



# AMRITA

## VISHWA VIDYAPEETHAM

A Multi Campus University with 'A' Grade Accreditation by NAAC

## AMRITA SCHOOL OF MEDICINE

### Amrita Centre for Allied Health Sciences

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## CURRICULUM

### MSc Clinical Nutrition and Food Science

(With effect from 2015-2016 onwards)



# Our Chancellor



## **SPIRITUAL PRINCIPLES IN EDUCATION**

***“In the gurukulas of ancient rishis, when the master spoke it was love that spoke; and at the receiving end disciple absorbed of nothing but love. Because of their love for their Master, the disciples’ hearts were like a fertile field, ready to receive the knowledge imparted by the Master. Love given and love received. Love made them open to each other. True giving and receiving take place where love is present. Real listening and ‘sraddha’ is possible only where there is love, otherwise the listener will be closed. If you are closed you will be easily dominated by anger and resentment, and nothing can enter into you”.***

**“Satguru Mata Amritanandamayi Devi”**

## Introducing AIMS

India is the second most populous nation on earth. This means that India's health problems are the world's health problems. And by the numbers, these problems are staggering 41 million cases of diabetes, nearly half the world's blind population, and 60% of the world's incidences of heart disease. But behind the numbers are human beings, and we believe that every human being has a right to high-quality healthcare.

Since opening its doors in 1998, AIMS, our 1,200 bed tertiary care hospital in Kochi, Kerala, has provided more than 4 billion rupees worth of charitable medical care; more than 3 million patients received completely free treatment. AIMS offers sophisticated and compassionate care in a serene and beautiful atmosphere, and is recognized as one of the premier hospitals in South Asia. Our commitment to serving the poor has attracted a dedicated team of highly qualified medical professionals from around the world.

The Amrita Institute of Medical Sciences is the adjunct to the term "New Universalism" coined by the World Health Organization. This massive healthcare infrastructure with over 3,330,000 sq. ft. of built-up area spread over 125 acres of land, supports a daily patient volume of about 3000 outpatients with 95 percent inpatient occupancy. Annual patient turnover touches an incredible figure of almost 800,000 outpatients and nearly 50,000 inpatients. There are 12 super specialty departments, 45 other departments, 4500 support staff and 670 faculty members.

With extensive facilities comprising 28 modern operating theatres, 230 equipped intensive-care beds, a fully computerized and networked Hospital Information System (HIS), a fully digital radiology department, 17 NABL accredited clinical laboratories and a 24/7 telemedicine service, AIMS offers a total and comprehensive healthcare solution comparable to the best hospitals in the world. The AIMS team comprises physicians, surgeons and other healthcare professionals of the highest caliber and experience.

AIMS features one of the most advanced hospital computer networks in India. The network supports more than 2000 computers and has computerized nearly every aspect of patient care including all patient information, lab testing and radiological imaging. A PET (Positron Emitting Tomography) CT scanner, the first of its kind in the state of Kerala and which is extremely useful for early detection of cancer, has been installed in AIMS and was inaugurated in July 2009 by Dr. A. P. J. Abdul Kalam, former President of India. The most recent addition is a 3 Tesla Silent MRI.

The educational institutions of Amrita Vishwa Vidya Peetham, a University established under section 3 of UGC Act 1956, has at its Health Sciences Campus in Kochi, the Amrita School of Medicine, the Amrita Centre for Nanosciences, the Amrita School of Dentistry, the Amrita College of Nursing, and the Amrita School of Pharmacy, committed to being centres of excellence providing value-based medical education, where the highest human qualities of compassion, dedication, purity and service are instilled in the youth. Amrita School of Ayurveda is located at Amritapuri, in the district of Kollam. Amrita University strives to help all students attain the competence and character to humbly serve humanity in accordance with the highest principles and standards of the healthcare profession.

**Table of Contents**  
**Part I – Rules and Regulations**

<b>SI No</b>	<b>Contents</b>	<b>Page No.</b>
I.	Post Graduate Programs	
	1. Details of Post Graduate Courses	7
	2. Medium of Instruction	7
II.	3. Eligibility	7
	General Rules	
	1. Duration of the course	8
	2. Discontinuation of Studies	8
	3. Educational Methodology	8
	4. Academic Calendar	9
III.	Examination Regulations	
	1. Attendance	9
	2. Internal Assessment	10
	3. University Examination	11
	4. Eligibility to appear for University Examination	12
	5. Valuation of Theory – Written Paper	12
	6. Supplementary Examination	12
7. Rules regarding Carryover subjects	13	
IV.	Criteria for Pass in University Examination – Regulations	
	1. Eligibility criteria for pass in University Examinations	13
	2. Evaluation and Grade	13
V.	Internship	
	1. Eligibility for Internship – Regulations	14
	2. Attendance and leave details during Internship	15
VI.	General considerations and Teaching / Learning Approach	15

## Table of Contents

### Part II – Syllabus

<b>SI. No</b>	<b>Contents</b>	<b>Page No.</b>
1	Introduction	17
2	Aims and Objectives	17
3	Justification of the course	17
4	Experience with the course in other institutions	18
5	Applied Physiology	19
6	Clinical Biochemistry	21
7	Food Science	24
8	Food Analysis and experimental cookery	27
9	Advanced Nutrition	28
10	Applied Nutrition	30
11	Research Methodology and Biostatistics	31
12	Food Microbiology	33
13	Pharmacology	36
14	Medical Nutrition Therapy – I	37
15	Medical Nutrition Therapy – II	38
16	Nutrition in critical care	39
17	Scheme of Examination	42

# Part I

## Rules and Regulations

## I. Post Graduate Programmes (Master of Sciences)

1. Details of Post Graduate Courses :			
Sl. No.	Course	Duration	Conditions of Eligibility for admission to the course
1	Medical Laboratory Technology (MLT)	2 years	Pass in B.Sc MLT (4 year regular courses only)
2	Neuro-Electro Physiology	3 years + 6 months Internship	B.Sc Physics
3	Swallowing Disorders and Therapy	2 years	BASLP
4	Clinical Research		MBBS.BDS/BAMS/BHMS/B.Pharm/B.Sc Allied Health Sciences/B.Sc Biotechnology/B.Sc Nursing/B.Sc in any Life Sciences
5	Biostatistics		Graduates in Statistics/Mathematics with paper in Statistics
6	Respiratory Therapy	2 years	B.Sc Respiratory Therapy
7	Clinical Nutrition	2 years + 6 months Internship	B.Sc., Nutrition Dietetics and Food Service Management /Food Science and Nutrition /Clinical Nutrition and Dietetics Food Service Management and Dietetics/ Home Science (with majors in Nutrition and Dietetics) /Human Science (with majors in Nutrition and Dietetics)

### 1. Medium of Instruction:

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

### 2. Eligibility:

Candidates for admission to the **M.Sc, CLINICAL NUTRITION and FOOD SCIENCE DEGREE COURSE UNDER ALLIED HEALTH SCIENCES** should have passed Degree in any one of the following courses from a recognized University B.Sc., Nutrition Dietetics and Food Service Management /Food Science and Nutrition / Clinical Nutrition and Dietetics Food Service Management and Dietetics/ Home Science (with majors in Nutrition and Dietetics) /Human Science (with majors in Nutrition and Dietetics)

## **II. General Rules:**

Admissions to the courses will be governed by the conditions laid down by the University from time to time and as published in the Regulations for admissions each year.

### **1. Duration of the Course**

Duration details are mentioned under clause No.I of this booklet.

Duration of the course	: 2 Years
Weeks available per year	: 52 weeks
Vacation / holidays	: 5 weeks (2 weeks vacation +3 weeks calendar holidays)
Examination (including preparatory)	: 6 weeks
Extra curricular activities	: 2 weeks
Weeks available	: 39 weeks
Hours per week	: 40 hours
Hours available per academic year:	1560 (39 weeks x 40 hours)

### **2. Discontinuation of studies**

Rules for discontinuation of studies during the course period will be those decided by the Chairman /Admissions, Centre for Allied Health Sciences, and Published in the "Terms and Conditions" every year.

### **3. Educational Methodology**

Learning occurs by attending didactic lectures, as part of regular work, from coworkers and senior faculty, through training offered in the workplace, through reading or other forms of self-study, using materials available through work, using materials obtained through a professional association or union, using materials obtained on students own initiative, during working hours at no cost to the student.

### **4. Academic Calendar**

#### **Annual Scheme**

#### **FIRST YEAR**

Commencement of classes	– August
First sessional exam	– 20 October - 30 October



Second sessional exam	– 20 January - 30 January
Model Exam (with practical)	– 15 May - 15 June (includes 10 days study leave)
University exam (with practical)	– 15 June - 15 July (includes 10 days study leave)
Annual Vacation	– After the exam

## **SECOND YEAR**

Commencement of classes	– August
First sessional exam	– 20 October - 30 October
Second sessional exam	– 20 January - 30 January
Model Exam (with practical)	– 15 May - 15 June (includes 10 days study leave)
University exam (with practical)	– 15 June - 15 July (includes 10 days study leave)

## **Internship**

Commencement of internship	– 01 August
Completion of internship	– 31 January

## **III. Examination Regulations:**

### **1. Attendance:**

**80% of attendance (physical presence) is mandatory.** Medical leave or other types of sanctioned leaves will not be counted as physical presence. For those who possess a minimum of 75% attendance, deficiency up to 5% may be condoned on medical or other genuine grounds by the Principal at his sole discretion and as per the recommendation of the Heads of Departments concerned. Students are allowed such condonation only once for entire course of study.

Condonation fee as decided by the Principal has to be paid. Attendance will be counted from the date of commencement of the session to the last day of the final examination in each subject.

### **2. Internal Assessment:**

- 1) Regular periodic assessment shall be conducted throughout the course. At least two sessional examinations in theory and preferably two practical examinations should be conducted in each subject. The model examination should be of the same pattern of the University Examination. Average of the two examinations

and the marks obtained in assignments / oral / viva / practicals also shall be taken to calculate the internal assessment.

- 2) A candidate should secure a minimum of 35% marks in the internal assessment in each subject (separately in theory and practical) to be eligible to appear for the University examination.
- 3) The internal assessment will be done by the department twice during the course period in a gap of not more than six months and final model exam which will be the same pattern of university examination as third sessional examination.

The periods for sessional examinations of first academic year are as follows:

First Sessional Exam: October

Second Sessional Exam: January

Model Exam: May /June

The period for sessional examinations of second academic year are as follows:

First Sessional Exam: October

Second Sessional Exam: January

Model Exam: May /June

- 4) Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, journal club, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.
- 5) Day to day assessment will be given importance during internal assessment, Weightage for Internal assessment shall be 20% of the total marks in each subject.
- 6) Sessional examination as mentioned above and the marks will be conducted and secured by the students along with their attendance details shall be forwarded to the Principal
- 7) Third sessional examinations (model exam) shall be held three to four weeks prior to the University Examination and the report shall be made available to the Principal ten days prior to the commencement of the university examination.

### **3. University Examinations:**

- University Examination shall be conducted at the end of every academic year.
- A candidate who satisfies the requirement of attendance, internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.
- One academic year will be twelve months including the days of the University Examination. Year will be counted from the date of commencement of classes which will include the inauguration day.
- The minimum pass for internal assessment is 35% and for the University Examination is 45%. However the student should score a total of 50% (adding the internal and external examination) to pass in each subject (separately for theory and practical)
- If a candidate fails in either theory or practical paper, he/she has to reappear for both the papers (theory and practical)
- Maximum number of attempts permitted for each paper is five (5) including the first attempt.
- The maximum period to complete the course shall not exceed 6 years.
- All practical examinations will be conducted in the respective clinical areas.
- Number of candidates for practical examination should be maximum 12 to 15 per day
- One internal and external examiner should jointly conduct the theory evaluation and practical examination for each student during the final year.

### **4. Eligibility to appear university Examination:**

A student who has secured 35% marks for Internal Assessment is qualified to appear for University Examination provided he/she satisfies percentage of attendance requirement as already mentioned at the III (1) of the clause.

### **5. Valuation of Theory – Revaluation Papers:**

- Valuation work will be undertaken by the examiners in the premises of the Examination Control Division in the Health Sciences Campus.

- There will be **Re-Valuation** for all the University examinations. Fees for revaluation will be decided by the Principal from time to time.
- Application for revaluation should be submitted within 5 days from date of result of examination declared and it should be submitted to the office with payment of fees as decided by the Principal.

## **6. Supplementary Examinations:**

Every main University examination will be followed by a supplementary examination which will normally be held within four to six months from the date of completion of the main examination.

As stipulated under clause No. 2 under Internal Assessment, HOD will hold an internal examination three to four weeks prior to the date of the University Examination. Marks secured in the said examination or the ones secured in the internal examination held prior to the earlier University Examination whichever is more only will be taken for the purpose of internal assessment. HODs will send such details to the Principal ten days prior to the date of commencement of University examination.

Students who have not passed / cleared all or any subjects in the first University examination will be permitted to attend the second year classes and also eligible to appear for second year university examination along with first year supplementary examination. However, he / she can appear for the final year university examination, only if he / she clears all the subjects in the previous year examinations.

Same attendance and internal marks of the main examination will be considered for the supplementary examination, unless the HOD furnish fresh internal marks and attendance after conducting fresh examination.

Students of supplementary batches are expected to prepare themselves for the University Examinations. No extra coaching is expected to be provided by the Institution. In case at any time the Institution has to provide extra coaching, students will be required to pay fees as fixed by the Principal for the said coaching.

## **7. Rules regarding carryover subjects:**

A candidate will be permitted to continue the second year of the course even if he/she has failed in the first year university examinations.

A candidate must have passed in all subjects to become eligible to undergo compulsory internship.

## **IV. Criteria for Pass in University Examination - Regulations:**

### **1. Eligibility criteria for pass in University Examination:**

In each of the subjects, a candidate must obtain 50% in aggregate for a pass and the details are as follows :

- A separate minimum of 35% for Internal Assessment
- 45% in Theory & 35% in Oral / Viva
- A separate minimum of 50% in aggregate for Practicals / Clinics (University Examinations)
- Overall 50% is the minimum pass in subject aggregate (University Theory + Viva / Oral + Practicals + Internal Assessment)

### **2. Evaluation and Grade:**

1. Minimum mark for pass shall be 50% in each of the theory and practical papers separately (including internal assessment) in all subjects.
2. A candidate who passes the examination in all subjects with an aggregate of 50% marks and above and less than 65% shall be declared to have passed the examination in the second class.
3. A candidate who passes the examination in all subjects in the first attempt obtaining not less than 65% of the aggregate marks for two years shall be declared to have passed the examination with First Class.
4. A candidate who secures an aggregate of 75% or above marks is awarded distinction. A candidate who secures not less than 75% marks in any subject will be deemed to have passed the subject with distinction in that subject provided he / she passes the whole examination in the first attempt.
5. A candidate who takes more than one attempt in any subject and pass subsequently shall be ranked only in pass class.
6. A Candidate passing the entire course is placed in Second class / First class / Distinction based on the cumulative percentage of the aggregate marks of all the subjects.
7. Rank in the examination: - Aggregate marks of all three year regular examinations will be considered for awarding rank for the M.Sc Graduate

Examination. For the courses where the number of students are more than 15 rank will be calculated as under :

- I. Topmost score will be declared as First Rank
- II. Second to the topmost will be declared as Second Rank
- III Third to the topmost will be declared as Third Rank

## **V. Internship:**

### **1. Eligibility for Internship - Regulations:**

Wherever internship is a part of the curriculum, students will have to do the internship in Amrita Institute of Medical Sciences itself. A candidate must have passed in all subjects to become eligible to undergo compulsory internship of six months. For the candidates who have not passed all the subjects the duration of second year shall be extended until they become eligible to undergo compulsory internship.

“Internship has to be done continuously for a period provided in the syllabus except in extra ordinary circumstances where subject to the approval of the Principal the same may be done in not more than two parts with an interruption not exceeding three months. In any case Internship shall be completed within one year from the date of acquiring eligibility to the internship.

### **2. Attendance and leave details during Internship:**

For 30 days of duty an intern will be eligible for one casual leave and one weekly off.

A Student will become eligible to receive his/her degree only after completion of internship to the complete satisfaction of the Principal.

## **VI. General considerations and teaching / learning approach:**

There must be enough experience to be provided for self learning. The methods and techniques that would ensure this must become a part of teaching learning process.

Proper records of the work should be maintained which will form the basis for the students assessment and should be available to any agency who is required to do statutory inspection of the school of the course.

# Part II

# Syllabus

## **1. INTRODUCTION:**

Dieticians are the professional members of the health team responsible for the nutritional care of individuals and groups. They function to assure quality nutritional care of individuals and groups at all stages of life span and in all conditions of health and disease.

The dietician assesses the nutritional status and determines the nutritional needs of individuals. Based upon this assessment, a nutritional care plan determines the type of nutrition therapy requirement, the treatment modality, intervention strategies and educational needs. Implementation of the nutritional care plan occurs through the provision of appropriate foods, individual client counseling or group instruction and follow up evaluation.

## **Aims and objectives of the course:**

### **Objectives:**

To impart knowledge and develop capacities of the students through state of the art higher education in the area of Clinical Nutrition and Dietetics, Medical Nutrition Management

To develop students to become health care professionals for services in various fields of clinical nutrition and medical nutrition management and related areas such as hospitals academics, research, industry, clinical nutrition department, training, extension and community service.

To develop capacities and abilities and enable them to pursue higher education and research in Clinical Nutrition and Dietetics.

### **3. Justification for the course:**

AIMS is a specialized center offering tertiary level super specialty services over a range of specialty disorders. The PG program in clinical nutrition build on previously acquired knowledge of food, nutrition and biological sciences. Course instructions focuses on theory and techniques of nutritional education, management and care and scientific principles upon which to plan nutritional therapy.

With the infrastructure of the hospital, a very prospective program is credited in AIMS that would enable the students to strive for professional competence, productivity and services to society. This educational experience will consist of guided professional settings, organized self-directed study, active participation in classroom and clinical laboratory experiments.



Students will be exposed to professional settings in the hospital, intensive lectures, rotation through various departments, develop a unique ethnic and moral value system that would make them competent as an entry level nutritionist/dietician.

#### **4. Experience with the course in other institutions**

This is the first college in Kerala to start M.Sc Clinical Nutrition in a hospital set up which enables the students to have clinical exposure at the time of education.

### **COURSE STRUCTURE**

#### **Program outcome**

1. PO1: After the completion of the course, the students can opt for highre studies (M Phil, Ph D)
2. PO2: They can work as health professionals
3. PO3: they can become entrepreneurs
4. PO4: they can be placed as teachers in professional colleges and research institutes
5. PO5: they can work at community level, empowering the popula-  
tion

#### **Program specific outcome**

1. PSO1: Hands on training in clincial nutrition and expertise in specialized nutrition support
2. PSO2: Exposure to other special areas of nutrition like sports nutrition and food microbiology exposure helps in career choices as food microbiologists
3. PSO3: Pharmacology helps in the professional descrimination of drug nutrient interactions.
4. PSO4: To impart knowledge and develop capacities of the stu-  
dents through state of the art higher education in the area of  
Clinical Nutrition and Dietetics, Medical Nutrition Management

5. PSO5: To develop students to become health care professionals for services in various fields of clinical nutrition and medical nutrition management and related areas such as hospitals academics, research, industry, clinical nutrition department, training, extension and community service.
6. PSO6: To develop capacities and abilities and enable them to pursue higher education and research in Clinical Nutrition and Dietetics.

## **SOFT SKILLS (ELECTIVE) COURSE AND COURSE OUTCOMES**

### CN 40 Soft Skills

CO1: Skill in conducting clinical research.

CO2: Attitude to be a lifelong learner.

CO3: Communication skills necessary in interacting with the patients, caregivers and colleagues. Values of Gender Sensitivity, positive attitude towards environment and sustainability.

CO4: Attitude to be a member of a healthcare team. Positive human values, including ethics and etiquette

CO5: Skill necessary to be a good communicator and teacher

### **First year.**

#### Theory class and posting in the clinical area

Applied Physiology

Clinical Biochemistry

Food Science

Food Analysis and experimental cookery

Advanced Nutrition

Applied Nutrition

Research Methodology and Biostatistics

Food Microbiology

Nutrition and Physical fitness

Mini Project

## **Second year**

Theory class and posting in the clinical area

Pharmacology

Medical Nutrition Therapy – I

Medical Nutrition Therapy – II

Nutrition in critical care

Clinical case presentation

Dissertation

## **Internship**

Six months internship in the clinical specialties.

# FIRST YEAR

During the first year the students will have didactic lecture from 8 am to 11am and from 2pm to 4pm.

## Internal Assessment

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks.

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## I. Applied Physiology (MCNF1)

- 1.CO1: Knowledge of general physiology, nerve-muscle physiology and haematology.
2. CO2: Knowledge of basic human physiology with respect to CVS, Respiratory system and GI system.
3. CO3: Knowledge of basic human physiology of excretion and CNS.

**Total: 90 hrs**

### 1. INTRODUCTION TO PHYSIOLOGY AND GENERAL PHYSIOLOGY-1 hr

#### 2. MUSCLE and NERVE - 3 hrs

1. Neurons and glial cells - Structure, function, Types, electrical property, degeneration and regeneration.
2. Muscle- Structure & Functions of skeletal muscle & smooth muscle
3. Neuromuscular transmission – Functional anatomy, Transmission & Clinical importance.

#### 3. HAEMATOLOGY - 9 hrs

1. Fluid compartments, Composition & functions of blood, Plasma protein – names, functions.
2. Erythrocyte - Morphology, Count, Function, Erythropoiesis, Factors affecting erythropoiesis, Structure of Haemoglobin, Erythrocyte Sedimentation rate, Anaemia, Polycythemia, Fate of RBC, Jaundice.
3. Leucocytes - Morphology, Types, Properties & Functions, variations in count.
4. Thrombocytes- Morphology, Count, Function, Variations.
5. Hemostasis. Coagulation and its disorders.
6. Blood groups and its importance, Blood transfusion.
7. Tissue fluid and Lymph
8. Immunity.

#### 4. CARDIOVASCULAR SYSTEM - 10 hrs

- Organisation of CVS, Properties of Cardiac Muscle, Origin and spread of cardiac impulse
- Cardiac Cycle – Electrical (ECG)and mechanical events,
- Cardiac output, Measurement, (Fick's Principle) regulation

- Blood pressure, measurement & variation, determinants, regulation, Shock.
- Regional circulation.(Salient features only)-coronary, Pulmonary, Cerebral, Cutaneous

### **5. RESPIRATORY SYSTEM - 8 hrs**

- Introduction. Functional anatomy, Mechanics of ventilation, Pressure changes, volume changes, Surfactant, Compliance, Airway resistance.
- Alveolar ventilation, Dead space, Ventilation perfusion ratio and its significance,
- Spirogram
- Diffusion of gases, O<sub>2</sub> transport, CO<sub>2</sub> transport.
- Regulation of respiration – Voluntary, Neural, Chemical.
- Abnormalities of respiration Hypoxia, Cyanosis, Dyspnea, Asphyxia, High altitude,
- Dysbarism.

### **6. DIGESTIVE SYSTEM - 7 hrs**

- Functional anatomy of GI tract,
- Secretions - Salivary secretion & its regulation, Gastric secretion and its regulation,
- Peptic ulcer, Pancreatic secretion and its regulation, Functions of liver. Bile – storage and functions. Intestinal juice
- Movements - Mastication, Deglutition, Movements of stomach, Small intestine, Large intestine. vomiting, Defecation.
- GI Hormones,
- Digestion & Absorption of carbohydrates, Proteins, Fat & vitamins

### **7. Excretion - 7 hrs**

- Functional anatomy of kidney, Structure and function of kidney and nephron
- Renal blood flow, Glomerular filtration rate, Definition, Measurement and factors affecting Tubular functions – Reabsorption, Secretion, Acidification, concentration and abnormalities.
- Micturition – Bladder innervation, Micturition reflex.
- Functions of skin

### **8. ENDOCRINOLOGY - 6 hrs**

1. Introduction to endocrinology (Different glands, hormones)
2. Pituitary gland ( Anterior and posterior glands, actions and applied aspects.
3. Thyroid gland (Actions and applied aspects)
4. Calcium homeostasis (Parathyroid, Vitamin D, Calcitonin, actions and applied aspects
5. Pancreas (Endocrine part – insulin, glucagon – actions and applied aspects
6. Adrenal cortex and medulla (Actions and applied aspects)

### **9. REPRODUCTIVE SYSTEM - 3 hrs**

1. Male Reproductive System- Different parts, spermatogenesis, hormones
2. Female reproductive system – Different parts, Sexual cycles – Menstrual cycles – Ovarian, endometrium

3. Lactation, Pregnancy & Contraception (Basics only)

**10. CENTRAL NERVOUS SYSTEM (Basics only) - 10 hrs**

1. Organization of Nervous system.
2. Synapse, Properties & Function
3. Reflexes, Reflex action, Property ,Function.
4. Sensory system – Receptor, Ascending sensory pathway (basics only), Thalamus, sensory cortex
5. Motor System – Spinal control of Motor activity, Motor areas in Cerebral Cortex,
6. Pyramidal & extra pyramidal tracts (basics only),
7. Basal ganglia & Cerebellum.
8. Hypothalamus
9. Autonomous nervous system
10. Cerebro spinal fluid- formation and functions.

**11. SPECIAL SENSES (Basics only) - 4 hrs**

1. Audition
2. Vision

Revision and evaluation session – 4-5 hours

**Reference books:**

**Essentials of Medical Physiology**

Anil Baran Singha Mahapatra

**II. Clinical Biochemistry (MCNF10)**

**Total: 90 hrs**

1. CO1: Knowledge of biochemistry of cell structure, functions, digestion, enzymes and proteins.
2. CO2: Knowledge of biochemistry of carbohydrates, minerals and vitamins
3. CO3: Knowledge of biochemistry of liver and renal function tests, specialized laboratory investigations and lipids.

**1. Cell structure and function**

**(1 hr)**

- Mitochondria
  - Endoplasmic reticulum, Lysosomes
- Fluid mosaic model for membrane structure

**2. Digestion and absorption of nutrients**

**(1 hr)**

- Absorption of glucose
- Digestion of carbohydrate
- Micelle
- Steatorrhea
- Enzymes in digestion of proteins

- 3. Enzymes** (3 hrs)
- Classify enzymes with one example from each class
  - Co-enzymes
  - Important features of active center of an enzyme
  - Competitive inhibition with 2 examples
  - Allosteric inhibition
  - Factors affecting enzyme velocity
  - Isoenzymes
  - Normal serum range and diagnostic importance of serum AST, ALP, ACP ALT, CK, GGT and AMYLASE.
- 4. Proteins** (2 hrs)
11. Classification of amino acids based on structure
  12. Essential amino acids
  13. Plasma proteins
  14. Immunoglobulins
- 1. Carbohydrates** (2 hrs)
4. Classification of carbohydrates
  5. Diabetes mellitus-symptoms and complications
  6. Glucose tolerance test
  7. Action of insulin and glucagon on carbohydrate metabolism
- 2. Vitamins** (3 hrs)
- Deficiency manifestations of vitamin A
  - Rickets
  - Two coenzyme functions of riboflavin, thiamine, niacin, folic acid biotin & PLP
  - Beriberi, pellagra & scurvy
- 3. Minerals** (2 hrs)
3. Factors maintaining serum calcium level and important functions of calcium
  4. Hypercalcemia, hypocalcemia, hyper and hypo kalemia, hyper and hypo natremia and phosphatemia
  5. Importance of trace elements
  6. Vitamin E and selenium
- 8. Hemoglobin** (1 hr)
9. Heme catabolism (degradation) steps only
  10. Serum bilirubin-normal range and changes in different types of jaundice
- 9. Liver function tests** (1 hr)
7. Jaundice and types of jaundice
  8. Enzymes in liver disease
- **Renal function tests** (1 hr)
    - Creatinine clearance test
    - Abnormal constituents of urine

- **Specialized laboratory investigations** **(1 hr)**  
**Principle and applications of**
  1. Radioimmunoassay (RIA)
  2. ELISA
  3. Colorimetry
  
- **Lipids** **(2 hrs)**
  - Classification of lipids
  - Essential fatty acid (EFA)
  - Poly unsaturated fatty acids(PUFA)
  - Phospholipids
  - Role of cholesterol in coronary artery disease
  - Important compounds synthesized from cholesterol
  
- **Metabolism** **(2 hrs)**
  1. TCA cycle steps only
  2. Electron transport chain in mitochondria-components only
  3. Uncouplers of ETC
  
- **Inborn errors of metabolism** **(3 hrs)**
  - Fanconi's syndrome
  - Phenylketonuria
  - Cystinuria
  - Galactosemia
  - von Gierke's disease
  - alkaptonuria
  - maple syrup urine disease
  - albinism
  
- **Maintenance of homeostasis** **(2 hrs)**
  1. Plasma buffers
  2. Renal mechanisms in pH regulation
  3. Anion gap
  4. Metabolic acidosis
  - 5.
  
- 16. Nucleic acids** **(1 hr)**
  4. Differences between DNA and RNA
  5. Purine and Pyrimidine bases,Chargaff's rule
  6. Structure of DNA
  7. Okazaki fragments



- 17. Cancer** (1 hr)
- Chemical and physical carcinogens
  - Tumor markers. Give examples.

– **Biochemistry of AIDS** (1 hr)

**Reference Books:**

1. Textbook of Biochemistry – DM Vasudevan, Sreekumari
2. Lippincott's Illustrated Review – Biochemistry
3. Harper's illustrated Biochemistry – 26th edition
4. Nutritional Biochemistry and Metabolism, 2nd edition
5. Satyanarayanan U

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**III. Food science (MCNF11) Total : 90 hrs**

1. CO1: To get a better understanding of various food groups
2. CO2: To learn about methods of food spoilage and preservation
3. CO3: To understand how sensory evaluation of food is being done

**1. Introduction to food science: (3hrs)**

Food as a source of nutrients, functions of food, food intake and its regulation, physical and physiochemical changes in food in relation to cookery, gel formation, denaturation of proteins, properties of colloids, stabilizers, enzymatic and non-enzymatic changes in cookery.

**2. Cereals and pulses: (4 hrs)**

Wheat: structure and composition, wheat types, milling of wheat, functions and behavior of flour component in dough, flour improves, tests for flour quality. Rice: processing, parboiling and rice products. Breakfast cereals: uncooked breakfast cereals, ready to eat cereals.

Pulses: composition and processing

**3. Fats and oils:**

**(3hrs)**

Sources, extraction of edible oils and fat, characteristics of fat and chemical properties, changes on fat during storage and cooking, use of fat

**4. Vegetables and fruits: (3hrs)**

Structure, pigments and acids in fruits and vegetables, cellulose and hemicellulose, role of pectic substances, jam and jelly

**5. Milk and milk products:**

**(3hrs)**

Composition, types, nutritive value, physical and chemical properties, coagulation of milk proteins, milk products.

**6. Meat, egg, poultry and fish:  
(4hrs)**

Structure and composition, nutritive value, methods of cooking, selection and purchase of meat, egg, poultry and fish.

**7. Sugar and confectionery:  
(3hrs)**

Sources, use and properties, crystallisation of sugar, stages of sugar cookery, fondant, fudge, caramel and brittles.

**8. Beverages and spices:  
(3hrs)**

Classification of beverages and manufacture, grading and composition, active compounds and pigments, factors controlling quality of tea and coffee, spices and condiments

**9. Starch cookery:  
(2hrs)**

Sources and use of starch, gelatinisation of flours

**10. Food preservation  
(2hrs)**

Factors responsible for deterioration and their control, methods of preservation (temperature, preservatives, radiation, concentration, fermentation, antibiotics)

**11. Phytochemicals in foods  
(2hrs)**

**12. Evaluation of food by sensory and objective methods: (3hrs)**

Factors affecting acceptability of food, selection of taste panel.

**13. Nutraceuticals and Functional Foods  
(5hrs)**

**Reference Books:**

- 1 Mary, K. Schmidl and Theodore, P. Labuza , Essentials of Functional Foods,
- 2 Culinary 25 and hospitality industry publication services, 2000.
- 3 Mazza, G , Functional Foods- Biochemical and processing aspects, Culinary and hospitality industry publication services, 1998.
- 4 Israel Goldberg , Functional foods, Pharma foods, Nutraceuticals, Culinary and
- 5 hospitality industry publication services, 2001.

- 6 Robert easy Wildman , Handbook of Nutraceuticals and Functional Foods,
- 7 Culinary and hospitality industry publication services, 2001.
- 8 David, H.Watson , Performance, Functional Foods, Culinary and hospitality
- 9 industry publication services, 2003.
- 10 Chatwick, R et al. , Functional Foods, Springer, 2003.
- 11 Jeffery Horst, Methods of Analysis for Functional Foods and Nutraceuticals, CRS Press, 2002.
- 12 Paresh, C. Dutta , Phytosterols as Functional Food Components and
- 13 Nutraceuticals, Marcel Dehker Inc, New York, 2004.
- 14 Potter N.M, Food Science, The AVI Publishing Company, Inc, West Port, Connecticut, USA, 1995.
- 15 Manay S and Shadaksharaswamy M (1987) Food- Facts & Principles, Wiley Eastern Ltd. New Delhi
- 16 Srilakshmi B , Food Science, New Age International (p) Ltd
- 17 Peckham CG and Graves HJ , Foundation of Food Preparation, The Macmillan Company, london, 1994
- 18 Parker R.O., Introduction to Food Science, Thomson Delmar Learning 2001

## **IV NUTRITION AND PHYSICAL FITNESS (MCNF13)**

1. CO1: To understand the importance of energy nutrients in physical activities
2. CO2 : To apply this knowledge in designing diet plans for various sports events
3. CO3: to understand different methods of physical fitness

### **UNIT –I**

Introduction to physical activity and exercise – types, Body system involved in exercise

Cardio respiratory, muscular and energy system. Definition of fitness. Substrate utilization during work.

### **UNIT – II**

Physical fitness assessment- cardio respiratory fitness, assessment of body composition, muscular fitness assessment, flexibility assessment.

### **UNIT –III**

Diet in exercise - Carbohydrates for exercise, carbohydrate loading, ergogenic aspects, carbohydrate based dietary supplements.

### **UNIT – IV**

Role of protein, electrolytes changes in exercise, electrolytes & temperature regulation. Fluid & Electrolyte losses, fluid and electrolyte replacement. Role of vitamins and minerals during exercise, vitamin and mineral supplements for exercise

### **UNIT – V**

Yoga and Fitness, effect of yoga on immune system, endocrine system, nervous system, digestive system and muscular system, Health benefits of yoga.

**Reference Books:**

1. Roberta Larson Duyff. John Wiley & Sons, Inc American Dietetic Association, complete food and Nutrition guide, 2nd edition 2002,
2. Nutrition for health fitness & sport Melvin H. Williams. 5th edition – 1999.
3. Udaiveer, Nutrition & Food, Anmol Publication Pvt. Ltd, New Delhi, 2005.
4. Guyton & Hall, Text book of Medical Physiology, 11th edition , 2006.
5. Gordon M. Wardlaw, Anne M. Smith contemporary Nutrition, Mc Graw – Hill International Edition, 2006.
6. Wc13 Mcgraw – Hill. Vishwannath M. Sardesai (), Introduction to clinical Nutrition, Marcel Dekker, Inc New York, 2003.

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**V. Food Analysis and Experimental cookery (MCNF12)**

**Total: 90 hrs**

**Food Analysis Practicals**

1. CO1: To perform the analysis of various nutrients in foods
2. CO2: To get hands on experience in experimental cookery
3. CO3: To perform the proximate analysis of various foods

- Moisture
- Ash
- Qualitative Analysis of Carbohydrates
- Estimation of amino acids
- Estimation of lipid
- Estimation of calcium
- Estimation of iron in foods
- Estimation of vitamin C
- Determination of crude fiber

**Food Science Practicals or Experimental cookery**

- Hospital kitchen
- Therapeutic diets
- Nutrition labelling

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**VI. Advanced Nutrition (MCNF14)**

**Total: 90hrs**

1. CO1: to study in detail the functions, metabolism, digestion and absorption of all macro and micro nutrients

2. CO2: To understand the mechanism of action of all macro and micro nutrients in disease conditions
  3. CO3: To study about the basics of newer nutritional therapies like nutrigenomics and space nutrition
- **Energy:** Energy content of foods. Physiological fuel value – review. Measurement of energy expenditure: BMR, RMR, Thermic effect of feeding and physical activity, methods of measurement. Estimating energy requirements of individuals and groups. Regulation of energy metabolism: control of food intake, digestion, absorption and body weight.
  - **Carbohydrates:** Types, classification, digestion and transport – review, dietary fibre, fructo-oligosaccharides, resistant starch – chemical composition and physiological effects. Glycemic index of foods. Sweeteners – nutritive and non-nutritive.
  - **Proteins:** Classification, digestion, absorption and transport – review. Metabolism of proteins: Role of muscle, liver and gastro intestinal tract. Protein quality, methods of evaluating protein quality. Protein and amino acid requirements. Therapeutic applications of specific amino acids: Branched chain, glutamine, arginine, homocysteine, cysteine, taurine.
  - **Lipids:** Classification, digestion, absorption, transport – review. Functions of EFA. Role of n-3, n-6 fatty acids in health and disease. Requirements of total fat and fatty acids. Trans fatty acids. Prostaglandins.
  - **Water:** Regulation of intra and extra cellular volume. Osmolality, water balance and its regulation.
  - **Minerals:**
    - Macro minerals: calcium, phosphorus, magnesium, sodium, potassium and chloride.
    - Micro minerals: Iron, copper, zinc, manganese, iodine, fluoride
    - Trace minerals: selenium, cobalt, chromium, vanadium, silicon, boron, nickel
  - **Vitamins:** Historical background, structure, food sources, absorption and transport, metabolism, biochemical function, assessment of status. Interactions with other nutrients. Physiological, pharmacological and therapeutic effects, toxicity and deficiency with respect to the following.
  - **Non-nutritive food components with potential health effects:** Polyphenols, tannins, phytate, phytoestrogens, cyanogenic compounds, lectins and saponins.
  - **Nutritional regulation of gene expression**

- **Nutritional requirements during special events:** Modifications in diet during space travels, sea voyages and at high altitude, nutrition of athletes

### Reference Books:

- Shils, Olson, Shike and Ross (1999). Modern Nutrition in Health and Disease, 9th edition, Williams & Wilkins
- Groff JL and Gropper SS: Advanced Nutrition and Human Metabolism, 3rd ed. Wadsworth Thomson Learning
- Whitney EN and Rolfes SR. Understanding Nutrition, 10th ed. West Publishing Co., 2004.
- Robinson CH, et al Normal And Therapeutic Nutrition, 17th ed, Macmillan Publishing Co, New York
- Baamji M, Prahlad N, Vinodini R (1998), Textbook of Human Nutrition, Oxford & IBH Pub Co. New Delhi
- Staci Nix, William's Basic Nutrition and Diet Therapy, 12th ed, Mosby 2005.
- Mahan and Escott- Stump, Krause's Food, Nutrition and Diet Therapy, 12th ed WB Saunders.
- Michael Zimmermann, "Micronutrients in the Prevention and Therapy of Disease" 9th ed, 2000

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## VII. Applied Nutrition (MCNF15)

### Total: 90 hrs

1. CO1: To study the various screening and assessment techniques in different stages of life
  2. CO2: To learn about the importance in nutrition in different stages of life
  3. CO3: Application of the principles learnt in clinical practice
1. **Food groups and RDA:** different food groups, principles of diet planning, RDA for Indians, basic principles involved in recommendation of dietary allowances allotted by ICMR
  2. **Nutritional assessment:** Nutrition screening and assessment; screening for nutritional risk; assessment of nutritional status; components of comprehensive nutrition assessment; anthropometric measures; biochemical indices; nutrition focussed health history and physical examination; POMR, SOAP, MNA, SGA, PINI, PNI
  3. **Maternal nutrition:** Physiological changes in pregnancy, foetal growth, requirements, consequences of under nutrition, effects of alcohol and smoking on foetal growth, nutritional requirements during pregnancy. Lactation-physiological adjustments during lactation, nutritional requirements of lactating women, diet during lactation.

4. **Foetal nutrition:** Nutrition for neonates – birth weight; postnatal growth assessments; macronutrient requirements and metabolic principles; AGA, LGA, SGA,; neonatal nutrition support techniques.
5. **Nutrition during infancy:** Nutritional status of infants, growth monitoring, nutritional allowances, breast feeding, formula feeding, weaning, feeding premature infants, LBW babies and their nutritional care
6. **Nutrition in pre-school age:** Growth, development, food habits and nutrient intake of preschoolers, prevalence of malnutrition in preschool age, dietary allowances, supplementary foods, feeding programme for preschool children
7. **Nutrition during school age:** Physical development during school age, nutritional status and nutritional requirements, food habits of school children
8. **Nutrition during adolescence:** Pattern of growth and development, food habits and nutritional requirements, prevention of malnutrition through behavioural modifications
9. **Geriatric nutrition:** Age related changes; nutrition screening and assessment; nutrition intervention; role of physical activity of older adults; food behaviour of older adults, medical conditions with nutritional implications that affect older adults.

### **Reference Books:**

1. Groff JL and Gropper SS: "Advanced Nutrition and Human Metabolism", 3rd ed. Wadsworth Thomson Learning
2. Mahan and Escott- Stump, "Krause's Food, Nutrition and Diet Therapy", 12th ed WB Saunders.
3. Alpers DH, Stenson FW, Bier MD – "Manual of Nutritional Therapeutics" 4th edition Lippincott Williams and Wilkins, 2002  
Mitchell, "Nutrition Across Life span" 1997

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## **VIII. Research methodology and Biostatistics (MCNF16)**

### **Total: 90 hrs**

CO1: Knowledge in understanding research –its objectives and significance

CO2: Competency in collecting data , creating questionnaires and selection of appropriate method for data collection

CO3: Detailed knowledge on Biostatistics/Statistics

## 1. **Introduction to research and types of research:**

Meaning of research, objectives of research, significance of research, research process, criteria of research

## 2. **Defining research problem:**

Selection of the problem, necessity of defining the problem, techniques in selecting a problem, examples

## 3. **Research design:**

Meaning of design, need for a research design, different research designs, basics of experimental designs, developing research plan, strengths and weakness, experimental, quasi experimental and correlational

## 4. **Sampling Design:**

Sample and universe, sampling, different methods of sampling, selection of a random sample, census and survey

## 5. **Measurement and scaling techniques:**

Measurement in research, measurement tools, scaling and scaling techniques

## 6. **Data collection:**

Methods of data collection, questionnaires/schedule, selection of appropriate method for data collection, guidelines for constructing questionnaire, guidelines for interviewing, sample questionnaires

## 7. **Data Analysis:**

Introduction to data analysis, demo with SPSS software

## 8. **Dissertation/Report writing:**

Technique of interpretation, report writing/dissertation writing, how to critique an article

## ***Biostatistics/Statistics***

### 1. **Introduction:**

Basic concepts (data, sources of data, variable), objectives, role of biostatistics/statistics, summary

### 2. **Descriptive Statistics:**

Ordered array, frequency distribution, measures of central tendency, measures of dispersion, summary

### 3. **Basic probability concepts:**

Introduction, elementary properties of probability, probability distributions (binomial, poisson, normal distribution) applications

### 4. **Sampling:**

Sampling distributions, sample means and difference between two means, sample proportion and difference between two sample proportion, sampling, sampling methods (SRS, Sys, SrRs, cluster sampling), sample size and sample calculation



**5. Testing of hypothesis and estimation:**

Testing of hypothesis, Type I and Type II error (critical region and power of the test), applications of testing of hypothesis, confidence interval for population mean, confidence interval for population proportion.

**6. Analysis of variance (ANOVA): I**

Introduction, CRD, RBD, LSD, factorial experiment, Summary

**7. Correlation and Regression:**

Introduction, correlation, correlation co-efficient, Regression(model) using the regression equation, Summary

**8. Non-parametric tests:**

Introduction, sign test, Wilcoxon signed rank test, median test, Mann-Whitney test and rank correlation, summary

**9. Multiple regression and correlation; Logistic regression; ANCOVA:**

Introduction, Methods and application

**10. Vital Statistics:**

Introduction, death rates and ratios, measures of fertility, measures of morbidity, measures of mortality, indicators of levels of health

**Reference Books:**

- Kothari CR, "Research Methodology, Methods and Techniques", Wiley Eastern Ltd, New Delhi, 2004.
- Gupta. S.P., "Statistical Methods", Sultan Chand & sons, New Delhi, 2002.

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**IX. Food Microbiology (MCNF2)**

**Total :**

**90hrs**

1. CO1: Understanding of useful and harmful food microbiota
2. CO2: Understanding spoilage and contamination of foods
3. CO3: Knowledge of principles of food preservation
4. CO4: knowledge about methods of microbiological examination of foods

**1. Food microbiota**

Molds : General characteristics, classification and identification

Yeast : General characteristics, classification and identification

Bacteria: General characteristics, classification and identification

Bacteria, yeasts and molds important in food microbiology

**2. Food as a substrate for microorganisms**

Growth curve, pH. O-R potential, concept of water activity, temperature, humidity, gaseous atmosphere and nutritional requirements, effects of intrinsic and extrinsic factors on growth of organisms.

**3. Primary sources of micro organisms**

Physical and chemical methods used in destruction of microorganisms: Pasteurization & sterilization

#### **4. Principles of food preservation**

- a) Asepsis, removal & anaerobic conditions
- b) Using high temperature
- c) Using low temperature, freezing, freeze drying
- d) Drying
- e) Food additives
- f) Radiation – UV rays, gamma rays
- g) Food fermentation – lactic acid fermentation and bacteriocin production, yoghurt, cheese, beer, tempeh

#### **5. Food spoilage and contamination in different kinds of foods**

- a) Cereals and cereal products
- b) Pulses and legumes
- c) Vegetables and fruits
- d) Meat and meat products
- e) Eggs and poultry
- f) Milk and milk products

#### **6. Microbes used in biotechnology**

- a) Bread, wines, dairy products
- b) Single cell protein

#### **7. Foods transmitted pathogens**

Food borne illness: Gastroenteritis, E.coli

Food poisoning: Botulism, mycotoxins, viruses, rickettsia, parasitic diseases with reference to Amoebiasis, Giardiasis, Ciliate dysentery, Cryptosporidiosis, intestinal helminthic infections etc

Viral diseases with special mention of hepatitis, poliomyelitis, AIDS, viral gastroenteritis, etc.,

Staphylococcus aureus, listeria monocytogenes and salmonella

**8. Non bacterial agents of food borne illness** – helminthus nematodes, protozoa, toxigenic algae, fungi

#### **9. Food sanitation, control and hygiene**

- Indices of food, milk, water sanitary quality
- Microbiological criteria of food, water and milk testing
- Food standards: FPO, PFA, BIS, AGMARK, Codex alimentarius
- Hazard Analysis Critical control points (HACCP)
- Risk analysis
- Quality systems ISO 9000 series

#### **10. Methods for microbiological examination of food**

Indicator organism, direct examination, cultural techniques, enumeration methods, plate counts, most probable number counts. Dye reduction tests, electric methods, ATP determination, rapid methods of the detection of specific organisms and toxins, immunological methods, DNA/RNA methodology

#### **Practicals:**

Staining methods  
 Media preparation  
 Bacteriological testing of water and food  
 Preparation of sauerkraut

**Reference Books:**

- Frazier W.C and Westhoff D.C, "Food Microbiology" 4th edition, 1995
- Anna K. Joshua, 1994, "Microbiology"
- Baanwart G.L(1987) "Basic Food Microbiology"

<b>Academic year</b>	<b>Theory</b>	<b>No. of Hours</b>	
<b>1st year</b>	Applied Physiology	90	
	Clinical Biochemistry	90	
	Food Science	90	
	Advanced Nutrition	90	
	Applied Nutrition	90	
	Research Methodology & Biostatistics	90	
	Food Microbiology	90	
	Nutrition and Physical Fitness	30	
	Mini Project (minimum 30 sample size) MCNF 2		
	<b>Clinical Postings</b>	<b>Duration of Post- ing (3hrs/day)</b>	<b>Case Studies</b>
	General Medicine	150 hrs	5
	General Surgery	150 hrs	5
	Paediatrics	150 hrs	5
	Obstetrics and Gyne- cology	150 hrs	5

	Psychiatry	150 hrs	5
	<b>Total – 5 Specialities</b>	<b>750 hrs</b>	<b>25</b>

## SECOND YEAR

During the second year the students will be posted in the clinical area with regular didactic lectures.

### **Internal Assessment**

One sessional exam and one model exam will be conducted this year. Average marks of these sessional examinations will be counted as internal marks along with performance in the clinical posting.

## **X. Pharmacology MCNF4**

### **1. CO1: Basic knowledge in pharmacology**

2. CO2 : Detailed systemic pharmacology
3. CO3: Detailed knowledge of drugs and groups of drugs
  - General Pharmacology – 4 hours
  - Evaluation of drugs in man, drug prescribing and drug interactions – 3 hours
  - Sedatives, hypnotics and pharmacotherapy of insomnia – 1 hour
  - Drugs effective in convulsive disorders – 1hour
  - Opioid analgesics – 1 hour
  - Analgesic – antipyretics and non-steroidal anti-inflammatory drugs – 1 hour
  - Psychopharmacology – 1 hour
  - Drug therapy of parkinsonism and other degenerative disorders of the brain – 1 hour
  - Local anesthetics – 1 hour
  - Adrenergic and adrenergic blocking drugs – 1 hour
  - Histamine and anti histamic drugs – 1 hour
  - Pharmacotherapy of cough – 1 hour
  - Pharmacotherapy of bronchial asthma and rhinitis – 1 hour
  - Digitalis and pharmacotherapy of cardiac failure – 1 hour
  - Vasodilator drugs and pharmacotherapy of angina pectoris – 1 hour
  - Pharmacotherapy of hypertension – 1 hour
  - Drugs and blood coagulation – 1 hour
  - Drugs effective in iron deficiency and other related anemias – 1 hour
  - Diuretics – 1 hour
  - Emetics, drug therapy of vomiting, vertigo and diarrhea – 1 hour
  - Pharmacotherapy of constipation – 1 hour
  - Pharmacotherapy of peptic ulcer – 1 hour

- Sulfonamides, Trimethoprim, cotrimoxazole, nitrofurans and quinolones – 1 hour
- Penicillins and antibiotics effective mainly against gram positive organisms – 1 hour
- Amonoglycosides and other antibiotics effective mainly against gram negative organisms – 1 hour
- Antibiotics effective against both gram positive and gram negative organisms – 1 hour
- – 1 hour
- Chemotherapy of urinary tract infections – 1 hour
- Antiseptics, disinfectants and insecticides – 1 hour
- Thyroid and antithyroid drugs – 1 hour
- Insulin and ant diabetic drugs – 1 hour
- Adrenal cortical steroids – 1 hour
- Vitamins and antioxidants – 1 hour
- Drugs, pregnancy and the newborn – 1 hour

**Reference books:**

**Essentials of Medical Pharmacology**

Tripathi

**Basics and Clinical Pharmacology**

Katzung

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**XI. Medical Nutrition Therapy – I MCNF5**

**Total: 90 hrs**

1. CO1: To understand the importance of different therapeutic diets
2. CO2: Understand the pathophysiology, medical and nutritional management of anaemia, GI disorders, hepato-pancreatic conditions, cardiovascular, pulmonary and renal disorders.
3. CO3 : To apply this classroom knowledge at clinical level

1. **Routine hospital diets:** modifications in diet consistency for hospitals, nutritional adequacy of hospital diets, psychology of feeding the patient, assessment of patient needs, nutrition education of the patient

2. **Medical Nutrition Therapy for Anaemia:**  
**Iron – related blood disorders** - Iron deficiency anaemia; Hemochromatosis; Iron toxicity  
**Megaloblastic Anaemias** - Pernicious and other Vitamin B12 deficiency anaemias; Folic acid deficiency anaemia

**Other Nutritional Anaemias** - Copper deficiency anaemia; Anaemia of protein-energy malnutrition; Sideroblastic(pyridoxine-responsive) anaemia

**Non-nutritional Anaemias** - Sports anaemia(hypochromic microcytic transient anaemia); Anaemia of pregnancy; Anaemia of inflammation, infection or malignancy; Sickle cell anaemia; Thalassemias

3. **Medical Nutrition Therapy for gastrointestinal disorders** - Disorders of the oesophagus; Disorders of the stomach; Common Intestinal problems; Diseases of the small intestine; Intestinal Brush-Border Enzyme deficiencies; Inflammatory Bowel Diseases; Disorders of the large intestine.
4. **Medical Nutrition Therapy for pancreatic and liver disorders** - Physiology and functions of the liver; Laboratory assessment of liver function; Diseases of the liver; Physiology and functions of the gall bladder; Diseases of the gall bladder; Physiology and functions of the exocrine pancreas
5. **Medical Nutrition Therapy for cardiovascular disorders** - Prevalence and incidence; Pathophysiology and etiology; Atherosclerosis; Dietary lipids and coronary heart disease; Plasma lipoproteins; Lipoprotein metabolism; Dietary factors and coronary heart disease; Diet and hypertension; Diet and stroke; Diet and peripheral vascular disease; Diet and chronic heart failure; Micronutrients and cardiovascular disease
6. **Medical Nutrition Therapy for pulmonary disorders** - Relationships between nutrition and the pulmonary system; Overview of medical nutrition therapy in pulmonary disease; Aspiration; Asthma; Chronic obstructive pulmonary disease; Cystic fibrosis; Lung cancer; Pneumonia; Respiratory failure; Tuberculosis
7. **Medical Nutrition Therapy for renal disorders:** Physiology and function of the kidneys; Renal disease; Glomerular diseases; Diseases of the tubules and interstitium; Progressive nature of renal disease; End-stage renal disease; Nephrolithiasis

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## **XII. Medical Nutrition Therapy – II MCNF6**

**Total:**

**90hrs**

1. CO1: To understand the importance of diet in weight management
2. CO2: Understand the pathophysiology, medical and nutritional management of endocrine systems, surgical and febrile conditions, disorders in skeletal, metabolic and neurological conditions
3. CO3: To apply this classroom knowledge at clinical level

- I. **Medical Nutrition Therapy for endocrine disorders** – Pathophysiology, diagnostic and screening criteria, management of diabetes mellitus, diabetes and age-related issues, implementing nutrition, self management, acute

complications, long-term complications, preventing diabetes, hypoglycemia of non-diabetic origin

- II. **Nutritional care for weight management:** body weight components, regulation of body weight; weight management throughout life; weight imbalance: overweight and obesity; management of obesity in adults; common problems encountered in obesity management; weight management in children; weight imbalance: excessive leanness.
- III. **Medical Nutrition Therapy for febrile and surgical conditions:** Fevers of short duration, chronic fevers and infections, pre operative and post operative nutrition
- IV. **Nutritional aspects of disease affecting the skeleton** – Overview of mineral ion homeostasis and bone metabolism; age-appropriate biochemical reference ranges; pharmaceutical agents commonly used in bone disease; rickets/osteomalacia; mineral ion homeostasis in preterm infants; corticosteroid-induced bone disease; osteoporosis associated with chronic disease; anorexia nervosa; senile osteoporosis
- V. **Medical Nutrition therapy for metabolic disorders** – Newborn screening; goals of medical nutrition therapy; disorders of amino acid metabolism; disorders of organic acid metabolism; disorders of urea cycle metabolism; disorders of carbohydrate metabolism; glycogen storage diseases; disorders of fatty acid oxidation; role of nutritionist in medical nutrition therapy for metabolic disorders
- VI. **Medical Nutrition Therapy for neurological disorders:** Neurologic disease classification, nervous system wiring and lesions, medical nutrition therapy, problems with procurement of food, nutritional deficiencies or excesses

### Reference Books:

1. Shils, Olson, Shike and Ross (1999). "Modern Nutrition in Health and Disease", 9th edition, Williams & Wilkins
  2. Marcia Nahikian Nelms and Sara Long, "Medical Nutrition Therapy (Case study)", 2004, 2nd ed, Thomson Wadsworth Publications.
  3. Whitney EN and Rolfes SR. "Understanding Nutrition", 10th ed. West Publishing Co., 2004.
- Marcia Nelms, Kathryn Sucher, "Nutrition Therapy and Pathophysiology", 2007
  - Gottschlich M – "The science and practice of nutrition support"
  - Staci Nix, "William's Basic Nutrition and Diet Therapy", 12th ed, Mosby 2005.
  - Mahan and Escott- Stump, "Krause's Food, Nutrition and Diet Therapy", 12th ed WB Saunders.
  - Laura E Mataresse – "Contemporary Nutrition Practice" 2003, 2nd edition Saunders Publications

- Srivastava, RK, "Current Nutritional Therapy Guidelines in Clinical Practice", 2008
- Grodner, "Foundations and Clinical Applications of Nutrition", 2000.
- Gibney M, "Clinical Nutrition" Blackwell Publishing, 2005.

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### **XIII. Nutrition in critical care MCNF7**

**Total:  
hrs**

**90**

1.CO1: To get a thorough knowledge in different methods of nutritional support

2. CO2 :To screen and assess the nutritional status of critically ill patients

3. CO3: to understand the different feeding modalities in enteral and parenteral nutrition

4. CO4: To learn about the nutritional requirements and management of critically ill patients

- Nutritional screening and nutritional status assessment of the critically ill.
- Nutritional support systems and other life-saving measures for the critically ill.

#### **Nutritional Support**

- Introduction
- Meeting the nutritional needs
- Oral feeding and oral nutritional supplements
- Enteral and parenteral nutrition support

#### **Rationale and Criteria for Appropriate Nutrition Support**

#### **Enteral Nutrition**

- Indications and contraindications
- Enteral access
- Enteral formula composition
- Tube feeding delivery systems
- Tube feeding administration methods
- Complications and monitoring

#### **Parenteral Nutrition**

- i. Patient selection
- ii. Parenteral access
- iii. Parenteral nutrition solutions
- iv. Physical characteristics of parenteral formulas
- v. Commercially available protein sources
- vi. Commercially available fat sources
- vii. Methods of administration
- viii. Complications and monitoring
- ix. Refeeding syndrome

#### **Transitional Feeding**

- i. Parenteral to enteral feeding
- ii. Parenteral to oral feeding
- iii. Enteral to oral feeding
- iv. Oral supplements



- **Role of immuno enhancers, conditionally essential nutrients, immunosuppressants, and special diets in critical care.**
- **Patho-physiological, clinical and metabolic aspects, understanding of the special nutritional requirements, nutritional goals and monitoring the therapy in critical illnesses like**
  - Stress, trauma, sepsis, burns
  - CV complications and surgery
  - ESRD, dialysis, transplant
  - Multiple organ failure
  - Cancer
  - AIDS
  - GI tract surgery, GER (Gastro-esophageal reflux) and complications
  - Hepatic failure and transplants
  - Neurosurgery
- **Complications of Nutritional Support Systems including Refeeding Syndrome**
- **Rehabilitations diets – stages.**
- **Diet related ethical issues in the terminally ill.**

**Reference Books:**

- Gottschlich M – “The science and practice of nutrition support”
- Laura E Mataresse – “Contemporary Nutrition Practice” 2003, 2nd edition Saunders Publications
- 3. Rombeau JL Caldwell DM, Text book of Enteral and Parenteral Nutrition
- Rombeau JL Caldwell DM, Clinical Nutrition Enteral and Tube Feeding 2nd ed WB Saunders 1990.

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<b>2nd year</b>	<b>Theory</b>	<b>No. of Hours</b>	
	Pharmacology	90	
	Medical Nutrition Therapy 1	90	
	Medical Nutrition Therapy 2	90	
	Nutrition in Critical Care	90	
	Clinical Case Presentations	2 hrs/ week	
	Journal club	2 hrs/ week	
	<b>Clinical Postings</b>	<b>Duration of posting (5hrs/day)</b>	
	Intensive care unit (ICU)	1 month	5
	Endocrinology	1 month	5
	Cardiology – Adult Paediatric	2 weeks 2 weeks	5
	Nephrology	1 month	5
	Gastroenterology – Adult Paediatric	2 weeks 2 weeks	5
	Neurology – Adult Paediatric	2 weeks 2 weeks	5
	Neurosurgery	1 month	5
	Gastro-intestinal surgery	1 month	5
	Transplant Unit – Kidney, Liver, BMT	1 month	5
	Pulmonology	1 month	5
	<b>Total – 10 Specialities</b>		<b>50</b>
	<b>Internship</b>	<b>6 months</b>	<b>50</b>

**SCHEME OF EXAMINATION**  
**M.Sc Clinical Nutrition and Food Sciences Degree Examination**  
 Distribution of Marks for each subject

No.	Name of Paper	Time hrs	Int	External			Project	Total
				Theory	Viva	Practical		
<b>First Year</b>								
CN 1	Applied Physiology	3	20	100	30			150
CN II	Clinical Biochemistry	3	20	100	30			150
CN III	Food Science	3	20	100	30			150
CN IV	Advanced Nutrition	3	20	100	30			150
CN V	Applied Nutrition	3	20	100	30			150
CN VI	Research Methodology and Biostatistics	3	20	100	30			150
CN VII	Food Microbiology	3	20	100	30			150
CN VIII	Nutrition and Physical fitness		50					50
CN IX	Food Analysis	3	50			100		150
CN X	Mini Project		50				50	100
<b>Second Year</b>								
CN XI	Pharmacology	3	20	100	30			150
CN XII	Medical Nutrition Therapy – I	3	20	100	30			150
CN XIII	Medical Nutrition Therapy - II	3	20	100	30			150
CN XIV	Nutrition in critical care		20	100	30			150
CN XV	Clinical Case Presentation	1	50			100		150
CN XVI	Dissertation		50				100	150
<b>Total</b>								<b>2250</b>

**Dissertation – Scheme of valuation and mark distribution**

Internal assessment	External assessment			Total marks
	External valuation	Presentation (Viva)	Oral (Viva)	
50	50	25	25	150

## Dissertation External valuation grading scale

Serial No.	Section	Maximum Marks
1	Relevance of the study	10
2	Review of literature	5
3	Materials and methods	10
4	Data analysis	10
5	Results and Discussion	10
6	Recommendations	5
	Total	50

### Pattern of Question paper (Theory) Paper 1 to VII & Paper XI to XIV

#### Pattern of Question Paper

Structured Essay (2 out of 3) - 40 marks (20 x 2 marks)  
Short Notes (10 out of 12) - 60 marks (6x 10 marks)

Total Marks - 100 marks

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#### IMPORTANT TELEPHONE NUMBERS

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