ONE</b></p> <p>Disorders of the Cardiovascular system: Disorders of rhythm --- Brady arrhythmias – Dysfunction of the SA and AV nodes --- Tachyarrhythmias</p> <p>Disorders of the heart --- Congestive heart failure --- Ischemic Heart disease (MI, Angina, Sudden cardiac death).--- Valvular heart disease –Rheumatic Heart Diseases -- Myocardial heart disease, Primary (essential) and secondary hypertension --- pathogenesis and risk factors --- effects of Hypertension on the heart, kidney, and brain.</p> <p>Introduction to other heart diseases: cardiomyopathies and congenital HD</p> <p>Atherosclerosis and other forms of Arteriosclerosis --- pathogenesis and risk factors</p> <p>Disorders of lipoprotein metabolism Cardiac Function tests</p> <p>Disorders of the respiratory system:</p> <p>General characteristics of respiratory disorders</p> <p>Classification of respiratory disorders</p> <p>Upper and lower respiratory tract infections: common cold, influenza, pneumonia</p> <p>Obstructive respiratory disorders: Bronchial asthma, bronchitis, emphysema</p> <p>Restrictive respiratory disorders: Pneumothorax, Atelectasis</p> <p>COPD, ARDS</p> <p>Respiratory failure</p> <p>Bronchiectasis --- Cystic Fibrosis --- Disorders of the pleura and the diaphragm</p> <p>Pulmonary Function Tests</p> <p>Neoplasia:</p> <p>Definition --- Tumors --- Benign and Malignant --- Characteristics</p> <p>Molecular basis of Cancers --- Oncogenes --- Activation --- Tumor Suppressor Genes</p> <p>Chemical carcinogenesis – stages</p>	<p><b>30</b></p>

<p>Radiation carcinogenesis</p> <p>Viral carcinogenesis</p> <p>Clinical features of cancers</p> <p>Host cell defenses</p> <p>Grading of tumors</p> <p>Diagnosis of cancers -- histologic and molecular methods -- Tumor markers</p>	
<p><b>UNIT TWO</b></p> <p>Disorders of the Kidney and the urinary tract</p> <p>Clinical Manifestations of renal diseases (overview)</p> <p>Types, pathogenesis and clinical manifestations of</p> <p>Glomerular diseases: glomerulonephritis, nephrosis, nephritic syndrome</p> <p>Diseases affecting the tubules and interstitium ---Pyelonephritis</p> <p>Diseases of the blood vessels --- Nephrosclerosis</p> <p>Urolithiasis</p> <p>Acute and chronic renal failure</p> <p>Voiding dysfunction, Incontinence, fluid-electrolyte balance,</p> <p>Renal function test</p> <p>Disorders of the GI tract:</p> <p>Pathogenesis and clinical manifestations of</p> <p>GERD and bile reflux- H. hernia</p> <p>Esophagitis</p> <p>Gastritis- peptic ulcer</p> <p>Vascular disease- Ischemic Bowel disease, haemorrhoids</p> <p>Enterocolitis- diarrhoea, dysentery</p> <p>Constipation</p> <p>Malabsorption syndromes-celiac sprue, Bacterial overgrowth syndrome and IIBD</p> <p>Colonic diverticulosis</p> <p>Gastric Function tests</p> <p>Liver disorders:</p> <p>Jaundice- abnormalities of bilirubin metabolism</p> <p>Morphology and patterns of hepatic Injury- Necrosis, degeneration and Inflammation, regeneration and fibrosis</p>	<p><b>30</b></p>

Inflammatory disease- viral hepatitis

Cirrhosis- etiology, alcohol and organ damage, Portal hypertension, ascites, splenomegaly, Hepatic failure

Hepatic encephalopathy

pathogenesis and features

Cholelithiasis- pathogenesis and manifestations of cholesterol and pigment stones

Cholestasis- Cholecystitis

Pancreatitis- chronic and acute

Liver function tests.

F). Disorders of the Endocrine system:

Diseases of the thyroid ---hypo and hyperthyroidism --diagnostic tests

Diabetes Mellitus- types, pathogenesis- metabolic derangements and metabolic alterations.

Complications of DM- Micro and macroangiopathy, neuropathy, nephropathy, retinopathy, diabetic foot

Diagnostic tests

G) . Disorders of Reproductive system:

Etiology, Pathogenesis, clinical manifestations, diagnosis and treatment of – Endometriosis, PCOS and STDs



### MND 103 Preventive and Therapeutic Dietetics

CL	CP	L	P
3	1	45	30

<b>Semester</b>	<b>I</b>
<b>Course Name</b>	<b>MND 103 Preventive and Therapeutic Dietetics (Theory and Practical )</b>
<b>Course Description</b>	It is a course that details the application of preventive and therapeutic Dietetics .
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Relate the physiologic role of specific nutrient &amp; non nutrient components of food in relation to various organ systems.</li> <li>2. Explain the mechanisms of disease management process and correlate it with the principles of medical nutrition therapy</li> <li>3. Interpret therapeutic principles in clinical settings to develop dietary interventions.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Racz B., Duskova M., Starka L., Hainer V., Kunesova M. Links between the circadian rhythm, obesity and the microbiome. <i>Physiol. Res.</i> 2018;67:S409–S420.</li> <li>2. Ceschia A, Horton R. Maternal health: time for a radical reappraisal. <i>The Lancet.</i> 2016;388(10056):2064–6.</li> <li>3. Wei M, Ho E, Hegde P. Wei M, et al. An overview of percutaneous endoscopic gastrostomy tube placement in the intensive care unit. <i>J Thorac Dis.</i> 2021 Aug;13(8):5277-5296.</li> <li>4. Preventive Nutrition – The Comprehensive Guide for Health Professionals (2005) ;3rd Edition; Edited by Andrienne Bendich, Richard J. Deckelbaum Human Press Inc., New Jersey.</li> </ol>

	<p>5. Nutrition Support for the critically ill patient – A Guide to Practice (2005); Edited by GAIL CRESCI Taylor and Francis London, CRC press, USA.</p> <p>6. Dietary Fiber in Human Nutrition (2001); 3rd Edition ; Edited by Gene A. Spiller CRC press, USA.</p> <p>7. Handbook of Nutrition and Food (2002); Edited by Carolyn D. Berdanier, CRC press, USA</p>
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics (Honors) (4-year program)
<b>Course Plan</b>	
<b>THEORY</b>	<b>Hours</b>
<p><b>UNIT ONE</b></p> <p>Role of macronutrients and micronutrients in therapeutic conditions</p> <p>Carbohydrates: Types, Mode of Action &amp; preventive use and therapeutic use in specific disease, Proteins: Types &amp; Role of specific amino acids- preventive and therapeutic uses in various disease states, Lipids: Types (regular/structured), Mode of action preventive and therapeutic and use in specific disease. Vitamins and Minerals: Its application in various disease conditions. Dietary fiber and Water, Its application in various disease conditions.</p> <p>The Immune &amp; Inflammatory System, Introduction to the immune system. Nutrients that affect immune function &amp; their assessment. Role of cytokines in therapeutic conditions</p> <p>Chrono nutrition and chronic diseases: Introduction to Chrono nutrition, Food timings, circadian rhythm and Chrono nutrition</p> <p>Fundamentals of nutrition therapy : - Feeding techniques, types of therapeutic diets</p> <p>Guidelines for nutrition therapy- hypometabolic starved patient &amp; hypermetabolic stressed patient.</p> <p>Critical Care Illness &amp; Conditions requiring intensive care:</p> <p>Definition- Critical Illness &amp; Conditions requiring intensive care, Goals of Nutrition Support in critically ill. Brief about Enteral Nutrition Support</p>	<b>20</b>

Burns: Definition: Burns, Types of Burns, Degree of Burns, Assessment of Burn Surface Area, Systemic Response to Burns on different organ system.

Diabetes (Type 1, Type 2, Gestational, Nephropathy and other complications.)

Obesity in different grades and age groups

Inborn Errors Of Metabolism

Phenylketonuria, glycogen storage disease, Galactosemia.

## UNIT TWO

Respiratory (Pulmonary) Disorders:

Normal respiration mechanism: a brief overview of different types of ventilation

MNT Goals & Principles, Acute Exacerbation MNT, Chronic condition MNT

Immunonutrition

Gastrointestinal disorders: Gastritis, GERD, diverticular diseases, gastric surgeries.

Liver disorders: Cirrhosis of the liver, hepatic encephalopathy, Liver transplant, Gall bladder disease, Pancreatitis (acute, chronic). Metabolic liver diseases- NAFLD, hemochromatosis. Disorders of the heart, Primary (essential) and secondary hypertension

Cardiovascular disorders: Disorders of the heart, Primary (essential) and secondary hypertension

Renal Disorders: Acute renal failure, Nephrotic syndrome, Chronic kidney disease, renal replacement therapy, renal transplant

Metabolic: Diabetes (Type 1, Type 2, Gestational, Nephropathy and other complications.)

Obesity in different grades and age groups

Diabetes (Type 1, Type 2, Gestational, Nephropathy and other complications.)

Obesity in different grades and age groups

Inborn Errors Of Metabolism, Phenylketonuria, glycogen storage disease, Galactosemia.

25

## PRACTICAL

30

A) Estimation of nutrient requirements- Energy, Carbohydrates, Protein etc. ,  
Disease specific dietary planning & interpretation of case studies

- Cardiovascular Disease-
- Diabetes
- Obesity
- Inborn Errors Of Metabolism

B) I. Standardizing general high calorie high protein recipes.

2. Standardizing general low calorie recipes
3. Standardizing recipes based on different nutrient needs
4. Counseling Techniques and mock sessions

C) Estimation of nutrient requirements-

Critical Care

Burns (different Types & Degrees)

Cancer (dietary guidelines for different cancers & therapies)

Surgery (associated to different disease states)

D) 1. Disease-specific dietary planning & interpretation of case studies and presentations in Gastrointestinal diseases-

2. Disease-specific dietary planning & interpretation of case studies and presentations in Liver disorders

3. Disease-specific dietary planning & interpretation of case studies and presentations in Renal Disorders

4. Disease-specific dietary planning & interpretation of case studies and presentations in Pulmonary Disease

E) 1. Review & Case study presentations for therapeutic conditions

2. Review of nutrient drug interactions

3. classes for small sample case study presentations by students

## MND 104 Research Methodology for Dietetics and Public Health

CL	CP	L	P
4	0	60	0

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	MND 104 Research Methodology for Dietetics and Public Health
<b>Course Description</b>	<p>This course provides students with a comprehensive understanding of research methodology in dietetics and public health with hands-on practical aspects in epidemiology, study design, statistics, body composition, physical activity assessment and dietary intake measurements as well as experience in scientific writing and detailed reviews of peer reviewed scientific papers in dietetics and public health. This course covers various aspects of research methodology, including research design, data collection, data analysis, and interpretation as well as ethical issues in conducting research. This course will enable students to design, conduct, and evaluate research studies.</p>

<b>Objectives</b>	1. To understand the principles of research methodology in dietetics and public health
	2. To identify the types of research questions and designs appropriate for studies and to provide an understanding of the term epidemiological studies
	3. To introduce the important scientific concepts in study design, research protocol development and ethical issues in research
	4. To introduce different strategies and interpretation of research studies and provide an understanding of key statistical issues including sampling, study size and statistical power.
<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• McClean S. (2019) Research Methods for Public Health. Sage Publications.</li> <li>• Lovegrove JA., Hodson L., Sharma S. and Lanham-New SA. (2015). Nutrition Research Methodologies (The Nutrition Society Textbook). Wiley-Blackwell; 1st edition.</li> <li>• Susan B and Deepa H. (2012) Introduction To Epidemiologic Research Methods In Public Health Practice. Jones &amp; Bartlett</li> <li>• Nelson M. (2020). Statistics in Nutrition and Dietetics. Wiley-Blackwell</li> <li>• Sreelatha k NT. and Sreelatha K. (2021) Research ethics and plagiarism. Ess Ess Pubns.</li> </ul>
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics (Honors) (4-year program)

<b>Course Plan</b>		
<b>Unit</b>	<b>Practical</b>	<b>Credit Hours</b>
<b>1.</b>	Introduction to Research Methodology : Definition and importance of research methodology, Research process: problem formulation, hypothesis development, data collection, data analysis, and interpretation, Overview of research designs: descriptive, analytical, and experimental	<b>15</b>
<b>2.</b>	Epidemiological Studies and Research Design: Types of research designs: cross-sectional, longitudinal, quasi-experimental, randomized controlled trials, Factors to consider when selecting a research design, Case studies: examples of different research designs in dietetics and public health	<b>15</b>
<b>3.</b>	Data Collection Methods : Surveys: types, advantages, and limitations, Interviews: types, advantages, and limitations Observational studies: types, advantages, and limitations Case studies: examples of different data collection methods in dietetics and public health	<b>15</b>
<b>4.</b>	Statistical analysis: descriptive statistics, inferential statistics Data analysis software: examples of commonly used software (e.g., SPSS), Data visualization techniques: charts, graphs, tables	<b>15</b>
<b>5</b>	Ethical considerations in research: informed consent, confidentiality, deception, Reporting research results: introduction, methods, results, discussion, conclusions Case studies: examples of ethical dilemmas in dietetics and public health research	<b>15</b>

### MND 105 Biostatistics

CL	CP	L	P
2	2	30	60

<b>Semester</b>	<b>VI</b>
<b>Course Name</b>	<b>MND 105 Biostatistics</b>
<b>Course Description</b>	Biostatistics applies statistical methods to biological and health research. The course covers data collection, analysis, and interpretation, focusing on study design, probability, hypothesis testing, regression, and survival analysis. Students learn to use statistical software, analyze real-world datasets, and apply findings to public health and clinical decision-making.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand fundamental statistical concepts and biological and health research methodologies.</li> <li>• To develop skills in designing and conducting epidemiological and clinical studies.</li> <li>• To master data collection, management, and analysis techniques using statistical software.</li> <li>• To learn to apply probability and hypothesis testing to real-world biological data.</li> <li>• To analyze and interpret results from regression models and survival analysis.</li> <li>• To communicate statistical findings effectively to inform public health and clinical decisions.</li> </ul>

<b>Reference Books</b>	<ul style="list-style-type: none"> <li>• Smith, G. (1998). Introduction to statistical reasoning. (<i>No Title</i>).</li> <li>• Daniel, W. W. (1978). <i>Biostatistics: a foundation for analysis in the health sciences</i> (Vol. 129). Wiley.</li> <li>• Kothari, C. R. (2004). Research methodology.</li> <li>• Bhatnagar, O. P. (1990). <i>Research Methods and Measurements in Behavioural and Social Sciences</i>. Agricole Publishing Academy.</li> </ul>
------------------------	--



**Instructor in charge**

M.Sc. and / Ph.D. in Foods and Nutrition or equivalent

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Overview of concepts and definition in biostatistics, Various measurements and types of variables- indicators, Types of data – nominal, ordinal, interval, and ratio, Measures of central tendency and deviation: mean, median, mode, standard deviation, Z-score, Concepts of reliability and validity , Interpretation of research data	6
2.	Hypothesis and sampling: Types of hypothesis and examples for nutritional research, Sample size calculation- statistical procedures Errors in sampling- type 1 and type 2 errors, Consideration for sampling for statistical tests sample size, sample grouping	8
3.	Statistical test: Concept of bivariate and multivariate, Comparison of data set –examples for nutritional research, T-test, paired t-test, Karl Pearson, correlation coefficient test, and others, Chi-square test and other various types of test	8
4.	Statistical tests for multiple variables; F-test (ANOVA) Concept of regression analysis, line of regression, regression test Conducting statistical analysis and interpretation of data	8
	<b>PRACTICALS - Computer programs for data analysis</b>	
1.	Use of software in statistical analysis: Excel, SPSS, JASP, JAMOVI R, Any other software	20
2.	Qualitative data analysis: ATLAS.T1, N-VIVO	20
3.	Integrating quantitative and quantitative data	5
4.	Various ways of presenting data: tables, figures graphs, and flow charts	15

## Second Semester

### MND 201 Nutrition Assessment Methods & Applications for Dietitians

CL	CP	L	P
2	2	30	60

<b>Course Description</b>	The course shall enable the student to learn about the various methods of nutritional assessment and the skills to measure and interpret them.
<b>Objectives</b>	<p>This course will enable the students to</p> <ol style="list-style-type: none"> <li>1. Understand the nutritional assessment of patients</li> <li>2. Learn the skills to measure and interpret the various indicators and indices of nutritional assessment.</li> <li>3. Learn to design a nutritional assessment plan for subjects.</li> </ol>
<b>References</b>	<ol style="list-style-type: none"> <li>1. Mahan, L.K. and Escott-Stump, S. (2021): Krause's Food Nutrition and Nutrition Care Process, 16th Edition, Elsevier Pvt. Ltd. ISBN 032381025X</li> <li>2. Vir SC. Public Health Nutrition in Developing Countries Pt 1 and 2.(2011) Wood head publishing India PVT LTD, New Delhi. Cambridge, Oxford, Philadelphia.</li> <li>3. Sehgal S and Raghuvanshi Rita S Textbook of Community Nutrition. (2007) Indian Council of Agricultural Research, Published by: Directorate of Information and Publication of Agriculture, Indian Council of Agriculture Research, Krishi Anusandhan Bhavan, Pusa, New Delhi-110012</li> <li>4. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. ISBN 9788120417427</li> </ol>

	<p>5. Jeliffe DS. The Assessment of Nutritional status of the community, (1966) WHO Geneva</p> <p>6. Gopaldas T and Sheshadri S. Nutritional Monitoring and Assessment. (1987) Oxford University Press, New Delhi.</p> <p>7. Gibson R.S. Principles of Nutritional Assessment (2005) - 3rd edition. Oxford University Press</p>
Webliography	<p>1. Nutrition Screening Tools for Hospitalized Patients, Patricia S. Anthony MS, RD 2008, <a href="https://doi.org/10.1177/0884533608321130">https://doi.org/10.1177/0884533608321130</a></p> <p>2. Holmes CJ, Racette SB. The Utility of Body Composition Assessment in Nutrition and Clinical Practice: An Overview of Current Methodology. <i>Nutrients</i>. 2021; 13(8):2493. <a href="https://doi.org/10.3390/nu13082493">https://doi.org/10.3390/nu13082493</a></p>
Prerequisites	Bachelor of Nutrition and Dietetics (Honors) (4-year program)

Course Plan		
Theory		
Unit	Topic	Hours
1.	Nutritional Assessment in Clinical Practice – Introduction, relevance	3
2.	Body composition and cellular basis of growth, Significance, and methods used for measurement of body composition in nutrition. Common Biomarkers of Nutritional Status and Inflammation	12
3.	,Malnutrition Universal Screening Tool, Nutritional Risk Screening 2002, Mini Nutritional Assessment®, Short Nutritional Assessment Questionnaire©, Malnutrition Screening Tool, and the Subjective Global Assessment.	4

4.	Information Sources: Screening or referral form, Interview of patient or key social support, Medical or health records , Community- or organization-based surveys and focus groups, Health surveillance data, reports, research studies	3
5.	Comparison of Food and Nutrient Intake Assessment Methods	4
6.	Websites and Apps for Tracking Nutritional Intake and Physical Activity Data	4

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Using nutrition assessment tools to measure nutritional status in patients in hospital: MUST, MNA. SGA, WHO Steps for assessment of NCDs	15
2.	Assessment of Nutritional risk factor of elderly Using Mini Nutritional Assessment Cumulative Illness Rating Scale for Geriatrics	5
3.	Designing a nutritional assessment system for a group of patients in a hospital setting <ul style="list-style-type: none"> <li>● The assessment system used</li> <li>● Type and number of measure-ments selected</li> <li>● Indices and indicators derived from these measure-ments</li> <li>● Interpretation and application of the indicators</li> </ul>	20

<p>4.</p>	<p>Case Studies to assess the nutritional status of patients in hospital using various tools</p> <p>Simplified nutritional appetite questionnaire (SNAQ)</p> <p>patient-generated subjective global assessment (PGSGA)</p> <p>nutrition risk screening (NRS)</p> <p>malnutrition screening tool (MST)</p> <p>Nutritional Risk Index(NRI)</p> <p>Biomarkers</p> <p>i) Cancer</p> <p>ii) Chronic liver Disease</p> <p>iii) Diabetes</p> <p>iv) Cardiovascular/ CHD</p>	<p>20</p>
-----------	--	-----------



## MND 202 Advances in enteral and parenteral nutrition

CL	CP	L	P
2	2	30	60

### Instructor in charge

M.Sc. and / Ph.D. in Foods and Nutrition or equivalent

### Course Description

The course shall enable the student to learn about the role of enteral and parenteral nutrition in various disease and their complications.

### Objectives

This course will enable the students to understand:

### References

1. Ayers P, Bobo ES, Hurt RT, Mays AA, Worthington PH, eds.(2020) ASPEN Parenteral Nutrition Handbook, Third Edition. Silver Spring, MD: American Society for Parenteral and Enteral Nutrition; .ISBN **1889622419**
2. Mahan, L.K. and Escott-Stump, S. (2021): Krause's Food Nutrition and Nutrition Care Process, 16th Edition, Elsevier Pvt. Ltd.ISBN 032381025X
3. Subhal Bhalchandra Dixit (Author), Atul Prabhakar Kulkarni Kapil Gangadhar Zirpe (Editor) **Textbook of Critical Care Nutrition (ISPEN) (2023)** Jaypee Brothers Medical publishers (Pvt) Ltd .ISBN **9356963150**
4. Nambiar VS and Zaveri D (2024). Nutrition Guidance After Mini Gastric Bypass Bariatric Surgery. Adhyayan Publishers and Distributors. ISBN-10 : 8119681169.
5. Nambiar VS and Zaveri D (2024).Nutrition Guidelines for Roux-en-Y Gastric Bypass Bariatric Surgery. Adhyayan Publishers and Distributors. ISBN-10 : 8119681215.

<b>Webliography</b>	<a href="#">nutrients-06-05142.pdf</a> Nutrients 2014, 6, 5142-5152; doi:10.3390/nu6115142
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics (Honors) (4-year program) and knowledge of medical nutrition therapy and advanced nutrition

<b>Course Plan</b>		
<b>Theory</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Important Issues in Enteral Nutrition Effect on Gut mucosa and gut-associated lymphoid tissue (GALT), Gut microbiota, Infections and Complications Refeeding Syndrome, Drug- Enteral Nutrition Interaction	5
	Role of Enteral Nutrition in the following: - Diabetes, Cancer Gastrointestinal diseases – IBD, Dementia, Paediatric critical care, Preterm infants	6
2.	Enteral immunomodulatory diet for acute lung injury and acute respiratory distress syndrome, omega-3 fatty acid, $\gamma$ -linolenic acid, and antioxidant supplementation	2
3.	Home-based enteral nutrition – Blenderized tube feeding,	2
<b>UNIT II</b>	Issues in Parenteral Nutrition: Compounding, Vascular access device-related complications, Metabolic Complications, Hepato biliary Complications, Metabolic Bone Disease	5
4.		
5.	Role of Parenteral Nutrition in the following: Critical care, Neonates and premature infants, Bariatric surgery, Cancer	4
6.	Examining safety and ethical issues in parenteral nutrition	2
7.	Nutrition support in long-term and home care	2

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	Planning tube-feeding diets for the following Diabetes Cancer Gastrointestinal diseases – IBD, Dementia Paediatric critical care Preterm infants	<b>36</b>
<b>2.</b>	Parenteral nutrition support for the following- Critical care Neonates and premature infants Bariatric surgery Cancer	<b>24</b>

स्वास्थ्यम् सर्वार्थसाधनम्  
 NCAHP  
 Since-2021  
 राष्ट्रीय सहबद्ध और स्वास्थ्य देख-रेख वृत्ति आयोग

## MND 203 Advances in Public Health Nutrition

CL	CP	L	P
2	2	30	60

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	MND 203 Advances in Public Health Nutrition
<b>Course Description</b>	The course aims to focus on the advances in Public Health Nutrition at National level and Global level
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand and define the advanced concepts in Public Health Nutrition (PHN)</li> <li>2. To understand the global importance of nutrition across the life cycle and its role in achieving Sustainable Development Goals (SDGs).</li> <li>3. To assess the impact of public policies on community nutrition and global health targets.</li> <li>4. To explore nutritional surveillance systems, for monitoring and evaluating public health nutrition programs.</li> <li>5. To analyze epidemiological data to understand the relationship between diet and community health.</li> <li>6. To emphasize the need for Health Promotion in diverse population.</li> </ol>

<b>Reference Book</b>	1. Lal, S. (2018). Textbook Of Community Medicine Preventive And Social Medicine With Recent Update. CBS Publishers & Distributors Private Limited.
	2. Public Health Nutrition in Developing Countries. (2011) Edited by Sheila Vir. Woodhead Publishing India PVT. LTD.
<b>Webliography</b>	<ol style="list-style-type: none"> <li>1. UNICEF. <a href="https://www.unicef.org/">https://www.unicef.org/</a></li> <li>2. WHO. <a href="http://www.who.int/">http://www.who.int/</a></li> <li>3. World Food Programme. <a href="http://www.wfp.org/content/about-wfp-">http://www.wfp.org/content/about-wfp-</a></li> <li>4. WHO. United Nations Decade of Action on Nutrition. <a href="http://www.who.int/nutrition/decade-of-action/en/">http://www.who.int/nutrition/decade-of-action/en/</a></li> <li>5. Mother, Infant and Young Child Nutrition and Malnutrition. <a href="http://motherchildnutrition.org/india/overview-india.html">http://motherchildnutrition.org/india/overview-india.html</a></li> <li>6. Double burden of malnutrition. <a href="http://www.who.int/nutrition/double-burden-malnutrition/en/">http://www.who.int/nutrition/double-burden-malnutrition/en/</a></li> <li>7. United Nations Development Programme. Sustainable Development Goals. <a href="http://www.undp.org/content/undp/en/home/sustainable-development-goals.html">http://www.undp.org/content/undp/en/home/sustainable-development-goals.html</a></li> <li>8. Global targets 2025 <a href="http://www.who.int/nutrition/global-target-2025">http://www.who.int/nutrition/global-target-2025</a></li> <li>9. Improving breastfeeding, complementary foods and feeding practices. <a href="http://www.unicef.org/nutrition/index_breastfeeding.html">www.unicef.org/nutrition/index_breastfeeding.html</a></li> <li>10. National Guidelines on Infant and Young Child Feeding. <a href="http://www.wcd.nic.in">www.wcd.nic.in</a></li> <li>11. WHO Health Statistics and Information Systems. Global Health Estimates. <a href="http://www.who.int/healthinfo/global_burden_disease/en/">http://www.who.int/healthinfo/global_burden_disease/en/</a></li> <li>12. WHO Non-communicable diseases and risk factors. <a href="http://www.who.int/ncds/en/">http://www.who.int/ncds/en/</a></li> <li>13. Overview of Non-Communicable Diseases and Related Risk Factors. <a href="https://www.cdc.gov/globalhealth/healthprotection/fetp/">https://www.cdc.gov/globalhealth/healthprotection/fetp/</a></li> </ol>

Course Plan		
Unit	Topic	Hours
I	<p>The Lancet Global Health Overview</p> <p>Global Nutrition Report and its relation with positive health, universal health coverage, malnutrition (under-nutrition, overweight, obesity, micronutrient malnutrition), Hidden Hunger, nutritional status, nutrition intervention, food and nutrient supplements, food substitute, nutrition education</p> <p>Food and nutrition security –overview, challenges and solutions (local, national, state)</p> <p>Poverty, hunger, HDI -components and indicators, comparison of global HDI with national and state HDI, calculations for GHI and HDI</p>	6
2	<p>Food Systems Approach to Sustainable Healthy Diets</p> <p>Knowledge, Leadership, Capacity, Coordination &amp; Governance</p> <p>Steps taken by GoI such as Green Revolution, White Revolution, GMOs and bio-fortified crops</p> <p>Food Corporation of India - Buffer stock</p> <p>Public Distribution System – Strength and Weaknesses</p> <p>Role of World Food Programme in ensuring Food and Nutrition Security</p>	8

<p><b>3</b></p>	<p>Concept of nutrition in all child survival programs and national health and development programs</p> <p>Maternal health in the perinatal period and beyond</p> <p>A global analysis of the determinants of maternal health and transitions in maternal mortality</p> <p>Vulnerabilities and reparative strategies during pregnancy, childbirth, and the postpartum period: moving from rhetoric to action</p> <p>Best Practices – Recent National and International Examples and Case Studies from NHM and Poshan 2.0</p> <p>Need for revision in nutrition programs and policies: Critique on gaps &amp; need for regular upgrading</p>	<p><b>8</b></p>
<p><b>4</b></p>	<p>Mainstreaming and Nutrition at National and International Level</p> <p>Concepts of nutrition advocacy</p> <p>Concepts and practices in nutrition advocacy– steps for success; some examples from successful nutrition advocacy programs</p> <p>Eat right India Movement</p> <p>Other New Initiatives for Nutrition Advocacy</p> <p>Role of FAO, WHO, NGO's &amp; United Nations in Global /National advocacy &amp; program implementation support to Government</p> <p>Operationalizing national/state policies and targets – steps for advocacy and mainstreaming of nutrition at field levels in various programs</p>	<p><b>8</b></p>

	<b>PRACTICAL</b>	<b>60</b>
<b>1</b>	To compare nutritional surveillance data sets: nutritional profile, determinants of nutritional status and gender differences, health data of MCH and other populations (at regional national and global level) and calculate trend lines of past 5 years and write a critique for way forward	<b>10</b>
<b>2</b>	<ul style="list-style-type: none"> <li>• Nutrition and Health Program Planning at Sub-National Level</li> <li>• Understanding the sub-national level: local, district or regional level situation through the use of available data sets; understanding the local nutrition health delivery systems for Essential Nutrition Actions (ENA), decentralization &amp; governance</li> <li>• Survey to understand the health systems of India – at primordial, primary, secondary and tertiary care- issues, concerns and best practices and way forward.</li> <li>• Engage in understanding field level Bottom-up, inter-sectoral, multi-stakeholder collaboration at the sub-national level for any program or policy (Management, Leadership &amp; Partnership for District Health)- - issues, concerns and best practices and way forward.</li> </ul>	<b>25</b>
<b>3</b>	<p>To conduct a coverage evaluation survey Using quantitative &amp; qualitative methods) for delivery of key nutrition health interventions in a community,</p> <ul style="list-style-type: none"> <li>• collect data</li> <li>• analyse,</li> <li>• interpret,</li> <li>• report &amp;</li> <li>• suggest recommendations for improving coverage &amp; delivery of services</li> </ul>	<b>25</b>

## MND 204 NUTRITION AND IMMUNITY

CL	CP	L	P
2	0	30	0

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	<b>MND 204 NUTRITION AND IMMUNITY</b>
<b>Course Description</b>	Introduction to basics of immunology, the role of various nutrients in modulating immune responses, and the impact on immune health.
<b>Objectives</b>	To gain knowledge on the immunological aspects To gain importance of nutrition immunity interactions.
<b>Text Books</b>	Nutrition, Immunity, and Infection by Philip C. Calder, Anil D. Kulkarni, Anil Digambar Kulkarni, CRC Press, Taylor & Francis Group, 2018 Nutrition and Immune Function by P. C. Calder, C. J. Field, H. S. Gill
<b>Reference Books</b>	Devereux,G., 9780851995830.0001, CABI, doi:10.1079/9780851995830.0001, (1–20), CABI Publishing, The immune system: an overview., (2002)
<b>Prerequisites</b>	Bachelor of Nutrition and Dietetics (Honors) (4-year program)

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
<b>1.</b>	<p>Role of Nutrition in Immunity</p> <p>Concept of immunity, Role of nutrition in infection, Effect of nutritional status on immunity.</p> <p>Immunity - Types of immunity, cells of the immune system, structure of immunoglobulins- – IgG, IgM, IgA, IgD, IgE, Immune response - humoral immunity, cell mediated immunity, immune changes in malnutrition, Immunologic effect and mechanism of different micronutrients, Clinical relevance of micronutrients., autoimmunity and hypersensitivity.</p>	<b>8</b>
<b>2.</b>	<p>Interactions of Nutrition, Immunity and Infection</p> <p>Defense mechanisms in the host cell and nutrients essential in the development of the immune system, Effect of infections on the nutritional status of an individual, Nutrient deficiencies and excesses affecting the immuno-competence and to infections.</p> <p>Nutrients with immuno-modulati properties - Arginine, Glutamine, Omega 3 fatty acids, sulphur containing amino acids, nucleotides, ornithine, alpha ketoglutarate and taurine; Supplementation, beneficiary effects-Prebiotics, Probiotics and symbiotics</p>	<b>8</b>
<b>3.</b>	<p>Nutritional Immunology in Disease Prevention and Gene Expression</p> <p>Role of nutrition in managing diseases, Auto Immune disorders, Designing foods for immune related disorders</p> <p>Fundamentals of gene structure- Principles of gene expressions, Transcription mechanism and regulation, Translation mechanism and regulation, Effects of nutrients on gene expression, Thrifty genotype – phenotype hypothesis</p>	<b>8</b>

4.	<p>Programmes on Immunization</p> <p>National and International, New Initiatives in Vaccines, Milestones in the Immunization program, Immunization and Child Health.</p> <p>Review of Research papers on Nutrition and Immunity</p>	6
----	---	---



## MND 205 Innovation in Food Product & Development

CL	CP	L	P
1	3	15	45

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	<b>MND 205 Innovation in Food Product &amp; Development</b>
<b>Course Description</b>	It is a first basic course giving an insight into various aspects of Innovation, Food Ingredients and Food Formulation.
<b>Objectives</b>	<p>1. To make a student understand concepts of Product Development – converting an Idea into a product and a plan to commercialize it</p> <p>2. To make a student understand concepts of Product Development , Quality control and Marketing the new product</p>
<b>Reference Books</b>	<p>1. Altschul A., M. (1993). Low calorie foods. Marcel Dekker.</p> <p>2. Goldberg, I. (1994). Functional foods: Designer foods, Pharma Foods, Nutraceuticals. Springer.</p> <p>3. Matz, S.A. (2004). Formulating and processing of dietetic foods. CHIPS Publ.</p> <p>4. Kalia, M. and Sood, S. (2010). Food preservation and processing. Revised edition, Kalyani Publishers, New Delhi.</p>

		<p>5. Srilakshmi, B. (2010). Food science (Fifth ed.) New Age International Pvt. Limited, Pub., New Delhi.</p> <p>6. Gordon, W.F. (2011). New food product development: From concept to market place (third edition). CPR, Press</p>
<b>Prerequisites</b>		Bachelor of Nutrition and Dietetics (Honors) (4-year program)
<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	<p>A) Basic principles of food product development: Sensory properties of food and their role in product development. Evaluation of food: Objective and subjective methods, selection and training of judges, Development of score cards and analysis of data.</p> <p>B) Concept of New Food Product Development – General classes of New Food Products, Reasons for new food product, Stages of new product development and New Food product life cycle</p>	5

2.	<p>A) Consumer Surveys, Idea Generation, Sources, Screening, Translation of idea to product prototype, Product testing, Consumer research evaluation: development of schedule and data analysis.</p> <p>B) Market testing, Pre Commercialization, and Product launch</p>	5
3.	<p>A) Packaging materials and labeling Food safety and quality control issues in product development, food quality regulations and standards, quality control and HACCP</p> <p>B) Product formulation and development for general and therapeutic use, functional foods and Nutraceuticals</p>	5

## **Innovation in Food Product & Development (Practical-45; 90hr )**

1. Sensory evaluation: Selection and Training of judges- Determination of Sensitivity Thresholds
2. Methods: Difference Test- Paired comparison- Duo-trio, Triangle test – preparation of score card and conduction of test
3. Numerical scoring, Composite scoring and Dilution tests- preparation of score card and conduction of test
4. Hedonic rating and Flavor Profile test - preparation of score card and conduction of test
5. Methods of Quantitative Descriptive Analysis - preparation of score card and conduction of test
- 6-10. Objective evaluation of Food – Physical, chemical and microbiological parameter analysis
- 10-15. Selection of Product categories, Idea generation and selection of Ingredients, Preparation of flow chart and ingredient preparation.
- 16-17. Innovative Product formulation and standardization – High Protein products
- 18-19. Innovative Product formulation and standardization – Low calorie Products
- 20-22. Innovative Product formulation and standardization – Bakery products with high fibre and low glycemic index
- 23-26. Innovative Product formulation and standardization – Food products with hypocholesterolemic property
- 27-30. Innovative Product formulation and standardization – Food products with antioxidant property
- 31-34. Innovative Product formulation and standardization – Food Product with HDL for Heart health
- 35-37. Innovative Product formulation and standardization – Food products with immunity boosting ingredients
- 38-40. Innovative Product formulation and standardization – Food products with low sodium
- 41-43. Innovative Product formulation and standardization – Food products with nutraceuticals- Food products for diabetics and obese
- 44-45. Packaging and sale of products, presentation of developed food products, Video shooting of product preparation

### MDN 206 Scientific Writing Skills

CL	CP	L	P
2	0	30	0

<b>Semester</b>	<b>II</b>
<b>Course Name</b>	<b>MDN 206 Scientific Writing Skills</b>
<b>Course Description</b>	This course aims to develop students' ability to write scientific papers, reports, and other professional documents. The focus will be on the principles of clear and concise scientific writing, understanding the structure of scientific papers, and developing skills for effective communication in the field of food and nutrition.
<b>Objectives</b>	<p>1 To understand the structure and elements of scientific papers.</p> <p>2 To develop skills for writing clear and concise scientific texts.</p> <p>3 To learn effective methods for presenting data and research findings.</p> <p>4 To understand ethical considerations in scientific writing.</p> <p>5 To practice writing different types of scientific documents</p>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Hofmann, A. H. (2019) Scientific writing and communication: Papers, proposals, and presentations (4th ed.). Oxford University Press.</li> <li>2. Silyn-Roberts, H. (2012) Writing for science and engineering: Papers, presentations and reports(2nd ed.) Butterworth-Heinemann.</li> <li>3. Alley, M. (2018). The craft of scientific writing* (4th ed.). Springer.</li> <li>4. Peat, J., Elliott, E., Baur, L., &amp; Keena, V. (2013). Scientific writing: Easy when you know how (2nd ed.). BMJ Books.</li> </ol>

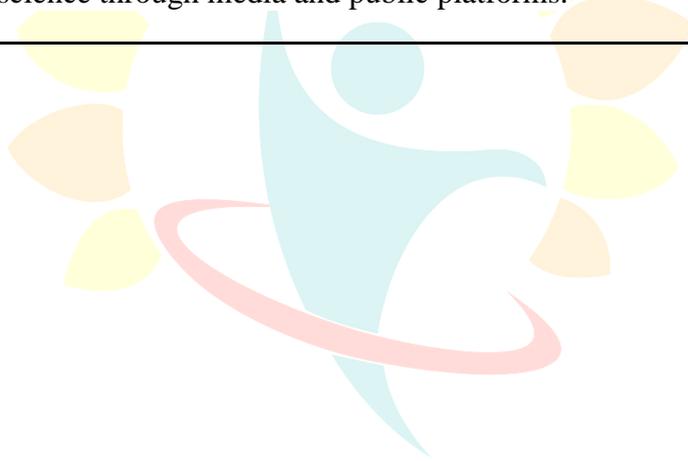
	<ol style="list-style-type: none"> <li>5. Day, R. A., &amp; Gastel, B. (2016)How to write and publish a scientific paper (8th ed.). Cambridge University Press.</li> <li>6. Gopen, G. D., &amp; Swan, J. A. (1990)The science of scientific writing. American Scientist, 78(6), 550-558.</li> <li>7. Katz, M. J. (2009). From research to manuscript: A guide to scientific writing (2nd ed.). Springer.</li> <li>8. <a href="https://nutrition.org/writing-publishing-nutrition-research/">https://nutrition.org/writing-publishing-nutrition-research/</a></li> <li>9. <a href="https://www.researcheracademy.elsevier.com/">https://www.researcheracademy.elsevier.com/</a></li> <li>10. <a href="https://www.nih.gov/grants-funding/introduction-grant-writing">https://www.nih.gov/grants-funding/introduction-grant-writing</a></li> <li>11. <a href="https://www.nature.com/scitable/ebooks/scientific-writing-and-publishing-14053993/">https://www.nature.com/scitable/ebooks/scientific-writing-and-publishing-14053993/</a></li> <li>12. <a href="https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_for_mating_and_style_guide/general_format.html">https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_for_mating_and_style_guide/general_format.html</a></li> <li>13. <a href="https://guides.lib.berkeley.edu/evaluating-resources">https://guides.lib.berkeley.edu/evaluating-resources</a></li> <li>14. <a href="https://writingcenter.unc.edu/tips-and-tools/scientific-writing/">https://writingcenter.unc.edu/tips-and-tools/scientific-writing/</a></li> </ol>
<p><b>Prerequisites</b></p>	<ol style="list-style-type: none"> <li>1. Basic understanding of food and nutrition science</li> <li>2. Proficiency in written and spoken English</li> <li>3. Basic research skills including familiarity with conducting literature reviews, using academic databases, and understanding primary vs. secondary sources.</li> <li>4. Basic computer skills, including proficiency in word processing software (e.g., Microsoft Word, Google Docs) and familiarity with referencing software (e.g., EndNote, Mendeley, Zotero), are essential for preparing assignments and papers.</li> </ol>

<b>Course Plan</b>		
<b>Unit</b>	<b>Topic</b>	<b>Credit Hours</b>
1.	Scientific Writing : Importance of Scientific Writing in Food and Nutrition; Role of scientific writing in research, industry, and public health communication, different types of scientific documents (research papers, review articles, reports, etc.); The Writing Process - Planning and organizing scientific papers. - Understanding the target audience and the purpose of scientific communication	6
2.	Structure and components of scientific papers :Overview of research paper structure - key components: title, abstract, introduction, methods, results, discussion, and references; writing the introduction and literature review - crafting a compelling introduction; conducting a literature review: finding, summarizing, and synthesizing relevant research.	6
3.	Methods, results, discussion and conclusion: Describing research methods - writing clear and detailed methodology sections. - importance of reproducibility and transparency; presenting results - effective use of tables, figures, and graphs; describing statistical analyses and interpreting data; crafting the discussion section - interpreting and discussing research findings; Discussing the significance, limitations, and future directions of the study; writing the conclusion and abstract - summarizing the main findings and contributions of the study. - crafting an abstract that succinctly summarizes the study's purpose, methods, results, and conclusions.	6

4.	Ethics and integrity in scientific writing: Ethical considerations - understanding plagiarism, authorship, and conflicts of interest; ethical data handling and reporting; peer review and publication process - the role of peer review in scientific publishing - how to respond to reviewer comments and revise manuscripts.	6
5.	Specialized writing and communication : Writing research proposals and grant applications - key elements of research proposals and grants; strategies for successful grant writing; writing for lay audiences and media - adapting scientific information for non-expert audiences. - communicating science through media and public platforms.	6



NATIONAL COMMISSION FOR ALLIED AND HEALTHCARE PROFESSIONS



PROFESSIONS

राष्ट्रीय सहबद्ध और स्वास्थ्य देख-रेख वृत्ति आयोग

स्वास्थ्यम् सर्वार्थसाधनम्

NCAHP

Since-2021

स्वास्थ्य देख-रेख वृत्ति आयोग

## Third Semester

### MND 301 INTELLECTUAL PROPERTY RIGHTS

CL	CP	L	P
2	0	30	0

**INSTRUCTOR IN CHARGE:** Lawyer or Faculty with experience in medical law or practice

**COURSE DESCRIPTION:** The course is designed to introduce fundamental aspects of Intellectual Property Rights to learners who are going to play a major role in development and management of innovative process. The course is designed for increasing among a multidisciplinary audience.

#### **OBJECTIVES:**

At the end of the semester, the student should be able to:

1. Analyse various aspects of copyrights and geographical indications
2. Analyse various aspects of patents and Infer aspects of industrial designs
3. Examine various aspects of trademark, and apply the knowledge about the enforcement of intellectual property rights

#### **Text Books and References**

1. T. M. Murray, M. J. Mehlman. Encyclopedia of Ethical, Legal and Policy Issues in Biotechnology, Vol 2, John Wiley & Sons, 2010.
2. P. N. Cheremisinoff, R. P. Ouellette, R. M. Bartholomew, Biotechnology Applications and Research, Technomic Publishing Co., Inc. 1985.
3. D. Balasubramaniam, C. F. A. Bryce, K. Dharmalingam, J. Green, K. Jayaraman, Concepts in Biotechnology, 3/e University Press. 2004.
4. B. David, T. R. Jewell, R. G. Buiser, Biotechnology: Demystifying the Concepts1/e., Wesley Longman, USA, 2000.
5. Parulekar, S. D'Souza, Indian Patents Law – Legal & Business Implications, Macmillan India Ltd. 2006.

6. L. Wadehra. Law Relating to Patents, Trademarks, Copyright, Designs & Geographical Indications, Universal law Publishing Pvt. Ltd., 2000.
7. P. Narayanan, Law of Copyright and Industrial Designs, 4/e., Eastern law House, Delhi. 2010.

**PREREQUISITES:** Medical law and Ethics.

<b>COURSE PLAN</b>		
<b>UNIT</b>	<b>TOPIC</b>	<b>HOURS</b>
1	Copyright: Definition, meaning of copyright, duration of copyright copyright protection, Related Rights : meaning, distinction between related rights and copyright, Rights covered by copyright Geographical Indications: geographical indication, geographical indication protection and its reasons.	10
2	Patents: Patents and kinds of inventions protected by a patent, patent document, and how to protect your inventions. Granting of patent, Rights of a patent, How extensive is patent protection? Drafting and Filing of a patent. Industrial Designs: Industrial design, industrial designs protection W protection provided by industrial design, duration of protection last, why to protect industrial designs	10
3	Trademarks: meaning, rights of trademark, of signs can be used as trademarks, trademark protection, trademark registration, length of trademark protection, Trade secrets, and know-how agreements. Enforcement Of Intellectual Property Rights: Infringement of intellectual property rights, Enforcement Measures	10

### MND 302 Precision Nutrition

CL	CP	L	P
4	0	60	0

<b>Semester</b>	<b>III</b>
<b>Course Name</b>	<b>MND 302 Precision Nutrition</b>
<b>Course Description</b>	It is a course which covers the advanced concepts of application of principles of precision nutrition in health and disease.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Integrate the concept of DNA, microbiome &amp; metabolic responses to specific foods or dietary patterns, to determine personalized eating plan for wellness and illness.</li> <li>2. Describe the principles of precision nutrition &amp; medicine, focusing on the interaction between nutrients and human/microbial genes.</li> <li>3. Identify genetic backgrounds contributing to individual differences in macro- and micronutrient metabolism</li> <li>4. Comprehend the biochemical, physiological and molecular aspects of energy metabolism and inflammatory pathways that play a crucial role in the pathogenesis of metabolic diseases, including roles of diet and dietary components</li> <li>5. Apply the concept of nutrigenetics for designing clinical nutrition therapies and diet plans for disease management.</li> </ol>

<p><b>Reference Books</b></p>	<ol style="list-style-type: none"> <li>1. Arshad, Z., Bains, V.K., Jhingran, R., Madan, R., &amp; Srivastava, R. (2017). Nutrigenomics: An Overview. <i>Asian Journal of Oral Health &amp; Allied Sciences</i>, 7(2), 52.</li> <li>2. Ayesha Nasir, Mir. M. Hassan Bullo, Zaheer Ahmed, Aysha Imtiaz, Eesha Yaqoob, Mahpara Safdar, Hajra Ahmed, Asma Afreen &amp; Sanabil Yaqoob. (2020). Nutrigenomics: Epigenetics and cancer prevention: A comprehensive review. <i>Critical Reviews in Food Science and Nutrition</i>, 60(8), 1375-1387. doi:10.1080/10408398.2019.1571480</li> <li>3. Berná G, Oliveras-López MJ, Jurado-Ruíz E, Tejedo J, Bedoya F, Soria B, Martín F. (2014). Nutrigenetics and nutrigenomics insights into diabetes etiopathogenesis. <i>Nutrients</i>, 6(11), 5338-5369. doi:10.3390/nu6115338</li> <li>4. Fenech M, El-Soheily A, Cahill L, Ferguson LR, French TA, Tai ES, Milner J, Koh WP, Xie L, Zucker M, Buckley M, Cosgrove L, Lockett T, Fung KY, Head R. (2011). Nutrigenetics and nutrigenomics: viewpoints on the current status and applications in nutrition research and practice. <i>J Nutrigenet Nutrigenomics</i>, 4(2), 69-89. doi:10.1159/000327772</li> <li>5. Ganesh S.B. &amp; Sugumar, K. (2020). Nutrigenomics: A new direction in periodontics. <i>International Journal of Applied Dental Sciences</i>, 6(1), 146-149.</li> <li>6. Harvard T.H. Chan School of Public Health. (2022). Precision Nutrition. The Nutrition Source. Retrieved from <a href="https://www.hsph.harvard.edu/nutritionsource/precision-nutrition/">https://www.hsph.harvard.edu/nutritionsource/precision-nutrition/</a></li> <li>7. Helland MH, Nordbotten GL. (2021). Dietary Changes, Motivators, and Barriers Affecting Diet and Physical Activity among Overweight and Obese: A Mixed Methods Approach. <i>Int J Environ Res Public Health</i>, 18(20), 10582. doi:10.3390/ijerph182010582</li> <li>8. Himanshu D, Ali W, Wamique M. (2020). Type 2 diabetes mellitus: pathogenesis and genetic diagnosis. <i>J Diabetes MetabDisord</i>, 19(2), 1959-1966. doi:10.1007/s40200-020-00641-x</li> <li>9. Manoharan, S., &amp; Kareem, N. (2020). Nutrigenomics In Periodontics - A Review. <i>International Journal of Pharmaceutical Research</i>, 12(1), 1983-1986.</li> </ol>
-------------------------------	---

	<p>10. Meiliana, A., &amp; Wijaya, A. (2020). Nutrigenetics, Nutrigenomics, and Precision Nutrition. <i>Indones Biomed J</i>, 12(3), 189-200.</p> <p>11. Sushrut Jangi, Katie Hsia, Naisi Zhao, Carol A Kumamoto, Sonia Friedman, Siddharth Singh, Dominique S Michaud. Dynamics of the Gut Mycobiome in Patients With Ulcerative Colitis. <i>Clin Gastroenterol Hepatol</i>, 2023 Oct 5:S1542-3565(23)00762-0. doi: 10.1016/j.cgh.2023.09.023</p> <p>12. Guojun Wu, Naisi Zhao, Liping Zhao. Microbial-host isozyme: A novel target in "drug the bug" strategies for diabetes. <i>Cell Metab</i>, 2023 Oct 3;35(10):1677-1679. doi: 10.1016/j.cmet.2023.09.008.</p> <p>13. Haslberger, Alexander G. (ed.) : <i>Advances in precision nutrition, personalization, and healthy aging</i> [ ] Cham. Springer, 2022. 978-3-031-10152-6</p>
<b>Prerequisites</b>	BSc Nutrition and Dietetics - 4 years Program



## Course Plan

### UNIT ONE

Introduction to Precision Nutrition and Nutritional Genomics :  
The Human Genome, Introduction, Study, SNP, Definition of various terms-  
Precision Nutrition, Personalized Nutrition, Nutrigenomics, Nutrigenetics, Exposome,  
Epigenetics, Gene variations, mutations, Epigenetics vs Epigenomics, Genotype &  
Phenotype, Differences between SNPs, Mutations and CNVs, The Genome of Rare and  
Complex Diseases, Genotype and Phenotype  
Precision Medicine : Influence of Genetics and Environmental Factors in Complex Diseases,  
Gene- Nutrient Interaction, Need for Precision: The problem of Missing Heritability  
Concept of Interaction  
Precision Nutrition vs. Community Nutrition, Current Basis of Nutritional Research  
Experimental Designs in Precision Nutrition, Omics Technologies and their Biomarkers,  
Epigenomics, Proteomics, Metabolomics, Metagenomics, Functional Genomics,  
Nutrigenetics, SNPs Associated with Nutrition-Related Diseases (Diet-Dependent), Vascular  
health, Cardiovascular diseases, Oxidative stress (eNOS SOD)  
ApoE Metabolic Health, Obesity ( Snacking), Diabetes Type 2, Methylation  
Detoxification : Liver health  
Circadian Rhythm and gene : Chronobiology, Appetite and Satiety, Central Clock  
Peripheral Clocks, Circadian Rhythm Hormones, Intake Control (Leptin and Ghrelin)  
Exercise Genotype: Adrenergic genotype, Food Specific Genotype : Caffeine, Lactose  
Gluten

Hours

30

NCAHP

Since-2021

## UNIT TWO

30

SNPs Predisposing to Complex Nutrition-Related Diseases - Genetic Risk Scores (GRS).

Diet-gene interaction: polygenic risk score: Type II Diabetes, Hypertension

Arteriosclerosis, Hyperlipidemia, Cancer

SNP vs. Allergies vs. Intolerances

Role of Bioactive Components of Diet on Gene Expression

The Effect of Micro and Macro Nutrients on Gene Expression

Human Microbiota Composition Enterotypes and Diet, Microbiota and Metabolic

Syndrome, Microbiota and Cardiovascular Diseases Effect of the Oral and Intestinal

Microbiota, Gut-brain Axis, Microbiota and Neurodegenerative Diseases

Microbiota and Neuropsychiatric Diseases, Schizophrenia, Anxiety, Depression, Autism,

Microbiota and Obesity

Gut microbiome and disease diagnosis and prognosis

Diet-Modulated MicroRNAs

Nutrition Systems Biology:

Integrated approach toward personalized nutrition

Role of AI in Nutrition System and Precision Health



## MND 304 Advanced Communication Skills for Nutrition Practice

CL	CP	L	P
1	3	15	45

### Instructor in charge

M.Sc. and / Ph.D. in Foods and Nutrition or equivalent

<b>Course Description</b>	The course shall enable the student to have good communication skills
<b>Objectives</b>	<ol style="list-style-type: none"><li>1. Learn about the various types of communication</li><li>2. Learn effective communication skills</li></ol>
<b>References</b>	<ol style="list-style-type: none"><li>1. Philipose Pamela. Media's Shifting Terrain: Five Years that Transformed the Way India Communicates,(2019) Orient Blackswan, New Delhi.ISBN 9352875346</li><li>2. Narula Uma, Mass Communication-Theory and Practice (2019) Har-Anand Publications, New Delhi ISBN 9388409361</li><li>3. Narula Uma. Communication Models (2023); Atlantic Publishers and Distributors (P) Ltd ISBN 8126906766</li></ol>
<b>Prerequisites</b>	First and Second Semester of M. Sc. Nutrition and Dietetics

<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Relevance of communication skills for nutrition practice Five Cs of communication	2
2.	Types of Communication Written communication, Creative writing, content creation Oral communication. Non-verbal and visual communication, Design and visual communication Contextual communication. Active Listening	8
2.	Effective Communication Skills active listening observation skills Body language Focus and attention Empathy	5

<b>Practical</b>		
<b>Unit</b>	<b>Topic</b>	<b>Hours</b>
1.	Role play and simulation for effective patient counseling.	3
2.	Critical analysis of nutrition and health related messages on print, visual and social media	2
3.	Create an interactive digital media project such as an interactive quiz or mini-game.	3
4.	Designing a logo, business card and pamphlets for clients	2
5.	Content creation for topical days like obesity day, osteoporosis day etc.	4
6.	Content calendar planner for activities	4
7.	Audio creation for public service announcement, podcasts	4
8.	Content creation for digital media, print media and social media platforms for disseminating content. Analysis of algorithms of views, likes and followers.	8
9.	Create short videos with specific nutrition education message in a story format.	8
10.	Communication skills for Marketing	8
11.	Use of Instagram account for engagement, LinkedIn for business	

### MND 305 Internship - MSc Nutrition and Dietetics

Name of the program	Masters in Nutrition and Dietetics
Course Title	Internship
Academic year	Second Year
Semester	03
Number of Practical Credits	10 =20 hours x 15= 300 hours
Duration	3 months
Course Prerequisite	Students should develop critical skills like evaluation of patients, designing meal plans, interaction with other health professionals and evaluating information received.
Course Synopsis	This module provides students with an opportunity to integrate and apply acquired knowledge and technical skills in actual clinical settings.

## Course Outcomes

- Select the right practice from the acquired skills as a clinical nutritionist and Dietitian  
Demonstrate an attitude of professionalism when working with colleagues and other health professional staff of the hospital  
Utilize skills in record keeping, organizing material, presentation of case studies and effective communication.
- Analyse and develop the ability to work independently and as a team member to perform critical thinking and problem-solving skills in different domains.
- Design, evaluate and implement new methods or protocols in different cases.
- Evaluate the relationship between nutrition data and pathologic processes, and how nutrition data relates to health and disease
- Develop the ability to work independently and as a team member to perform critical thinking and problem-solving skills in different domains.

Content	Competencies
<b>Orientation</b>	<p>Define the role of dietitian in hospitals</p> <p>Outline the functioning of the Dietetics Services in a hospital and learn about its working schedules and plans.</p> <p>List and summarize the knowledge about the maintenance of the patient's case file and how the details are entered/registered in it.</p>
<b>Food Service Area</b>	<p>Interpret the therapeutic and normal diet settings in the kitchen</p> <p>Interpret acquiring skills in food procurement quality maintenance and patient food service.</p> <p>Acquire skills in Menu system, Personnel Management, Food supply, procurement and control, Food production,</p>

<p><b>Medicine</b></p> <p><b>(2 cases)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions.</p> <p>Explain and develop the dietary counselling given to the patients.</p> <p>Illustrate and relate the condition in which enteral and parenteral nutrition is provided and its administration and formulation.</p>
<p><b>Nephrology and Urology</b></p> <p><b>(1 case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions</p> <p>Explain and develop the dietary counselling given to the patients. Illustrate and relate the condition in which enteral and parenteral nutrition is provided and its administration and formulation.</p>
<p><b>Cardiology</b></p> <p><b>(1 case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions in disease condition of the patients.</p> <p>Explain and develop the dietary counselling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</p>

<p><b>Gastroenterology</b></p> <p><b>(1 case)</b></p>	<p>Illustrate the assessment of nutritional status among patients. Interpret and apply dietary interventions to patients with disease conditions</p> <p>Explain and develop the dietary counselling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</p>
<p><b>Oncology</b></p> <p><b>(1 case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions in the disease condition of the patients.</p> <p>Explain and develop the dietary counselling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration and formulation.</p>
<p><b>Obstetrics</b></p> <p><b>Gynaecology</b></p> <p><b>(1 case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions.</p> <p>Explain and develop the dietary counseling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</p>
<p><b>Pediatrics</b></p> <p><b>(2 cases)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions in the disease condition of the patients. Explain and develop the dietary counseling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</p>

<p><b>Surgery</b></p> <p><b>(1 Case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions.</p> <p>Explain and develop the dietary counselling given to the patients.</p> <p>Illustrate and relate the condition in which Enteral and Parenteral nutrition is provided, its administration, and formulation.</p>
<p><b>Intensive care unit</b></p> <p><b>(2 Cases)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions.</p> <p>Explain and develop the dietary counseling given to the patients.</p> <p>Illustrate and relate the condition in which enteral and parenteral nutrition is provided, as well as its administration and formulation.</p>
<p><b>Psychiatry/ Rehabilitation</b></p> <p><b>(1 Case)</b></p>	<p>Illustrate the assessment of nutritional status among patients.</p> <p>Interpret and apply dietary interventions to patients with disease conditions.</p> <p>Explain and develop the dietary counseling given to the patients. Illustrate and relate the condition in which enteral and parenteral nutrition is provided, as well as its administration and formulation.</p>
<p><b>Mini Project</b></p>	<p>Provide interns with practical experience in their field of study or interest, allowing them to apply the knowledge and skills they have gained in a real-world setting</p>
<p><b>Standardization</b></p>	<p>Enforce a level of consistency or uniformity while giving MNT or any other operations within the selected environment.</p>

**Learning Strategies:** Small group discussion (SGD), Problem-Based Learning (PBL), Case Based Learning (CBL), Clinics, Seminars.

**Formative Assessment:** Quiz, Viva, Clinical assessment (OSCE, OSPE, WBPA), Clinical Log Book. The internship completion certificate will be issued from the Dean's office, only after · Successfully clearing all four assessment exams and Obtaining a satisfactory completion certificate from the head/ In-charge of the department at the end of the internship.



## MND 401 Dissertation (3 months)

**Course Objectives** The Dissertation aims to develop skills in conducting a research study/ working in a project and learn the process of writing a dissertation/ project report

**Course Learning Outcomes:** Students will be able to

1. Know the practical aspects of, collecting data/ project work
2. Evaluate, select, and use appropriate strategies for the reduction, analysis, and presentation of data collected during the research process/ project work
3. Suitably illustrate data/ insights using various graphical and other methods.
4. Prepare a dissertation

The research will be an original work with plagiarism check and ethical clearance. document/ project report based on research process/ project work done. The student will be guided and supervised by a member of the teaching faculty of the Institute. However, the dissertation in which the research culminates should reflect the student's own work. The students will undertake an independent piece of research work on an issue of contemporary concern that contributes to the advancement of knowledge in the field of Dietetics of Clinical Nutrition.

### **Assessment:**

Distribution of marks for Internal and External assessments will be based on the credit distribution of the theory and practical for the courses. For eg. If a course has 3 credits for Lectures and 0.5 credits for Practicals, 25 marks for theory and 5 marks for practicals will be considered for internal assessments out of the 30 marks. Similar ratios will be followed for External assessments. For Practical examinations, an internal and external examiner will assess the candidates.

### **Research Project:**

An internal and external examiner will assess the candidates for the final evaluation. Clinical Dietitians with PhD (Preferably in the relevant disciplines of Nutrition and Dietetics ) should be the examiner for the assessment of research projects.

### **4.3. PhD Guidelines**

#### **Minimum Standards and Procedure for Award of Ph.D. Degree:**

Every University established or incorporated by or under a Central Act, a Provincial Act, or a State Act, and every Institution Deemed to be a University under Section 3 of the UGC Act, 1956, and every degree-granting autonomous College and every affiliated college allowed offering Ph.D. programs. Candidates for admission to the Ph.D. program shall have completed:

A 2-year/4-semester Master's degree program, (after 4 years of undergraduate degree) with at least 55% marks in aggregate or its equivalent grade 'B' (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree from a foreign educational institution accredited by an Assessment and accreditation Agency which is approved, recognized, or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country to assess, accredit or assure the quality and standards of educational institutions. □ A candidate seeking admission after a 5-year/10-semester Bachelor's degree in Research should have a minimum CGPA of 7.0/10.

A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-abled, Economically Weaker Section (EWS) and other categories of candidates as per the Commission's Decision from time to time.

Note: The eligibility marks of 55% (or an equivalent grade on a point scale wherever The grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures, if any. A relaxation of 0.5 score in CGPA or an equivalent relaxation of grade may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-abled, Economically Weaker Section (EWS) and other categories of candidates as per the decision of the Commission from time to time.

Ph.D. program shall be for a minimum duration of two years excluding course work or a minimum of 3 years including course work, and a maximum of six years.

Extension beyond the above limits will be governed by the relevant clauses as stipulated in the Statute/Ordinance of the individual Institution concerned, but not beyond more than two years or 3 years as mentioned above.

All Universities shall admit Ph.D. Scholars through a National Eligibility Test (NET) or National Entrance Test or an Entrance test/exit exam conducted by NCAHP.

Eligibility criteria to be a Research Supervisor, Co-Supervisor, Number of Ph.D. scholars permissible per Supervisor, etc.

Any regular Professor/Associate Professor of the University/ College, with at least five research publications in peer-reviewed or refereed journals after obtaining PhD and any regular Assistant Professor of the university/ college with a minimum of five years of teaching/research experience with a Ph.D. degree and at least three research publications in peer-reviewed or refereed journals may be recognized as Research

Supervisor. Provided that in areas/disciplines where there is no or only a limited number of peer-reviewed or refereed journals, the Institution may relax the above condition for recognition of a person as Research Supervisor with reasons recorded in writing. Only a full-time regular teacher of the University/ College concerned can act as a Research Supervisor. Adjunct faculties are not permitted to be Research Supervisors except being Co-supervisor. However, Co-Supervisors from within the same department or other departments of the same institution or sister institutions may be permitted with the approval of the Research Advisory Committee. In specific cases of a formal institutional collaboration based on the MoUs, the Universities/Colleges concerned may approve a faculty member as Research Supervisor/Co-Supervisor for a Ph.D. candidate from the collaborating institution. In the case of topics which are inter-disciplinary and where the Department concerned feels that the expertise in the Department has to be supplemented from outside, the Department may appoint a Research Supervisor from the Department itself, who shall be known as the Research Supervisor, and a Co-Supervisor from outside the Department/Faculty/College/University on such terms and conditions as may be specified and agreed upon by the consenting Institutions.

The allocation of a Research Supervisor for a selected research scholar shall be decided by the Department concerned depending on the number of scholars per Research Supervisor, the available specialization among the Supervisors, and the research interests of the scholars as indicated by them at the time of interview/viva voce.

A Research Supervisor/Co-Supervisor who is a Professor cannot guide more than eight (8) Ph.D. scholars at any given point of time. An Associate Professor as Research Supervisor can guide up to a maximum of six (6) Ph.D. scholars (including co-supervision) and an Assistant Professor as Research Supervisor can guide up to a maximum of four (4) Ph.D. scholars. One additional research scholar can be allotted to each supervisor over and above the allotted number provided the Research Supervisor is implementing a major sponsored research project. Further, each Research Supervisor/Co-Supervisor can guide two international students on a supernumerary basis. At any point of time the total number of candidates under a research supervisor shall not exceed the number as prescribed above including the candidates under co-supervision.

Note: The Research Supervisor should declare the number of Ph.D. scholars registered With him/her periodically to the University/College. He/she cannot increase the number by using recognition from multiple universities/colleges. University teachers after superannuation, if they are re-appointed in the parent University As contract or honorary or distinguished or emeritus professors, may continue as Research Supervisors till the age of 70. The university/college, after considering the research track record and fitness of such superannuated teachers to supervise scholars, may decide on his/her continuation as a Research Supervisor with or without financial commitment. The minimum number of credit requirement for the Ph.D. programme should be at least 12 credits and a maximum of 16 credits.

The coursework shall be treated as a prerequisite for Ph.D. preparation. A minimum of four credits shall be assigned to one or more courses on Research Methodology which could cover areas such as quantitative methods, qualitative methods, computer applications, research ethics, and review of published research in the relevant field, fieldwork, etc. Students who register for a Ph.D. directly from four-year undergraduate with research will have to undertake 6-8 credit courses (at Ph.D. level) about relevant skills/research techniques/domain-specific subjects offered by the University.

All Ph.D., entrants irrespective of discipline, shall be required to take credit-based courses in teaching/education/pedagogy/writing related to their chosen Ph.D. subject during their doctoral training period. Other courses shall be advanced-level courses preparing the students for the Ph.D. degree. Lifelong learners/ accomplished researchers as evinced from their original contributions in terms of patents granted or new relevant knowledge or/and artistic practices desirous to get a research degree the Research Advisory Committee may provide choices in selecting the courses/ credits that facilitate the entrepreneur in the monetization of IP thus generated. Credits earned for completed coursework are transferable from one institution to another institution through the Academic Bank of Credits. All fresh Ph.D. entrants, irrespective of discipline, will be required to take credit-based courses in teaching/education/pedagogy/writing related to their chosen Ph.D subject during their doctoral training period. Ph.D. scholars may also have 3-4 hours per week of actual teaching experience gathered through teaching assistantships or other forms of knowledge dissemination that are not repetitive. All dissemination activities including External presentations and posters, popular articles conveying scientific information (or scientific articles) to the general public, production of books, commissioned research and Internal presentations must be approved by the departmental level Research Committee. Teaching for the Department, supervision of fellow students/technical staff, and dissemination tasks can also be credited as knowledge dissemination and as a work commitment. The Department where the scholar pursues his/her research shall prescribe the course(s) to him/her based on the recommendations of the Research Advisory Committee (RAC) of the research scholar. All candidates admitted to the Ph.D. programs shall be required to complete the coursework prescribed by the Department during the initial one or two semesters.

Grades in the course work, including research methodology courses shall be finalized after a combined assessment by the Research Advisory Committee and the Department and the final grades shall be communicated to the Institution/College. A Ph.D. scholar has to obtain a minimum of 55% of marks or its equivalent grade in the UGC10-point scale (or an equivalent grade/CGPA in a point scale wherever the grading system is followed) in the course work in order to be eligible to continue in the programme and submit the thesis.

There shall be a Research Advisory Committee, or an equivalent body for a similar purpose as defined in the Statutes/Ordinances of the Institution concerned, for each Ph.D. scholar. The Research Supervisor of the scholar shall be the Convener of this Committee. This Committee shall have the following responsibilities:

- To review the research proposal and finalize the topic of research;
- To guide the research scholar to develop the study design and methodology of research and identify the course(s) that he/she may have to do.
- To periodically review and assist in the progress of the research work of the research scholar.

A research scholar shall appear before the Research Advisory Committee once in six months to make a presentation of the progress of his/her work for evaluation and further guidance. The six-monthly progress reports shall be submitted by the Research Advisory Committee to the Institution with a copy to the research scholar. In case the progress of the research scholar is unsatisfactory, the Research Advisory Committee shall record the reasons for the same and suggest corrective measures. If the research scholar fails (even after 3 failures or 3 attempts) to implement these corrective measures, the Research Advisory Committee may recommend the cancellation of registration from the program. Upon satisfactory completion of course work and obtaining the marks/grade, the Ph.D. scholar shall be required to undertake research work and produce a draft dissertation/thesis within a reasonable time, as stipulated by the Institution concerned based on these Regulations. Before the submission of the thesis, the scholar shall make a presentation in the Department before the Research Advisory Committee of the Institution concerned which shall also be open to all faculty members and other research scholars. The feedback and comments obtained from them may be suitably incorporated into the draft thesis in consultation with the Research Advisory Committee.

- It is desirable that the research work of Ph.D. scholars is published in peer-reviewed or refereed journals and presented in conferences/seminars. At least 2 publications in peer reviewed Scopus/Science Index journals are mandatory (It can be 1 publication and 1 conference presentation also). The quality assessment of Ph.D. degrees should be the responsibility of the Institutions. The institutions are free to evolve guidelines in this regard, if needed.

- The thesis shall be submitted together with an originality report produced by an anti-plagiarism software application. The supervisor (and co-supervisor, if there is any) shall receive an originality report on the whole text of the thesis and shall take this report into account in the evaluation of the submission.

Note: An originality report is not to be considered as sufficient proof that the submitted thesis does not contain plagiarized text. Avoiding plagiarism and other forms of academic misconduct in the authorship of the thesis remains the sole responsibility of the researcher. If the Research Supervisor (or Co-Supervisor) suspects plagiarism, he or she may ask for an investigation.

The Ph.D. thesis submitted by a research scholar shall be evaluated by his/her Research Supervisor and at least two external examiners, who are experts in the field and not in employment of the Institution. Examiner(s) should be academics with a good record of scholarly publications in the field. Out of the two external examiners, one must be from out of the state in which the institution is located. Where possible, one of the external examiners may preferably be chosen as a distinguished academician, not below the rank of Professor or equivalent, from outside India. The viva-voce examination based, among other things, on the critiques given in the evaluation report, shall be conducted by the Research Supervisor and at least one of the two external examiners and shall be open attended by Members of the Research Advisory Committee, all faculty members of the Department, other research scholars and other interested experts/researchers.

o If the research results of the thesis constitute new possible things for the protection of intellectual property rights (IPRs), the Ph.D. candidate and Supervisor shall inform the University or the Research Advisory Committee about the matter. In this case, the Ph.D. candidate, with the consent of the Supervisor, may request that the submitted dissertation be treated discreetly before the thesis is submitted for assessment, until the defense/viva voce. The IPR Cell or the competent body of the university designated for the purpose shall conduct the procedure for legal and commercial protection of research results, by the relevant regulations. In this case, the public defense can be extended, in agreement with the Ph.D. candidate, at the latest for a year, starting on the day of the procedure of evaluation of the dissertation. Request for extension of defense/viva voce must accompany the Certificate of the Technology Transfer from the competent authority. The viva voce of the research scholar to defend the thesis shall be conducted only if the evaluation report(s) of the examiner(s) on the thesis recommends acceptance.

If one of the evaluation reports of the examiner in case of a Ph.D. thesis, recommends rejection, the Institution shall send the thesis to an alternate examiner out of the approved panel of examiners and the viva-voce examination shall be held only if the report of the alternate examiner is satisfactory. If the report of the alternate examiner is also unsatisfactory, the thesis shall be rejected, and the research scholar shall be declared ineligible for the award of the degree.

The Institutions shall develop appropriate methods so as to complete the entire process of evaluation of the Ph.D. thesis within three months from the date of submission of the thesis.

Academic, research, administrative, and infrastructure requirements to be fulfilled by Post-Graduate Colleges for getting recognition for offering Ph.D. programs:

Post Graduate Departments of Universities/Colleges may be considered eligible to offer Ph.D. programs only if they satisfy the availability of eligible Research Supervisors, required

infrastructure, and supporting administrative and research promotion facilities as per these Regulations. Post Graduate Departments of such Colleges, Research laboratories of the Government of India/State Government with at least two Ph.D. qualified teachers/scientists/other academic staff in the Department concerned along with required infrastructure, supporting administrative and research promotion facilities as per these Regulations, stipulated below, shall be considered eligible to offer Ph.D. programs. Post Graduate College should additionally have the necessary recognition by the Institution under which they operate to offer a Ph.D. program. Colleges with adequate facilities for research as mentioned below alone shall offer Ph.D. programs:

Exclusive research laboratories with sophisticated equipment as specified by the Institution concerned with the provision for adequate space per research scholar along with computer facilities and essential software, and uninterrupted power and water supply; Earmarked library resources including the latest books, Indian and International journals, e-journals,

extended working hours for all disciplines, adequate space for research scholars in the Department/ library for reading, writing, and storing the study and research materials;

Colleges may also access the required facilities of the neighbouring Institutions/Colleges, or of those Institutions/Colleges/R&D laboratories/Organizations which have the required facilities.

All requirements for the Ph.D. degree of such candidates must be duly fulfilled. It is the joint responsibility of the affiliated Colleges, University departments/ Universities.

Notwithstanding anything contained in these Regulations or any other Rule or Regulation, for the time being in force, no University/College shall conduct Ph.D. programs through distance education

mode/online mode. Candidates in service shall be allowed to do a Ph.D., provided all the eligibility conditions mentioned in the extant Ph.D. Regulations are met.

Following the successful completion of the evaluation process and before the announcement of the award of the Ph.D. degree(s), the Institution concerned shall submit an electronic copy of the Ph.D. thesis to the INFLIBNET/Institutional Electronic Archive, for hosting the same to make it accessible to all Institutions. Shodhganga theses repository/registration is also mandatory. The guidelines on matters such as full-time and part-time enrolment, roles and responsibilities within departmental research committees, admissions procedures, supervision arrangements including co-supervisors, regulations concerning leave and vacation entitlements, funding protocols, fee structures, registration processes, duration of study, coursework requirements, qualifying examination procedures, criteria for publication, guidelines for the submission of final theses, and appointment of external examiners, etc., are subject to alignment or modification under the regulations stipulated by the National Commission for Academic and Health Professions (NCAHP) as amended periodically.

स्वास्थ्यम् सर्वार्थसाधनम्

NCAHP

Since-2021



## Chapter 5

### Competency Standards for Entry Level into the Profession of Dietician in India

Newly qualified dietitian-nutritionists should have the necessary knowledge, skills, and attitudes to perform their role when they begin to practice.

Competency-based education uses both educational (classroom/theory) and clinical outcomes (practice); work-based assessments rely heavily on the observations and judgments of suitably trained supervisors or preceptors with frequent, effective direct observations, coaching, and feedback.

Structured Clinical Examinations (OSCE), especially if the direct observations of students with real patients or clients are difficult. The very nature of the competency standards suggests that multiple pieces of assessment evidence would be required to make a judgment on a trainee's achievement of competence.

The minimum level of education of a dietitian-nutritionist is:

A bachelor's degree in nutrition and dietetics and

A period of supervised professional practice of at least 500 hours and Meets the international competency standards. The Standards should be used as a key reference for a variety of interested people/groups or organizations (stakeholders) and purposes.

- For higher education institutions when designing and developing new programs of dietitian-nutritionist education, or when revising existing programs.
- For internal and external evaluation, providing a plan to support control of quality and improvements, such as academic review, as well as for making judgments about minimum standards being met.
- For employers to understand the competencies, qualities, and capabilities that should be demonstrated by the dietitian-nutritionist.
- For students to understand the competencies, qualities, and capabilities being developed during their education and training.
- For patients, clients, other health professionals, the government, and other stakeholders to understand the roles of the dietetics profession,
- For the dietetics workforce to improve the profile and image of the dietetics workforce.
- For the dietetics workforce to help assist with the exchange of professionals between countries.

## Definitions used in this document

In any learning process there are two key players - the learner and the ‘supervisor’ or teacher. There is some confusion in the use of terms to define competence. The definitions provided here are to help distinguish the different roles of the most relevant players in the learning dynamic

Term	Definition
<b>Competence (-s)</b>	<p>Professional competence is the regular and skillful use of “communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection” and “the bringing together of different components to perform, do something successfully or manage complex situations”</p> <p>Competence defines WHAT a person can do well, effectively, and following professional standards.</p> <p>Competence refers to a person’s ability or the skills and knowledge that the person possesses. Competence can only be demonstrated.</p> <p>Competence is an outcome: it describes what someone can do. It does not describe the learning process that the individual has taken. Competence represents the whole combination of knowledge, understanding, skills, and abilities and the capacity for applying them.</p> <p>In order to reliably measure someone’s ability to do something, there must be clearly defined and widely accessible standards through which performance is measured and accredited; Competence is a measure of what someone can do at a particular point in time.</p>

<p><b>Competency(-ies)</b></p>	<p>Competency is a skill whereas competence is the sign of a person's practice in the workplace context. Competency is defined as “an observable ability... integrating .... knowledge, skills, values and attitudes”.</p> <p>The focus of competency is concentrated on the learners and their actions rather than upon already agreed-upon products, or it can mean active participation through learning.</p> <p>Learning programs (in Higher Education or elsewhere) are therefore competency-based programs.</p>
<p><b>Learning Outcomes</b></p>	<p>Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate or do after the completion of learning. They can refer to a single subject, course, unit, or module or they can refer to a time period of study, for example, a first or a second cycle program (Europe) or a program year. Learning outcomes specify the requirements for award of academic credit. Learning outcomes are developed by academic staff, who have professional knowledge of actual practice requirements and expectations.</p>
<p><b>Behavioural Objective</b></p>	<p>A behavioural objective has three parts:</p> <ol style="list-style-type: none"> <li>a defined behavioural verb,</li> <li>described conditions that allow the behaviour described by the verb,</li> <li>a description of the minimum level of acceptable performance (criteria).</li> </ol> <p>An example of a behavioural objective is: by the end of the period of training (the condition), the student will be able to perform a physical nutrition assessment (the behaviour) with 90% accuracy (the minimum level of performance) In this document, higher order behavioural descriptors<sup>5</sup> such as “synthesizes”, “evaluates”, “creates”, “characterizes” and similar are not included as these standards are designed as minimum to enter the profession. This does not preclude the</p>

	<p>use of higher order objectives in practice as these are examples only. The actual level or quality of performance needed to meet the behavioural objectives is not outlined in this document, as it is expected that local contexts and expectations will lead to a variety of performance measures.</p>
<b>Client</b>	<p>The term “client” is used to include; individual patients – whether in the hospital or the community, a group such as a community group seeking nutrition services, stakeholders or organisations who may be purchasing or funding programs or services, or any other people who are receiving nutrition services.</p> <p>Learning outcomes specify the requirements for award of academic credit. Learning outcomes are developed by academic staff, who have professional knowledge of actual practice requirements and expectations</p>

- Epstein R and Hundert E. Defining and assessing professional competence. JAMA. 2002; 287: 226-35
- Fernandez N, Dory V, Ste-Marie L, Chaput M, Charlin B and Boucher A. Varying conceptions of competence: an analysis of how health science educators define competence. Med Educ. 2012; 46: 357-65
- Frank JR, Mungroo R, Ahmad Y, Wang M, De Rossi S and Horsley T. Toward a definition of competency-based education in medicine: a systematic review of published definitions. Med Teach. 2010; 32: 631-7
- Anderson LW, Krathwohl DR, Bloom BS A Taxonomy for learning, teaching and assessing: a revision of Bloom’s taxonomy of educational objectives, New York, Longman 2001.

<b>1.0 Dietetic Process and Professional Reasoning</b>			
	Competency	Behavioural objectives or learning outcomes	Examples of Behaviour
<b>1.1</b>	Applies the nutrition care process based on the expectations and priorities of individuals, group, communities or population	<p>a) Can identify, assess, and develop goals for nutrition related problems with individuals, groups, communities, populations and regulator</p> <p>b) Develops and implements intervention plans, and monitors and evaluates the outcomes, and reports on it</p>	<p>Clinical Practice</p> <p>Writes nutrition care plan sheets for simulated and/or real cases</p> <p>Makes reasoned case reports or provides case portfolio</p> <p>Gives case presentations</p> <p>Public Health/Community Nutrition</p> <p>Writes report for group education / community projects demonstrating needs assessment, plans and implementation</p> <p>Foodservice Management</p> <p>Assesses the accurate delivery of appropriate meals consistent with the nutrition plan</p> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Writes report on implementation of plan and outcomes</li> </ul>

			<ul style="list-style-type: none"> <li>• Presents evidence of interaction with individuals/groups/populations demonstrating improvement of planned nutrition interventions (simulated cases or real ‘cases’)</li> </ul>
<b>1.2</b>	Engages in collaborative (shared) practice in providing high-quality, cost efficient services to achieve positive health outcomes	<p>a) Establishes collaborative (shared) partnerships, consults with and advises clients, caregivers, team members and other stakeholders to improve care</p> <p>b) Undertakes basic cost-benefit analysis of intervention</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Documents evidence of inter professional involvement in partnership activities to improve care or service</li> <li>• Finds evidence for (and of) quality assurance of dietetic services</li> <li>• Reports on the effective and timely completion of independent work</li> </ul> <p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Provides a case portfolio or case(s) connecting activity and impact resulting in improved care</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Find ways to use time and resources more cost-effectively</li> </ul> <p>Foodservice Management</p>

			<ul style="list-style-type: none"> <li>Writes a report of food service management project(s) with cost-benefit evidence</li> </ul>
<b>1.3</b>	Reflects and reviews own dietetic practice	<p>a) Utilizes the process of reflection<sup>7</sup> to take action on critical incidents<sup>8</sup> (either positive or negative) that reflects professional benefit</p> <p>b) Develops plans for own dietetic practice improvement</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Writes and presents critical incident reflection</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Shows how systematic evaluation of practice provides opportunities for Lifelong learning and on-going assessment of competence</li> <li>Uses feed-back from peers, supervisors and colleagues to write on the value of supervised interaction with colleagues and clients</li> </ul>
<b>1.4</b>	Works independently and in partnership to integrate nutrition and dietetics into overall professional care/service	<p>Accepts personal responsibility and is answerable to others for actions and decisions</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Describes the ethics of communication, including social media</li> <li>Shows agreement with and acts on policies, procedures, and professional ethics through nutrition care notes or other documentation.</li> </ul>

		<p>a) Maintains a critical knowledge of current best practice guidelines and policy statements</p> <p>b) Contributes to team decision-making</p>	<ul style="list-style-type: none"> <li>• Uses reports and feedback by supervisors to show professional role in a multidisciplinary team Clinical Practice</li> <li>• Reports examples where limitations of own knowledge and skills required individual clients to be referred to other competent professionals.</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Demonstrates the use of best practice guidelines and policy statements for a safe and professional service</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Works according to the principles of a non-discriminatory client centred practice</li> <li>• Reports on assessment approaches that utilise principles of community development</li> </ul> <p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Presents a case portfolio(s) showing client centred intervention(s)</li> </ul>
--	--	--	--

<p><b>1.5</b></p>	<p>Respects the unique emotional, social, cultural, religious, ecological needs of individuals, groups, communities or populations</p>	<p>a) Recognises social, cultural, regional and religious influences on food selection and the provision of nutrition interventions.</p> <p>b) Uses client-centred intervention and community development approaches</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Takes into account diverse sociocultural situations, ability and resources of clients when planning nutrition care or services</li> </ul> <p>Public Health/Community Nutrition or Foodservice Management</p> <ul style="list-style-type: none"> <li>• Demonstrates cultural competency and how diverse socio-cultural groups and diversity within socioeconomic status guides community projects.</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Works according to the principles of a non-discriminatory client centred practice</li> <li>• Reports on assessment approaches that utilise principles of community development</li> </ul> <p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Presents a case portfolio(s) showing client centred intervention(s)</li> </ul>
-------------------	--	--	---

<b>2.0 Evidence Based Practice and Application of Research</b>			
	Competency	Behavioural objectives or learning outcomes	Examples of Behaviour
<b>2.1</b>	Systematically search, judge, interpret and apply findings from food, nutrition, dietetic, social, behavioural and education sciences into practice	<p>a) Can demonstrate skills in independent searching of scientific literature and other relevant information</p> <p>b) Interprets, analyses, synthesises and critically appraises research findings and their applicability to practice</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Writes an evidence based report to justify a nutritional intervention</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Works showing a logical, reasoned approach to dietetic practice</li> </ul> <p>Clinical Practice</p> <ul style="list-style-type: none"> <li>Presents case studies showing an evidenced based approach with reasoned conclusions</li> <li>Shows through care plans that problem solving skills have been used to provide a justified approach to practice</li> </ul>

2.2	Identify, design and participate in research and audit to enhance the practice of dietetics	<p>a) Participates in research or evaluation or audit projects within the field of nutrition and dietetics</p> <p>b) Uses principles of research design, data management, analyses and interpretation in dietetic practice</p> <p>c) Shows how results from audit/research activities can be used to enhance own practice</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Reports on how dietetic practice was audited against standards and proposes future actions</li> <li>• Writes a research, or audit project report in the field of dietetics and nutrition</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Develops and uses systems to manage data and information which is shown to enhance dietetic practice</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Keeps a reflective portfolio to show how systematic monitoring and use of evidence have informed and changed own practice</li> <li>• Uses reports from supervisors and peers to show how own practice has changed due to audit outcome</li> </ul>
-----	---	---	--

<p>2.3</p>	<p>Apply food and nutrition science to solve problems</p>	<p>a) Collects and analyses relevant information related to an identified issue and proposes a solution</p> <p>b) Provides evidence based rationale to resolve the identified issue</p> <p>c) Discusses ways dietitian-nutritionists can contribute to the research process.</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Develops and presents a protocol for a research project Public Health/Community Nutrition</li> <li>• Writes a project report demonstrating information gathering from and for communities/groups and prioritising issues</li> </ul> <p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Shows in nutrition care process notes how issues have been resolved and solutions implemented</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Leads a discussion on how dietitian-nutritionists have contributed to a research outcome</li> <li>• Participates in research as part of the team</li> </ul>
------------	---	--	--

<p><b>2.4</b></p>	<p>Adopts an evidence based approach to dietetics practice. Adopts an evidence based approach to dietetics practice</p>	<p>a) Judges the evidence to answer practical dietetic questions b) Uses contextual factors and stakeholder perspectives to justify decisions</p>	<p>Any Practice Setting • A case portfolio shows justified evidence-based practice • Demonstrates professional judgement in the use of evidence Clinical Practice • Case notes and care plans clearly show how evidence has been used to guide decisions</p>
<p><b>2.5</b></p>	<p>Shares evidence based dietetics and nutrition with colleagues and key stakeholders</p>	<p>a) Summarizes and communicates research information appropriate to the 'audience'. b) Shares own knowledge, skills and experiences with others</p>	<p>Any Practice Setting • Writes a summary of evidence based dietetics or nutrition in response to questions Any Practice Setting • Makes an oral or poster presentation of thesis, dissertation, research projects or case studies</p>

### 3.0 Quality Assurance of Dietetics Practice

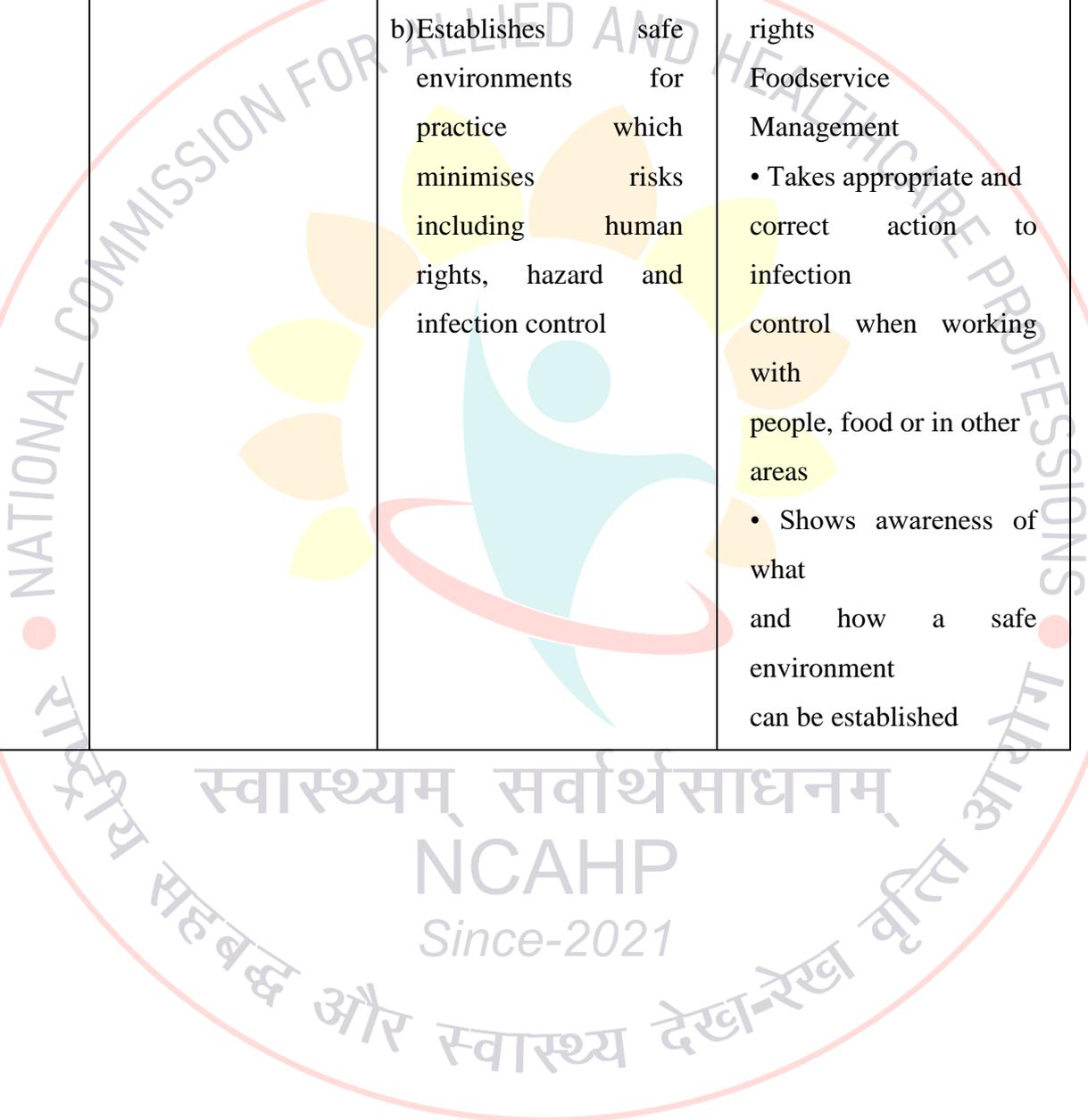
	Competency	Behavioural objectives or learning outcomes	Examples of Behaviour
<b>3.1</b>	Improve practice through continuous and systematic evaluation maintaining clear and concise records of all activities	<p>a) Uses dietetics and other standards to systematically evaluate practice and participate in audit procedures</p> <p>b) Collects data and revises plans to achieve continuous quality improvement across the dietetics service in partnership with others</p> <p>c) Uses current technology in practice to provide evidence for quality assurance purpose</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Locates and summarises dietetic and other standards which are applied for quality assurance Foodservice Management</li> <li>Produces an audit cycle</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>Produces documentation which can be audited successfully Clinical Practice</li> <li>Always uses a standardised system for collecting patient records Foodservice Management</li> <li>Develops a plan for quality improvement involving stakeholders</li> <li>Discusses the ways a service can be evaluated</li> </ul>

<p><b>3.2</b></p>	<p>Maintain competence to practice through lifelong learning (LL)</p>	<p>a) Demonstrates regular review of own practice and competence</p> <p>b) Implements a plan for professional development.</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Routinely seeks feedback on performance as a dietitian nutritionist from peers, colleagues, clients and others</li> <li>• Identifies own competences and compares to published professional competences</li> <li>• Produces a Lifelong Learning (LLL) plan</li> </ul> <p>Any Practice Setting Sets themselves continuous improvement tasks</p> <ul style="list-style-type: none"> <li>• Discusses choice of activities to show how they meet LLL plan</li> <li>• Actively shows how professional development activities meet the LLL plan</li> </ul>
-------------------	---	--	---

<p><b>3.3</b></p>	<p>Assumes leadership, educational and mentoring roles</p>	<p>a) Participates in supervision, teaching and mentoring in processes with peers, students and colleagues</p> <p>b) Demonstrates leadership skills in a variety of formal and informal roles</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Maintains professional boundaries, roles and responsibilities when working with others</li> <li>• Engages in a formal or informal learning partnership with clear agreed outcomes</li> <li>• Uses a range of techniques to encourage others to reflect on their professional progress</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Demonstrates commitment to achieving a successful outcome for the project and the team</li> <li>• Encourages others to value each other's abilities and contribution</li> </ul>
-------------------	--	---	--

<p><b>3.4</b></p>	<p>Use current technologies, to collect and manage data responsibly and professionally for information and reporting purpose</p>	<p>a) Develops, plans and gathers valid, reliable and comprehensive information using current technology</p> <p>b) Assesses the relevance, importance and validity of data gathered both electronically and by other means</p>	<p>Clinical Practice</p> <ul style="list-style-type: none"> <li>Shows how use of electronic health records or health management systems in patient care can be assessed for relevance</li> </ul> <p>Public Health/Community Nutrition</p> <ul style="list-style-type: none"> <li>Produces evidence of how digital literacy has been successfully used in IT related projects</li> </ul> <p>Foodservice Management</p> <ul style="list-style-type: none"> <li>Leads a discussion on the validity of results from nutrition software used to analyse nutrient composition of diets</li> </ul>
-------------------	--	--	---

3.5	Accepts responsibility for ensuring practice meets legislative requirements	<p>a) Complies with current legislation that applies to the professional context in which dietitians-nutritionists work</p> <p>b) Establishes safe environments for practice which minimises risks including human rights, hazard and infection control</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Adopts an approach to their work and role which shows concern for human rights</li> </ul> <p>Foodservice Management</p> <ul style="list-style-type: none"> <li>• Takes appropriate and correct action to infection control when working with people, food or in other areas</li> <li>• Shows awareness of what and how a safe environment can be established</li> </ul>
-----	---	---	--



<b>4.0 Professional relationships, communication and partnerships</b>			
	Competency	Behavioural objectives or learning outcomes	Examples of Behaviour
<b>4.1</b>	Communicate effectively and responsibly using multiple means	<p>a) Uses a communication style to meet the needs of stakeholder</p> <p>b) Writes and speaks clearly, concisely and professionally using professional terminology</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Adapts communication style to meet the needs and level of understanding of the individual or group</li> <li>• Uses encouraging and active listening techniques to maintain rapport</li> <li>• Explains how the use of nonverbal communications can be used to evaluate effective communication</li> <li>• Develops and explains the uses of teaching materials for users of differing abilities</li> <li>• Develops (in writing, visually or verbally) and evaluates a client resource information package</li> </ul>

			<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Seeks feedback on type and style of communication from peers, supervisors and colleagues</li> <li>• Presents and discusses an audit of communication styles and language of printed or other media</li> </ul> <p>Foodservice Management</p> <ul style="list-style-type: none"> <li>• When working and communicating with teams always checks for team members' understanding</li> </ul>
4.2	Demonstrate interpersonal skills, professional autonomy and accountability	a) Establishes trust and rapport with stakeholders	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Takes corrective action during one on one conversations to restore rapport and understanding</li> <li>• Accepts accountability and responsibility for own actions</li> </ul> <p>Clinical Practice</p>

			<ul style="list-style-type: none"> <li>• Seeks views of supervisors/teachers on the establishment of trust and rapport during interviews</li> <li>• Writes a reflective log about an encounter where professional autonomy was challenged.</li> </ul>
4.3	Build partnerships, networks and promote the dietetics profession	<p>a) Shows how opportunities for partnerships and networks can be used effectively</p> <p>b) raise the profile of the profession through professionalization and networking.</p>	<p>Any practice Setting</p> <ul style="list-style-type: none"> <li>• Records how a professional encounter was used to promote/introduce the expertise of dietitian nutritionists</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Works and behaves as a professional dietitian/nutritionist using the professional code of conduct</li> </ul>

			<ul style="list-style-type: none"> <li>• Writes an article for a professional dietetics newsletter or other media source</li> <li>• Serves on a committee and promotes the role of the dietitian-nutritionist</li> </ul>
<b>4.4</b>	Seek, support and promote opportunities for learning among peers, and others	<p>a) Identifies and uses learning episodes to support team members, peers and others</p> <p>b) Engages in the development and use of appropriate learning materials to support professional development</p> <p>c) ) Seeks, responds to, and provides, effective feedback</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Encourages others to recognise learning opportunities in daily life to advance practice</li> <li>• Writes a reflective log about a learning opportunity in which team members advanced their understanding of dietetics</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Sets-up or actively participates in a literature review and discussion or a Journal Club</li> <li>• Develops a learning episode and evaluates its effectiveness</li> </ul> <p>Any Practice Setting •</p> <ul style="list-style-type: none"> <li>Monitors and reports on learning undertaken by a peer</li> </ul>

			<ul style="list-style-type: none"> <li>• Pro-actively takes a critical approach to own learning and sets goals and targets for lifelong learning</li> </ul>
4.5	Advocate for the contribution that nutrition and dietetics can make to improve health	<p>Identifies opportunities to change factors affecting health</p> <p>Advocates on behalf of stakeholders to improve health</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Undertakes a project to show how dietetics and dietitian nutritionists can improve nutritional health for an individual or a population (e.g. malnutrition).</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Write a report on how advocacy has changed policies or other situations</li> </ul>



### 5.0 Evidence-Based Practice and Application of Research

	Competency	Behavioural objectives or learning outcomes	Examples of Behaviour
5.1	Integrates knowledge of food and food systems, human nutrition and dietetics in the provision of services	<p>Uses knowledge of food, nutrition and dietetics in the prevention and treatment of disease and promotion of health</p> <p>Explains why new and revised information about food, human nutrition and dietetics is necessary for provision of a safe service</p>	<p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Writes nutrition care plan / case reports / meal plans for simulated and/or real cases which shows the use of a knowledge of food and nutrition</li> <li>• Uses food composition data appropriately when considering a care plan</li> </ul> <p>Public Health/Community Nutrition</p> <ul style="list-style-type: none"> <li>• Makes plans for group education / community projects demonstrating needs assessment and giving rationales / evidence for plans and implementation</li> </ul> <p>Foodservice Management</p>

			<ul style="list-style-type: none"> <li>• Reports by supervisors confirm use of knowledge of food and food systems, human nutrition and dietetics</li> <li>• Describe aspects of food systems from procurement through preparation and distribution that affect nutritional well-being of patients/clients</li> <li>• Shows the application of knowledge of food science and basic food preparation techniques when speaking with users</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Finds and shares new knowledge about human nutrition and dietetics with colleagues</li> </ul>
--	--	--	--

5.2	Integrates knowledge of biomedical sciences in the provision of services	a) Uses knowledge of biomedical sciences (e.g. nutrition, anatomy, physiology, immunology, biochemistry, epidemiology, genetics, pharmacology) to support safe practice	<p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Presents case reports which show how a knowledge of biomedical sciences has informed the care of patients</li> <li>• Uses biochemical parameters, physical and anthropometric data, laboratory tests (compared to reference values and standards) when formulating care plans</li> </ul>
5.3	Integrates a knowledge of behavioural and social sciences in the provision of dietetic services	<p>a) Can develop a basic business plan for dietetics and nutrition services</p> <p>b) Shows how leadership, management skills and resources (financial, human, physical and/or material resources) affects service provision</p>	<p>Clinical Practice</p> <ul style="list-style-type: none"> <li>• Shows how theories of behaviour change are used in practice to improve eating behaviours</li> </ul> <p>Foodservice Management</p> <ul style="list-style-type: none"> <li>• Provides evidence of how management of individual cases or food service has used behavioural and social sciences, for example, where health inequalities are present</li> </ul>

<p><b>5.4</b></p>	<p>Integrates business and management principles and skills in the provision of service</p>	<p>a) Can develop a basic business plan for dietetics and nutrition service</p> <p>b) Shows how leadership, management skills and resources (financial, human, physical and/or material resources) affects service provision</p>	<p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Writes a basic business plan for nutrition and dietetic services using business, financial and management principles and skills</li> </ul> <p>Any Practice Setting</p> <ul style="list-style-type: none"> <li>• Writes a reflective log entry on teamwork and group work tasks or activities at university or in real world settings, considering integration of business, financial and management principles and skills</li> </ul>
<p><b>5.5</b></p>	<p>Integrates a knowledge of organisational, professional and legislative requirements in the provision of dietetic services</p>	<p>c) Recognises how a systematic understanding of the relevant organisational and legislative requirements relates to a safe professional dietetics service</p> <p>b) Explains how a systematic understanding of relevant professional requirements can affect a safe and professional service</p>	<p>Foodservice Management</p> <ul style="list-style-type: none"> <li>• Reports on how organisational and legislative requirements (e.g. Health &amp; Safety Regulations, Food &amp; Drug Regulations, Nutrition Labelling Regulations) were recognised during the practical placement</li> </ul> <p>Any Practice Setting</p>

			<ul style="list-style-type: none"> <li>• Documents evidence of compliance with relevant professional codes, guidelines and standards of practice and ethics</li> <li>• Shows how a critical incident reflection related to professional or legal issue affected subsequent practice</li> </ul>
--	--	--	--

**Competency Standards for Dietitian-Nutritionists Minimum requirements for entrance into the profession at the point of qualification**

**References**

1. Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. ACEND Accreditation Standards for Internship Programs in Nutrition and Dietetics leading to the RD credential. 2012. Available from [www.eatright.org/cade](http://www.eatright.org/cade)
2. Bologna Declaration explained; can be found at <http://europa.eu.int/comm/education/policies/educ/bologna/bologna.pdf>
3. Dietitians Association of Australia National Competency Standards from Dietitians in Australia 2015 available from [http://daa.asn.au/wpcontent/uploads/2015/03/3\\_Revised-NCS-2015-Pre-Publish\\_FINAL.pdf](http://daa.asn.au/wpcontent/uploads/2015/03/3_Revised-NCS-2015-Pre-Publish_FINAL.pdf)
4. Dubois, D. (Ed.) (1998), The competency casebook. Amherst, MA: HRD, & Silver Spring MD: International Society for Performance Improvement.
5. European Federation of the Associations of Dietitians DIETS2 Thematic Network for Dietetics. European Dietetic Advanced Competencies 2012 available from [www.thematicnetworkdietetics.eu](http://www.thematicnetworkdietetics.eu)

6. Epstein R and Hundert E. Defining and assessing professional competence. JAMA. 2002; 287: 226-35.
7. European Federation of the Associations of Dietitians DIETS2 Thematic Network for Dietetics. European Dietetic Competences and their Performance Indicators attained at the point of qualification and entry to the profession of Dietetics 2009 available from [www.efad.org](http://www.efad.org)
8. European Federation of the Associations of Dietitians DIETS2 Thematic Network for Dietetics. Pedagogic Standards for dietetic placement Teachers 2013, available from [www.efad.org](http://www.efad.org)
9. Fernandez N, Dory V, Ste-Marie L, Chaput M, Charlin B and Boucher A. Varying conceptions of competence: an analysis of how health science educators define competence. Med Educ. 2012; 46: 357-65.
10. Frank JR, Mungroo R, Ahmad Y, Wang M, De Rossi S and Horsley T. Toward a definition of competency-based education in medicine: a systematic review of published definitions. Med Teach. 2010; 32: 631-7.
11. Holmboes ES. Realizing the promise of competency-based medical education. Acad Med. 2015 ;90(4):411-3.
12. Khan K and Ramachandran S Conceptual framework for performance assessment: competency, competence, and performance in the context of assessments in healthcare – deciphering the terminology. Medical Teacher 2012;34:920-928
13. Malaysian Competencies 2014 available from [www.dietitians.org.my](http://www.dietitians.org.my)
14. McConnell E A Competence vs Competency Nursing Management 2001: 32(5):14
15. Partnership for Dietetic Education and Practice (PDEP-PFPN) The Integrated Competencies for Dietetic Education and Practice ICDEP 2013. Available from [www.dietitians.c](http://www.dietitians.c)

*Content is Adapted from: International Competency Standards for Dietitian-Nutritionists Copyright International Confederation of Dietetic Associations 2016. All rights reserved. Permission is given to reprint this full document with ICDA copyright included.*



## Chapter 6

### Minimum Standard Requirements:

#### Bachelor in Nutrition and Dietetics program

All existing Nutrition and Dietetics Colleges or A new College will impart Nutrition and Dietetics education is suggested the following conditions are fulfilled :

1) Infrastructural, Functional & Equipment, and Human Resource Requirements The establishment of a Nutrition and Dietetics college – No person shall establish a college/institute except after obtaining prior permission from the National Commission (NCAHP). Nutritional Sciences education prepares a person for independent practice and involves extensive clinical training in almost every specialty & super specialty of nutritional care. The following organizations shall be eligible to apply for permission to set up a Nutrition and Dietetics College, namely: -

1. A State Government/Union territory;
2. A University and Deemed to be a University
3. An autonomous body promoted by Central and State Government by or under a Statute for medical education;
4. A society registered under the Societies Registration Act, 1860 (21 of 1860) or corresponding Acts in States; or
5. A public religious or charitable trust registered under the Trust Act, of 1882 (2 of 1882) or the WAKFS Act, 1954 (29 of 1954).

#### Hospital / Hospital Attachment

- If the college is on the premises of MCI/NMC permitted/recognized Medical College as constituent college, then, there is no requirement for attachment to any other hospital.
- In all other cases Proof of availability of own/attached hospital (Government/Private) for clinical training of 30 students shall be furnished (student: OPD ratio of 1:5). The hospital must be within a 20 km radius of the College. The college must provide mandatory bus service to the students if the hospital is located more than 1 km away from the College. Within 5 years of application of these Rules, the colleges must have their Own Prescribed Hospital in the college Premises.

- College can be affiliated to a maximum five (05) hospitals having indoor and outdoor facility in the above-mentioned specialty clinics.
- Tie-up hospitals cannot get attached to more than two colleges. If the affiliated hospital is attached with two colleges, the OPD strength must be adequately divided among the colleges as per the prescribed student: OPD ratio.
- The affiliated hospital shall provide information regarding any MOU with other colleges, if any & MOU should be for at least five years.
- The MOU should mention the available clinical specialties, patient loads, and availability of required equipment for clinical training with names and designations of the faculties responsible for the training in the hospital.
- Faculty: The college/institute must arrange for Nutrition and Dietetics faculty members for supervision and clinical teaching of students inside the hospital.
- Hospitals may recruit its Registered Clinical Dietitians for supervision and training of Nutrition and Dietetics students and supervision of interns

#### **Land And Building**

- If the college is on the premises of a permitted/ recognized medical college, no separate land is required. Existing norms of land for medical college will suffice. Besides that, the constructed area/Building norms for Nutrition and Dietetics College must be fulfilled as per the requirement mentioned below. In all other cases, the applicant must provide the land details on which the institution will be established for providing Nutrition and education education. It should be in the name of the society/ Trust/company applying for the same (sale deed/lease/gift deed etc.). That the applicant Institution / Trust should have an independent building for
- Nutrition And Dietetics College and facilities for clinical training as per the curriculum as prescribed by the commission from time to time.
- Such a building should be constructed in such a way that there is adequate parking space and recreational area or open space for students as prescribed by the commission.
- Such a building should have adequate space and should have an outpatient Dietetics department, various laboratories as needed, office space, classrooms, a hostel, and other ancillary facilities. Dietetics OPD and the college can be placed in different buildings within 50 KM (or as per the NCAHP regulations) distance in the same state of India.

- Minimum exclusive built-up area for such a college should be 38400 sq.ft for the intake of 60 students per batch.
- Building should be universally accessible to persons with disability and as per NBCI guidelines (National Building Code of India).
- Building must be recorded on the appellate institute name or if the land is under lease agreement, it must be for at least 10 years
- Building must have requisite clearances from the respective civic and administrative authorities like - Fire NOC, structural stability certificates, land use certificates, etc.
- The building must have CCTV cameras for CCTV surveillance in every area of common use as can be prescribed.
- Biometric facility for students and staff, faculty attendance record/documentation.

### 3) Nutrition and Dietetics Departments

Faculty requirement for UG: Full time (FT); Part-time (PT)

It is recommended that a core faculty and student ratio for UG 1:10 be followed.

Ideally, all the faculties should be full-time. In case of non-availability of full-time faculty, 40% may be part-time/visiting/Ad hoc faculties (non-core subjects only)

Faculties appointed for academics for teaching purposes are considered full-time (Maximum of 8 hours per day or Minimum of 40 hours per week).

Qualified Dietitians may be taken as part-time Visiting faculties

### **Guidelines of Building and Laboratories**

#### **Teaching Block**

For a college with an annual admission capacity of 60 students, the constructed area of the college should be a minimum of 38400 sq.ft.

The details of the constructed area are given below for an admission capacity of 60 students.

S. No.	Teaching Block	Minimum Area (in sq. feet)
1.	Lecture Hall	8 @ 900=7200
2.	Skill labs for 30 students 1. Nutrition Lab (Food Analysis) 2. Nutritional Biochemistry 3. Institutional Food Service Management 4. Food Microbiology Lab 5. Anatomy & Physiology Lab 6. Nutritional Assessment Lab	1500 1500 1500 1500 1500 1500
3.	Computer lab (1:5 computer student ratio as per student intake)	2000
4.	A.V.Aids Room	1000
5.	Multipurpose Hall	3000
6.	Common Room for Boys	1000
7.	Common Room for Girls	1000
8.	Principal Room with toilet	500
9.	Vice Principal Room	300
10.	Library	3000
11.	One Room for each Head of Departments	5@200=1000
12.	Faculty Room with Ladies and Gents Toilet	2400
13.	Provisions for Toilet for Boys	600
14.	Provisions for Toilet for Girls	600
15.	Admin Room	800
16.	Waiting/Lounge area with Ladies' and Gent's Toilet	1000
17.	Store Room	5 @ 500=2500
18.	Canteen with Pantry	1500
	Total Area	38400 sq.ft.

## Clinical Infrastructure

The minimum Equipment (for 30 students) for the Bachelor in Nutrition and Dietetics in Honors Program for various labs is as follows:

1. Nutrition Lab (Food Analysis)
2. Nutritional Biochemistry
3. Food Production and Service Lab Management
4. Meal Management/Dietetics Lab
5. Food Microbiology
6. Anatomy & Physiology Lab

### 1. Nutrition Lab

Undergraduate students will learn how to measure Body mass, body composition, and the assessment of nutritional status: anthropometric, biochemical lab., clinical and dietary intake.

#### Equipment/Instrument

- Weighing Machine Digital platform scale 200Kg/BMI electronic scale - 2 no
- Heigntometer -medical height measuring weight scale, Stadiometer -2no
- Tape for circumference- Non-stretchable tape - 2 no
- MUAC tape - Coded tape -2
- Skinfold measurements - Harpenden Skinfold Calipers -1no.
- Infantometer -1
- STEP for fitness test -1
- Stadiometer
- Calibration weights -1
- BP Instrument = Digital/Manual -1 no.
- Digital food weighing Balance-1no.
- Body Composition Analyzer- 1 no.

## 2. Nutritional Biochemistry Lab

- Weighing balance – Regular with Beam balance - 4
- Digital weighing balance - 2
- pH meter
- Water Bath
- Colorimeter- 2
- Spectrophotometer- 1
- Distillation apparatus
- Soxhlet glass apparatus
- Nitrogen analyzer – glass unit
- RM number - glass unit
- Hot air oven
- Muffle furnace
- centrifuge
- Refrigerator
- Test tube stand

### Glassware

- Beakers
- Test tubes & Test Tube Holder
- Burette + Burette stand
- Standard flask
- pipettes
- Conical flask

## 3. Institutional Food Service Management

### Cleaning and Washing

- Stainless steel commercial kitchen sinks
- Dishwasher
- Washing machine (Clothes)

## Storage

- Refrigerator Commercial
- Deep freezer
- Water storage unit
- Non perishable food storage containers
- Perishable Food storage containers
- Hot food storage racks (cooked food)

## Food preparation

- Stainless steel LPG burner
- Gas stock pot stove
- Commercial Mixer
- Heavy duty mixer and grinder
- Induction bulk cooking stove
- Wet grinder
- Roti maker
- steaming equipment
- frying pans
- Cooking pots
- Microwave
- Oven
- Exhaust fans
- Coffee and Tea machines
- Utensils
- Cooking vessels (assorted sizes)
- Kettles
- Steaming equipment
- Idly steamer
- Dosa pans
- Colanders
- Cutting boards
- Double boilers
- funnels

- graters
- Kitchen knives (assorted)
- Measuring spoons and cups (assorted)
- Weighing scales
- spatulas
- Ladles
- Peelers
- Mashers
- Cutlery
- Crockery
- Assorted serving spoons, cups, plates and bowls
- Choppers
- Food processor
- Motor and Pestle
- Can openers
- Slicers
- Pressure cookers
- Frying pans and pots
- Deep frying pan
- Hot and cold food displays
- Thalis with compartments

#### **Safety Equipment**

- Fire extinguisher
- Hot food holding gloves

#### **4. Meal Management/Dietetics Laboratory**

##### **Equipment/Instrument -**

- Gas stoves /Induction stove - 15-20 no.
- Refrigerator -1
- Oven -1
- Microwave-1
- Mixer/Grinder/Chopper-1

### **Utensils for Preparation and Cooking - 15-20 sets**

- Types of kadai
- Pressure Cooker
- Steamers for idli, dhokla, dumplings etc.
- Tawa
- Frying Pan, saucepan
- Sandwich maker/ Griller
- Knives, peelers, graters
- Spatula, spoons, Slotted Turner, Slotted Spoon, Solid Spoon, Soup Ladle, Whisk, Tong,
- Set of 5 Measuring Cups,
- Set of 5 Measuring Spoons
- Measuring jar
- Chopping board
- Mixing bowls

### **Utensils for Serving- 15-20 sets**

- Plates- full, quarter
- Bowls- Large, medium and small
- Soup bowl and spoons
- Teacups/ Mugs
- Casserole
- Microwave-proof serving bowls
- Trays
- Spoons
- Glasses
- Serving Spoons

### **Utensils for Storage -**

- Large, Medium and small boxes for provisions
- Storage cupboards
- Vegetable Bags
- Baskets for vegetables and fruit

### **Serving Linen -**

- Table mats etc.
- Cloth napkins
- Table Covers
- Kitchen towels

### **5. Food Microbiology Laboratory**

- Weighing balance
- pH meter
- Autoclave
- Hot air oven
- Laminar flow (Vertical /Horizontal)
- Colony counter
- Light Microscope
- Fume chamber
- Incubator
- Refrigerator
- Centrifuge
- Bunsen Burner
- Gas Cylinder
- Glassware -
- Test tubes
- Petri dishes
- Wire loop
- Pipettes
- Burettes
- Beakers
- Standard flask
- Test tube holder and Test tube stand
- Conical flask

## 6. Anatomy and Physiology Laboratory Models -

- Human torso
- Human Respiratory system
- Organ system

### Individual organs -

- Human lungs
- Kidney and Bladder
- Brain
- liver and pancreas
- Sahli's pipette
- Microscope (Light/ Digital)
- Hot air Oven
- Colorimeter
- Haemoglobin meter
- Centrifuge
- Blood pressure monitor
- Sphygmomanometer
- Stethoscope
- Haemocytometer
- Bunsen Burner
- Refrigerator
- Tripod stand
- Steamers
- Water bath
- Electric kettle
- Balances
- Thermometer
- Wash bottles
- Body fat Analyser (Desirable)
- Brushes
- Tongs
- Cotton

- Spirit
- Syringes
- Hb Pipettes
- Stop watch
- Mounted slides
- Cover slip
- Test tube holder
- Test tubes
- Capillary tubes
- Crucible
- Lancets
- Pipettes
- Beakers
- Graduated Spatula
- Watch glass
- Tissues -
- Epithelial
- Connective
- Muscular
- Nervous
- Bone
- Charts – Different Concepts/ aspects
- A school of Nutrition and Dietetics should have an attached clinic/hospital to cater to clinical learning.

**Guidelines for standalone institutes:**

A clear legally vetted (Notarised stamp paper) Memorandum of understanding (MoU) needs to be provided for any institute/hospital to share the infrastructure and it should follow the NCAHP guidelines

### **Desirable Batch size for Bachelor of Nutrition and Dietetics in Honors :**

It should be proportional to the OPD (Outpatient Department) of the clinic/hospital. Each student should be able to examine a minimum of 5 patients per day. For example: For an OPD of 150, one can have an intake of 30 students per batch. A clinic/hospital having an OPD of 500 can have an intake of 100 students per batch. If the intake is more than 30, infrastructure should also be increased proportionally. Student and faculty ratio is 10:1. The maximum batch size should be proportional to infrastructure, number of faculties, and OPD.

### **Desirable Batch size for Masters in Bachelor of Nutrition and Dietetics:**

A maximum of 25% of the Bachelor's program shall be the batch size of a post-graduate program. Teachers at the level of Assistant Professor II or Scientist D and above shall guide the students. The teacher-student ratio for dissertation guidance shall be 1:4.

### **Faculty requirement for PG:**

Principal/Vice Principal/HOD is the same for both UG and PG programs.

It is recommended that a core faculty and student ratio of 1:3 for PG to be followed.

Student-faculty ratio needs to be 3:1 at least Associate Professor Level for PG teaching. In case of non-availability of full-time faculty, 30% may be part-time/visiting/Ad hoc faculties.

Separate facilities need to be provided for PG students/Fellowship programs/PhD programs.

स्वास्थ्यम् सर्वार्थसाधनम्  
NCAHP  
Since-2021

### Library Details:

Item	Requirements
Text Books As per the syllabus; one copy of the Book per 10 students.	Approximately 450 books for 30 intake and 900 books for 60 intake for UG.
Reference Books	100 Advanced Books As per requirement
Journals	At least 2 international and 2 national journals
subscription to electronic databases/e-journals	Required
Mandatory Internet facility Access to e-library Equipment	Minimum 15 computer terminals for 60 students/8 for 30 students

### Suggested faculty strength for UG

30 seats (5*30=150 students)	40 seats (5*40=200 students)	50 seats (5*50= 250 students)	60 seats (5*60= 300 students)	100 Seats (5*100= 500 students)
Professor-1	Professor-1	Professor-1	Professor-2	Professor-4
Associate Professor-2	Associate Professor-3	Associate Professor-4	Associate Professor-4	Associate Professor-8
Assistant Professor-12	Assistant Professor-16	Assistant Professor-20	Assistant Professor-24	Assistant Professor-38



## References:

1. Narayan, K Kar, S Gupta, N. From 'Paramedics' to 'Allied Health Professionals': Landscaping the Journey and Way Forward. Public Health Foundation of India: New Delhi, India, 2012.
2. Allied Health Professions Federation. AHPs involvement in health and social care 2011. Available from:  
[http://www.ahpf.org.uk/files/ahpf\\_gov\\_briefing\\_v7\\_09-05-11.pdf](http://www.ahpf.org.uk/files/ahpf_gov_briefing_v7_09-05-11.pdf)
3. Medical Council of India. Vision 2015. Published March 2011. Available from:  
[http://www.mciindia.org/tools/announcement/MCI\\_booklet.pdf](http://www.mciindia.org/tools/announcement/MCI_booklet.pdf)
4. World Health Organization. World report on vision. 2019.  
<https://www.who.int/publications/i/item/9789241516570>
5. International Agency for Prevention of Blindness. 2030 Insight.  
<https://www.iapb.org/about/2030-insight/>
6. McCormick, I., Mactaggart, I., Resnikoff, S., Muirhead, D., Murthy, G. V., Silva, J. C & Eye Health Indicators Prioritisation Project Group. (2022). Eye health indicators for universal health coverage: results of a global expert prioritization process. British Journal of Ophthalmology, 106(7), 893-901.
7. THE NATIONAL COMMISSION FOR ALLIED AND HEALTHCARE PROFESSIONS ACT, 2021.

Note: All members of the Nutritional Sciences task force have deliberated upon and provided counsel regarding the aforementioned curriculum, drawing from their extensive years of experience in the field of Nutrition and Dietetics. It is noted that all aspects delineated within the curriculum are subject to modification by the regulations set forth by the National Commission for Allied & Healthcare Professions (NCAHP)