

## Syllabus and Examination pattern for Undergraduate Medical Course Part I

### (A) NOTIFICATION

Ref. :

- (1) *Medical Council of India Regulation on Graduate Medical Education, 1997.*
- (2) *Amendment of the regulations on graduate medical education notified by Government of India from time to time :*
  - a. *Gazette Notification dated 29.05.1999.*
  - b. *Notification no. MCI-37 (2)/2001/Med-922, dated 12.04.2001.*
  - c. *Notification no. MCI-26 (3)/2003/Med-18503, dated 26.09.2003.*
  - d. *Notification no. MCI-26 (3)/2003/Med-20958, dated 15.10.2003.*

*In exercise of the powers, conferred under section 26 of Krishna Institute of Medical Sciences Deemed University, the Board of Management in its meeting held on 13<sup>th</sup> August, 2005, has been pleased to approve the Bye-law pertaining to MBBS course as given in schedule here to Annexed.*

*The Bye-law as above shall be effective for the students admitted to MBBS course Phase I from the academic year 2005-06 onwards.*

**By Order  
Registrar**

### (B) INTRODUCTION

The Medical Council of India has notified the following regulations from academic year 1997-98. These regulations recommend :

- (1) That the medical curriculum should be oriented towards training students to undertake the responsibilities of a physician of first contact who is capable of looking after the preventive, promotive, curative and rehabilitative aspects of medicine.
- (2) The training though broad based and flexible should aim to provide an educational experience of the essentials required for health care in our country.
- (3) To undertake the responsibilities of service situations which is a changing condition and of various types. It is essential to provide adequate placement training tailored to the needs of such services as to enable the graduates to become effective instruments of implementation of those requirements. To avail of opportunities and be able to conduct professional requirements the graduate shall endeavour to have acquired basic training in different aspects of medical care.
- (4) The importance of the community aspects of health care and of rural health care services is to be recognized. This aspect of education and training of graduates should be adequately recognized in the prescribed curriculum. Its importance has been systematically upgraded over the past years and adequate exposure to such experiences should be available throughout all the three phases of education and training. This has to be further emphasized and intensified by providing exposure to field practice areas and training during the internship

period. The aim of the period of rural training during internship is to enable the fresh graduates to function efficiently under such settings.

- (5) The educational experience should emphasize health and community orientation instead of only disease and hospital orientation or being concentrated - on curative - aspects. As such all the basic concepts of modern scientific medical education are to be adequately dealt with.
- (6) There must be enough experiences to be provided for self learning. The methods and techniques that would ensure this must become a part of teaching -learning process.
- (7) The medical graduate of modern scientific medicine shall endeavour to become capable of functioning independently in both urban or rural environment. He/she shall endeavour to give emphasis on fundamental aspects of the subjects taught and on common problems of health and disease avoiding unnecessary details of specialization.
- (8) The importance of social factors in relation to the problem of health and diseases should receive proper emphasis throughout the course and to achieve this purpose, the educational process should also be community based than only hospital based. The importance of population control and family welfare planning should be emphasized throughout the period of training with the importance of health and development duly emphasized.
- (9) Adequate emphasis is to be placed on cultivation logical and scientific habits of thought, clarity of expression and independence of judgment, ability to collect and analyse information and to correlate them.
- (10) The educational process should be placed in a historic background as an evolving process and not merely as an acquisition of a large number of disjointed facts without a proper perspective. The history of Medicine with reference to the evolution of medical knowledge both in this country and the rest of the world should form a part of this process.
- (11) Lectures should be supplemented by use of active methods related to demonstrations and first hand experience. Students will be encouraged to learn in small groups, through peer interactions so as to gain maximal experience through contacts with patients and the communities in which they live. While the curriculum objectives often refer to areas of knowledge or science, they are best taught in a setting of clinical relevance and hands on experience for students who assimilate and make this knowledge a part of their own working skills.
- (12) The graduate medical education in clinical subjects should be based primarily on out-patient teaching, emergency departments and within the community including peripheral health care institutions. The out-patient departments should be suitably planned to provide training to graduates in small groups.
- (13) Clinics should be organized in small groups of preferably not more than 10 students so that a teacher can give personal attention to each students with a view to improve this skill and competence in handling of the patients.
- (14) Proper records of the work should be maintained which will form the basis for the students' internal assessment and should be available to the inspectors at the time of inspection of the college by the Medical Council of India.

- (15) Maximal efforts have to be made to encourage integrated teaching between traditional subject areas using a problem based learning approach starting with clinical or community cases and exploring the relevance of various pre-clinical disciplines in both understanding and resolution of the problem. Every attempt be made to de-emphasize compartmentalization of disciplines so as to achieve both horizontal and vertical integration in different phases.
- (16) Every attempt is to be made to encourage students to participate in group discussions and seminars to enable them to develop personality, character, expression and other faculties which are necessary for a medical graduate to function either in solo practice or as a team leader when he begins his independent career. A discussion group should not have more than 20 students.
- (17) Faculty members should avail of modern educational technology while teaching the students and to attain this objective, Medical Education units / Departments be established in all medical colleges for faculty development and providing learning resource material to teachers
- (18) To derive maximum advantage out of this curriculum the vacation period to students in one calendar year should not exceed one month during the 4 ½ years MBBS course.
- (19) In order to implement the curriculum in to, State Government and Institutional Bodies must ensure that adequate financial and technical inputs are provided.

**(C) OBJECTIVES OF MEDICAL EDUCATION TRAINING PROGRAM**

**(1) National Goals :**

At the end of undergraduate program, the medical student shall endeavour to be able to

- a. Recognize 'health for all' as a national goal and health right of all citizens and by undergoing training for medial profession fulfill his /her social obligations towards realization of this goal.
- b. Learn every aspect of National policies on health and devote himself / herself to its implementation.
- c. Achieve competence in practice of holistic medicine, encompassing promotive, preventive, curative and rehabilitative aspects of common disease.
- d. Develop scientific temper, acquire education experience for proficiency in profession and promote healthy living.
- e. Become exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

**(2) Institutional Goals :**

In consonance with the national goals each Medical Institution should evolve Institutional goals to define the kind of trained manpower (or professionals) they intend to produce. The undergraduate students coming out of a medical Institute should :

- a. be competent in diagnosis and management of common health problems of the individual and the community, commensurate with his / her position as a member of the health team at the primary, secondary or tertiary levels, using his/ her clinical skills based on history, physical examination and relevant investigations.
- b. Be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems.

- c. Appreciate rationale for different therapeutic modalities, be familiar with the administration of the 'essential drugs' and their common side effects.
- d. Be able to appreciate the socio-psychological, cultural, economic and environmental factors affecting health and develop human attitude towards the patients in discharging one's professional responsibilities.
- e. Possess the attitude for continued self learning and to seek further expertise or to pursue research in any chosen area of medicine.
- f. Be familiar with basic factors which are essential for the implementation of the National Health Programs including practical aspects of the following
  - i. Family Welfare and Maternal and Child Health (MCH)
  - ii. Sanitation and water supply
  - iii. Prevention and control of communicable and non-communicable diseases.
  - iv. Immunization
  - v. Health Education
- g. Acquire basic management skills in the area of human resources, materials and resources management related to health care delivery.
- h. Be able to identify community health problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures.
- i. Be able to work as a leading partner in health care teams and acquire proficiency in communication skills.
- j. Be competent to work in a variety of health care settings.
- k. Have personal characteristics and attitudes required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.
- l. All efforts must be made to equip the medical graduate to acquire the skills as detailed in APPENX B.

**(D) REGULATIONS GOVERNING M.B.B.S. DEGREE COURSE : ELIGIBILITY FOR ADMISSION, MIGRATION, ATTENDENCE, DURATION AND TRAINING PERIOD**

**(I) Admission to Medical Course**

**(a) Eligibility criteria**

No candidate shall be allowed to be admitted to the medical curriculum of first Bachelor of Medicine and Bachelor of Surgery (MBBS) course until :

**a.1 Age**

He/she has completed the age of 17 years on or before first day of July of the year when the prescribed academic session of the said course is to commence.

**a.2 Qualifying Examination**

He/she has passed qualifying examination as under

- a. The higher secondary examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher Secondary Examination after a period of 12 years study, the last two years of study comprising of Physics, Chemistry, Biology and Mathematics or any other elective subject with English at a level not less than the core course for English as prescribed by the National Council for Education Research and Training after the introduction of the 10+2+3 years educational structure as recommended by the National Committee on education.

**Note :** Where the course content is not as prescribed for 10 +2 education structure of the National Committee, the candidates will have to undergo a period of one year pre-professional training before admission to the Medical College.

OR

b. The Intermediate examination in science of an Indian University / Board of other recognized examining body with Physics, Chemistry and Biology which shall include a practical test in these subjects and also English as a compulsory subject.

OR

(c) The pre-professional / pre medical examination with Physics, Chemistry and Biology, after passing either the higher secondary school examination, or the pre-university or an equivalent examination. The pre-professional / pre-medical examination shall include a practical test in Physics, Chemistry and Biology and also English as a compulsory subject.

OR

(d) The first year of the three years degree course of a recognized university with Physics, Chemistry and Biology including a practical test in these subjects o\provided the examination is a “University Examination” and candidate has passed 10 + 2 with English at a level not less than a core course.

OR

(e) B.Sc. examination of an Indian University, provided that he/she has passed the B.Sc. examination with not less than two of the following subjects - Physics, Chemistry, Biology (Botany Zoology) and further that he/she has passed the earlier qualifying examination with the following subjects - Physics, Chemistry, Biology and English.

OR

(f) Any other examination which, in scope and standard is found to be equivalent to the Intermediate science examination of an Indian University Board, taking Physics, Chemistry and Biology including a practical test in each of these subject and English.

Note : The Pre-medical course may be conducted either at Medical College or a Science College.

- Marks obtained in Mathematics are not to be considered for admission to MBBS Course.
- After the 10+2 course is introduced, the integrated courses should be abolished.
- Candidates who have passed “Physical Science” instead of Physics and Chemistry as two separate subjects are not eligible for admission to MBBS course as per Medical Council Of India Regulations vide letter MCI-37(2)/2001/Med.922 dated 14.02.2001.

### a.3 Marks

- a. In case of admission on the basis of qualifying examination, a candidate for admission to MBBS course must have passed individually in the subjects of Physics, Chemistry, Biology and English and must have obtained not less than 50% marks taken together in Physics, Chemistry and Biology in the qualifying examination. In respect of candidates belonging to Scheduled casts, Scheduled Tribes or Category I, the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination be not less than 40% instead of 50%.
- b. In case of admission on the basis of competitive entrance examination, a candidate must have passed individually in the subjects of Physics, Chemistry, Biology and English and must have Obtained not less than 50% marks in Physics, Chemistry and Biology taken together at the qualifying examination and in addition must have come in the merit list prepared as a result of such competitive entrance examination by securing not less than 50% marks in the competitive examination. In respect of candidates

belonging to Scheduled casts, Scheduled Tribes or Category I, the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination and competitive entrance examination be not less than 40% instead of 50% as stated above. (vide amendment to MCI Regulations, 1997, notified in Gazette of Government of India dated 29.05.1999.)

**(II) Migration**

- (1) Migration from one medical college to other is not a right of a student. However, migration of students from one medical college to another medical college in India may be considered by the Medical Council of India. Only in exceptional cases on extreme compassionate grounds, provided following criteria are fulfilled. Routine migrations on other grounds shall not be allowed.
- (2) Both the colleges, i.e. one at which the students is studying at present and one to which migration is sought, are recognized by the Medical Council of India.
- (3) The applicant candidate should have passed first professional MBBS examination.
- (4) The applicant candidate submits his application for migration, complete in all respects, to all authorities concerned within a period of one month of passing (declaration of results) the first professional Bachelor of Medicine and Bachelor of Surgery (MBBS) examination.
- (5) The applicant candidate must submit an affidavit stating that he/she will pursue 18 month of prescribed study before appearing at IInd professional bachelor of Medicine and Bachelor of Surgery (MBBS) examination at the transferee medical college, which should be duly certified by the Registrar of the concerned University in which he/she is seeking transfer. The transfer will be applicable only after receipt of the affidavit.

**Note 1**

- i. Migration during clinical course of study shall not be allowed on any ground.
- ii. All application for migration shall be referred to Medical Council of India by College authorities. No Institution/University shall allow migration directly without the approval of the Council.
- iii. Council reserves the right, not to entertain any application which is not under the prescribed compassionate grounds and also to take independent decisions where applicant has been allowed to migrate without referring the same to the Council.

**Note 2 Compassionate grounds criteria.**

- i. Death of supporting guardian.
- ii. Illness of the candidate causing disability.
- iii. Disturbed conditions as declared by Government in the Medical College area.

**(III) Attendance**

Every candidate should have attendance not less than 75% of the total classes conducted in theory, practical and clinical jointly in each calendar year calculated from the date of commencement of the term to the last working as notified by the University in each of the subjects prescribed to be eligible to appear for the University examination. (vide Medical Council of India Notification on Graduate Medical Education

(Amendment) Regulations 2003, published in the Gazette of India Part III, Section 4, Extraordinary issued on 15 Oct. 2003.)

**(IV) Training period and Time Distribution**

- (1) Every student shall undergo a period of certified study extending over 4½ academic years from the date of commencement of his study for the subject comprising the medical curriculum to the date of completion of the examination followed by one year compulsory rotating Internship. The 4½ years course has been divided into three phases.
  - i. Phase I - 1 year, consisting of two terms of 6 months each.
  - ii. Phase II - 1½ years, consisting of three terms of 6 months each
  - iii. Phase III - 3½ years, after Phase I, consisting of seven terms of 6 months each.
- (2) The first year shall be occupied in the study of Phase I (Pre Clinical) subjects of Human Anatomy (650 hours), Physiology including Bio-Physics (480 hours), Bio-Chemistry (240 hours) and Introduction to Community Medicine including Humanities (60 hours). Rest of the time shall be equally divided between Anatomy and Physiology plus Biochemistry combined.
- (3) After passing pre-clinical subjects in Phase-I, the Phase-II shall be of 3 terms (1½ years), devoted to Para Clinical and Clinical subjects. Para Clinical subjects shall consist of Pathology, Pharmacology, Microbiology, Forensic Medicine & Toxicology and part of Community Medicine. During this phase the clinical subjects i.e. Medicine and its allied specialities, Surgery and its allied specialities and Obstetrics and Gynecology shall be taught concurrently.
- (4) Phase III consists of Community Medicine and clinical subjects - Medicine and its allied specialities, Surgery and its allied specialities and Obstetrics and Gynecology.

**(V) TEACHING HOURS**

Distribution of teaching hours in Phase I subjects

Methods	Subject/Number of Hours			
	Anatomy	Physiology	Biochemistry	Community Medicine
Lectures	175 hrs	167 hrs	80 hrs	40 hrs
Tutorials	65 hrs	113 hrs	90 hrs	10 hrs
Group Dissection	75 hrs			4 hrs
Practical/ Demonstration	70 hrs	200 hrs	70 hrs	6 hrs
Dissection	270 hrs	-	-	
<b>TOTAL</b>	<b>655 hrs</b>	<b>480 hrs</b>	<b>240 hrs</b>	<b>60 hrs</b>

## FIRST M.B.B.S. CURRICULUM

### HUMAN ANATOMY

#### **Goal**

The broad goal of the teaching of undergraduate students in Anatomy aims at providing comprehensive knowledge of the gross and microscopic structure and development of human body to provide a basis for understanding the clinical correlation of organs or structures involved and the anatomical basis for the disease presentations.

#### **Objectives**

At the end of the course the student shall be able to

- 1) Comprehend the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the body.
- 2) Identify the microscopic structure and correlate elementary ultra structure of various organs and tissues and correlate the structure with the functions as pre requisites for understanding the altered state in various disease processes.
- 3) Comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functions of the organs and systems. He/She shall be able to locate the site of gross lesions according to the deficits encountered.
- 4) Demonstrate knowledge of the basic principles and sequential development of the organs and systems, recognize the critical stages of development and the effects of common teratogens, genetic mutations and environmental hazards. He/She shall be able to explain the development basis of the major variations and abnormalities.

#### **Skills**

At the end of the course the students shall be able to :

- 1) Identify and locate all the structures of the body and mark. The topography of the living anatomy.
- 2) Identify the organs and tissues under the microscope.
- 3) Understand principles of karyotyping and identify the gross congenital anomalies.
- 4) Understand principles of newer imaging techniques and interpretation of C T scan, sonogram etc.
- 5) Understand clinical basis of some common clinical procedures i.e. intramuscular and intravenous injection, lumbar puncture and kidney biopsy etc.

#### **Integration**

From the integrated teaching of other basic sciences, students shall be able to comprehend and regulation and integration of various organs and system in the body and thus interpret the anatomical basis of disease process.

### **COURSE CONTENT THEORY**

#### **Cross Sectional Anatomy & Endoscopic Anatomy**

Superior Extremity - Shoulder region, Mid Arm (Insertion of coraco-brachialis), Mid forearm level (compartments of forearm), Hand. Inferior Extremity Mid thigh (Passing through adductor canal), Knee joint, cross section of Leg (Compartments), Saggittal section of foot (arches) Abdomen - cross section of Inguinal Canal, Cross section of Rectus sheath at different level, Transpyloric plane, Subcostal plane, Transtuberular plane, Peritoneal reflexion in pelvis, supracolic & Infracolic, compartments, Vertical Tracing of peritoneum, Endoscopic view of G.I. tract and Urinary tract. Thorax - Suprasternal notch (Inlet of Thorax), Mid Manubrosternum level - (sup. Medianastium.), Sternal Angle, Sterno - xiphisternal Joint (Post mediastinum), Endoscopic view of trachea and bronchi.



**H.N.F.**

Glabella, Nasion (orbit), Nasal Cavity, C-4 level (deep cervical fascia), C-6 level (trachea, oesophagus), Endoscopic view of pharynx and larynx and sinuses

**Brain**

Spinal Cord - Cervical, thoracic, Lumbar & sacral, Medulla oblongata-sensory & motor decussation mid olivary level. Pons-Lower & Upper part, Cerebellum- Dentate nucleus, |Mid-brain-Sup. Colliculus & Inf. Colliculus, Cerebrum-Interventricular foramen, Temporal lobe. Sagittal & coronal sections

**Must Know**

Organs seen & their disposition

**Desirable to know**

Description of organs

**Nice to know**

Applied Imp

**Applied Anatomy****Superior Extremity**

Mammary Gland, Clavipectoral fascia, Brachial plexus, Erb's, Klumpky's Saturday night, crutch, Winging of scapula, Wrist drop, claw hand, Ape thumb, deformity, Carpal tunnel syndrome, Shoulder Joint, Supination & pronation, Colle's fracture, Whitlow, space of parona, Radial & Ulnar bursa, Dupuytrons contracture, Grips

**Inferior Extremity**

Femoral ring, Femoral hernia, Adductor canal, Stabilization of pelvis, Sciatica, Sleeping foot, Foot drop, Hammer toe, Injury to menisci, Cruciate ligaments, Locking & unlocking, Blood supply of Head of Femur, Congenital dislocation, Perthe's disease, prosthesis, Club foot, pes cavus, Walking mechanism, swing and stance phase

**Abdomen**

Inguinal hernia, Hasselbach's Triangle, Inguinal Mechanism, Rectus sheath, Applied Imp. Of Testis, spermatic cord, hydrocele with types, Herniation-Lumbar, Hiatus, Epiploic Foramen, Internal herniation, Ascitis, pouch of Douglas, Jaundice-extra-hepatic biliary apparatus, Extravasation of urine, Perineal tears, Fistula & fissures, Portocaval shunts, Anastomosis, Piles, Prolapse of Uterus, Pudendal block, Lumbar puncture, Epidural anesthesia

**Thorax**

Intercostal block, Pleural tapping, Bronchpulmonary segments, Ischaemic heart Diseases, Tracheo-bronchial fistula, Atrial flutter, Fibrillation, Ectopic beats, Pericarditis, Mediastinal flutter, Mediastinal syndrome

**H.N.F.**

Parapharyngeal spaces, deep cervical fascia, Carotid sheath, Thyroid & Parotid gland, Structures in Mid line, Lacrimation, Epistaxis, sinusitis, Aphasia-tonsillitis, Otitis media, Torticollis

**Brain**

Meningitis, Venous sinuses, Pituitary tumours, Hemiplegia, Strokes and, syndromes, Facial palsy

**Must Know**

Anatomical basis, Boundaries, Etiology.

**Desirable to know**

Signs & Symptoms.

**Nice to know**

Treatment, Counselling & Follow up.

## **General Anatomy**

Descriptive Terms Regarding position, planes, movements, parts of body and movements. Integument Introduction, Classification, structure and functions appendages of skin like sweat gland, Hair, sebaceous gland, nail and arrector pilorum. Innervation, Langer's line' flexure lines. Superficial Fascia-distribution & Function. Deep Fascia Structure, distribution & function, Modification, Retinacula. Ligaments, capsule, tendon- Applied- sprains, structure and function. Cartilage Definition, Types, structure, Nutrition Distribution. General Osteology Definition, Functions, Distribution, Classification Ossification, parts of long bones, Nutrition of bones, Growth. Joints Classification, structure, movements, Blood supply & Nerve supply. General Myology Definition, types, Classification - Agonist etc. Bursa, synergists, Aponeurosis. General Angiology Classification, distribution, Function, structure, vas vasorum, Nerve supply, Collateral circulation, end arteries. Lymphatic System Lymph vessels, Central & Peripheral Lymphoid tissue. T & B Lymphocytes. General Neurology Structure Neurons, classification, Neuroglia, Nerves Cranial & spinal. ASNS - Ganglia, pre & post ganglionic fibres. Parasymp Craniosacral outflow, Sympathetic.

### **Must know**

Classification, Definition, Distribution, parts, Structure.

### **Desirable to know**

Growth, Nutrition, Nerve Supply, Applied.

### **Nice to know**

Kinesiology, Skin grafts, Effect of Hormones.

## **Regional Anatomy**

### **A) Superior extremity**

#### **Osteology**

Clavicle, Scapula, Humerus, Radius, Ulna & Hand articulated.

#### **Must know**

Identification with side, Anatomical position, parts, Joints formed, Muscular attachments, Nerves & vessels related.

#### **Desirable to know**

Ossification, function, peculiarities, line of Wt transmission, capsular attachment.

#### **Nice to know**

Common site of fractures carrying angle, subluxation Other angles.

#### **Arthrology**

Shoulder girdle, Elbow, Radioulnar & wrist Joints. 1st carpometacarpal Joint.

#### **Must know**

Bones taking part, type, classification, movements with Muscles involved, structures giving stability.

#### **Desirable to know**

Capsule, Blood Supply, Nerve Supply, Articular cartilage, Movements of thumb.

#### **Nice to know**

Applied, Fall on outstretched Hand, Midcarpal, MP & IP Joints.

#### **Myology**

#### **Must know**

Muscles with origin, insertion, Nerve supply, And Action, Identification.

#### **Desirable to know**

Blood supply groups of muscles, Boundaries of Intermuscular spaces. Triangle of auscultations. Anatomical Snuff Box.

#### **Nice to know**

Volkman's ischaemic contracture, extensor Expansion.

**Angiology**

Axillary, Brachial, Ulnar, Radial & Palmar arches, veins,

**Must know**

Formation, end, Branches of Tributaries.

**Desirable to know**

Course, relation, variation.

**Nice to know**

Applied Importance, Collateral circulation. Axillary group of Lymph nodes. Lymphatic drainage of Breast

**Neurology**

Brachial Plexus, Radial, Median, Ulnar, Axillary & Musculocutaneous Nerve.

**Must know**

Formation Origin, Root Value, Branches and distribution.

**Desirable to know**

Relations, course, variations.

**Nice to know**

Applied Importance.

**Miscellaneous**

Mammary gland, clavipectoral fascia, Interosseous membrane. Axilla boundaries.

**B) INFERIOR EXTREMITY****Osteology**

Hip bone, Femur, Patella, Tibia, Fibula, Articulated foot.

**Must know**

Identification with side, Anatomical position, parts, Joints formed, muscular attachments, Nerves and Vessels related.

**Desirable to know**

Ossification, capsular attachment, functions peculiarities, Line of weight transmission.

**Nice to know**

Fractures, dislocation, angles, calcar femorale, calcaneal Spur, March fracture, Nutrient artery.

**Arthrology**

Hip Joint, knee joint Ankle Joint, subtalar & talocalcaneo navicular Joints.

**Must know**

Bones taking part, type, classification, movements with Muscles involved, structures, giving stability.

**Desirable to know**

Capsule, Blood supply, Nerve Supply, Articular Cartilage Menisci, intraarticular structures. Inversion & Eversion.

**Nice to know**

Fractures, dislocations, Bucket Handle injury to Medial Meniscus, Bursitis.

**Myology**

Compartments with muscle display.

**Must know**

Identification, Origin, insertion, Nerve supply & action.

**Desirable to know**

Blood supply, Groups of muscles, Layers of sole.

**Nice to know**

Extensor expansion, peripheral Heart, white or antigravity muscles.

**Angiology**

Femoral, popliteal anterior and posterior tibial. Common peroneal, plantar arch, dorsalis pedis artery Superficial and deep veins, perforators. Inguinal group of Lymph nodes.

**Must know**

Formation, end, branches or Tributaries.

**Desirable to know**

Course, Relations, Variations.

**Nice to know**

Applied importance, Collateral circulation popliteal aneurysm. Intermittant claudication.

**Neurology**

Lumbar & Sacral plexus formation sciatic, femoral, obturator, tibial and common peroneal Nerve.

**Must know**

Origin, root value, Branches & distribution.

**Desirable to know**

Relation, course & variations.

**Nice to know**

Sciatica, foot drop, I.M. Injection.

**Miscellaneous**

Femoral Triangle - contents, Sheath, Canal, Ring. iliotibial tract, Saphenous opening, Adductor Canal Arches of foot- Talipes - Equinovarus, Clawing of Toes.

**C) ABDOMEN****Abdominal Organs**

Stomach, spleen liver, biliary apparatus, pancreas, small & large Intestine, vermiform appendix, kidneys, ureters, suprarenal glands.

**Must know**

Morphology, Blood supply, Lymphatics, Nerve supply.

**Desirable to know**

Applied, Peptic ulcer, splenic circulation, stabilising Factors, Gallstones, Renal stones, Ureter sites of Constriction.

**Nice to know**

Biopsy, Approach to kidney, pheochromocytoma, Renal & Liver transplant, Cushing & Addison's syndrome. Gastroscopy.

**Pelvic Viscera**

Urinary bladder, Urethra, Prostate, Uterus, Ovaries. Uterine tubes, Rectum & Anal anal.

**Must know**

Morphology, relation blood supply, nerve supply.

**Desirable to know**

Supports, Applied importance like Fistula, fissure.

**Nice to know**

Treatment, Investigations.

**Perineum**

Scrotum, Testes, Epididymis, Spermatic cord, Ischioanal fossa Pudendal canal, perineal spaces, penis, vagina, urogenital & Pelvic diaphragm, perineal muscles.

**Must know**

Situation, structure, dimensions, formation.

**Desirable to know**

Blood supply, Nerve supply.

**Nice to know**

Ischiorectal abscess, Herniation Superficial inguinal Pouch.

**Abdominal Wall - Anterior and posterior.**

Rectus\_sheath, Inguinal Canal, Thoracolumbar fascia, psoas Major, quadratus lumborum, Thoraco abdominal diaphragm.

**Must know**

Formation, Extent, boundaries.

**Desirable to know**

Parts, Blood supply, Applied.

**Nice to know**

Hernia operations, Incisions, psoas abscess.

**Peritoneum**

Greater & lesser, omentum, epiploic foramen, Pouch of Douglas, paracolic gutter lesser sac

**Osteology**

Lumbar vertebra, sacrum, bony pelvis

**Must know**

Identification, classification, attachments, sex Determination, anatomical postion.

**Desirable to know**

Ossification, Relations of vessels & Nerves. Various indices.

**Nice to know**

Types of female pelvis, applied.

**Arthrology**

Intervertebral Joints, LumboSacral, sacroiliac, sacrococcygeal & Symphysis pubis.

**Must know**

Type, bones participating, movements.

**Desirable to know**

Muscles involved in these movements.

**Nice to know**

Applied, disc Prolapse.

**Angiology**

Portal vein, Inferior vena cava, Abdominal aorta.

**Must know**

Origin, termination, branches tributaries. Level-II- Course & relations, portosystemic anastomosis.

**Desirable to know**

Applied.

**Neurology**

Lumbar & sacral plexus.

**Must know**

Formation, branches.

**Desirable to know**

Distribution.

**Nice to know**

Applied.

**D) THORAX****Thoracic wall**

Thoracic inlet, Intercostal space.

**Must know**

Boundaries, Contents, Muscles, Respiratory Movements.

**Desirable to know**

Accessory muscles, Nerve block.

**Nice to know**

Applied, Barrel chest, Herpes Zoster.

**Mediastinum****Must know**

Definition, divisions, boundaries & Contents.

**Desirable to know**

Disposition of contents.

**Nice to know**

Applied, Mediastinitis.

**Pleura and Lungs****Must know**

Pleural reflections, recesses, Morphology of lung, bronchpulmonary segments, root & Hilum.

**Desirable to know**

Function of recesses, pulmonary Lig. Blood supply & Nerve supply, relations.

**Nice to know**

Pleural effusion, bronchoscopy, Lobectomy, segmental resection, postural Drainage.

**Pericardium and Heart****Must know**

Divisions of pericardium with sinuses. Anatomical position Heart, dimensions Surfaces & borders, interior of all chambers, Vessels of Heart.

**Desirable to know**

Relations, conducting system with Nerve supply.

**Nice to know**

Referred pain, Ischaemic diseases, Fallot's Tetralogy etc.

**Osteology**

Sternum, ribs, thoracic vertebra.

**Must know**

Identification, parts Anatomical position, Attachments classification.

**Desirable to know**

Ossification, relations.

**Nice to know**

Flail chest, fractures, pleural reflection on 12<sup>th</sup> rib.

**E) HEAD, NECK & FACE****Myology**

Triangles of Neck, Deep fascia sternocleidomastoid, Trapezius, digastric, Mylohyoid, Hyoglossus, Facial muscles, muscles of mastication. Laryngeal & pharyngeal Musculature, muscles of tongue & palate, extra & intraocular muscles, Layers of muscles of Back.

**Must know**

Boundaries & contents of Triangles, Origin, Actions Nerve supply, insertion.

**Desirable to know**

Relations spaces, spread of infections, Blood Supply of Face.

**Nice to know**

Damage, Applied, investigations, dangerous area of face, Facial Nerve palsy, Squint.

**Gland**

Thyroid, parathyroid, parotid, submandibular sublingual pituitary, Lacrimal gland.

**Must know**

Type, classification, Dimensions, surfaces & Borders, Duct.

**Desirable to be**

Relations, blood supply, Nerve supply, coverings Intraglandular structures.

**Nice to know**

Applied.

**Viscera**

Scalp, palate, tongue, pharynx, Larynx, orbit, Lacrimal apparatus, eye ball, nasal cavity, paranasal air sinuses, palatine tonsil, Ear- Middle ear, part of external and internal ear, Meninges.

**Must know**

Dimensions, extension, parts, structure.

**Desirable to know**

Relations, Blood supply, Nerve supply, Lymphatics.

**Nice to know**

Applied, investigations, treatment, phonation, Deglutition.

**Osteology**

Skull as a whole, Interior of skull cranial fossae, skullcap, mandible, Hyoid, cervical vertebrae & vertebral column as a whole, Fetal skull.

**Must know**

Different Norms, points, Foramina, structures, passing through, Number & type of bones.

**Desirable to know**

Age & sex determination, fontanelles, Craniometry. Dental Formula.

**Nice to know**

Fractures, Cervical rib.

**Arthrology**

T.M. Joint, Atlanto axial Joints, Sutural Joints.

**Must know**

Type, Bones taking part, movements.

**Desirable to know**

Muscles concerned, Blood & Nerve supply. Applied.

**Angiology**

Subclavian, Carotid system, Ext. & internal, Jugular veins, venous sinuses, Lymphatic drainage of HNF.

**Must know**

Origin, end, Branches & Tributaries.

**Desirable to know**

Parts, relations, Course, Variations.

**Nice to know**

Collateral circulation, aneurysm, cervical, Rib, emissary vein.

**Neurology**

Cranial Nerves, brachial & cervical plexus. Parasymp & symp. ganglion.

**Must know**

Number, component, nuclei, distribution,

**Desirable to know**

Course, relations

**Nice to know**

Applied, Reflex pathways.

## **F) BRAIN AND SPINAL CORD (NEUROANATOMY)**

### **Spinal Cord**

#### **Must know**

Gross features, enlargements, covering, extent, Filum terminale, cross section with ascending & Descending tracts, spinal segments.

#### **Desirable to know**

Vertebral correlation, nuclei, Blood supply.

#### **Nice to know**

Trauma, myelography, Applied, Lamellar pattern.

### **Brain**

Dimensions, parts, attachment of cranial nerves.

### **Medulla oblongata**

#### **Must know**

Cross sectional study at different levels with Cranial Nerve nuclei & Inf. olivary nucleus

#### **Desirable to know**

Blood supply, Organisation and column theory of cranial Nerve nuclei. Tuber cinereum.

#### **Nice to know**

Syndromes.

### **Pons**

#### **Must know**

Cross sectional study at different regions.

#### **Desirable to Know**

Relations, Blood supply.

#### **Nice to Know**

Syndromes, Pontine haemorrhage.

### **Cerebellum**

#### **Must Know**

Divisions, lobes, nuclei, dimensions, relations, Peduncles, classification.

#### **Desirable to Know**

Internal structure, connections.

#### **Nice to Know**

Dysfunction, ataxia, hypotonia.

### **Midbrain**

#### **Must Know**

Cross sections at Sup. & Inf colliculus & display of gray & white matter.

Red nucleus, substantia nigra.

#### **Desirable to Know**

Lemnisci, sup. Colliculus.

#### **Nice to Know**

Syndromes.

### **Cerebrum**

#### **Must Know**

Sulci, classification, Gyri, functional areas, surfaces. Borders, poles, lobes, basal nuclei, corpus callosum Classification of white matter, internal capsule.

#### **Desirable to Know**

Caudate, amygdala, septal nuclei, Olfactory area, Structures forming limbic lobe, Blood supply.



**Nice to Know**

Applied Importance.

**Diencephalon****Must Know**

Parts, nuclei of Thalamus, nuclei of hypothalamus, Geniculate bodies, Epithalamus, Nucleii belonging to Subthalamus, Relation, Functions.

**Desirable to Know**

Connections, Blood supply, visual & auditory pathway.

**Nice to Know**

Syndromes, Applied.

**Ventricular System****Must Know**

Classification, situation, parts, boundaries. Communications, C.S.F. Circulation.

**Desirable to Know**

Choroid plexus, recesses.

**Nice to Know**

Applied, Hydrocephalous

**Blood Supply**

Arteries & veins.

**Must Know**

Circle of Willies formation, branches & distribution.

**Desirable to Know**

Blood brain barrier, End arteries.

**Nice to Know**

Hemiplegia.

**HISTOLOGY****I) General Histology****Microscope****Must Know**

Light Microscope, Parts. Magnification, resolution.

**Desirable to Know**

Histological Techniques, H & E staining, special Stains.

**Nice to Know**

Electron & other types of microscopes.

**Cytology****Must Know**

Cell definition, Cell membrane, Cytoplasm, Nucleus, Cell Organelles.

**Desirable to Know**

Endoplasmic reticulum, cytoplasm, cell cycle, cell division, Cell transport, Micro villi structure.

**Nice to Know**

Applied importance, Barr body, lpyknotic- Types of nuclei.

**Epithelium****Must Know**

Definition, classification structure & functions.

**Desirable to Know**

Nutrition, repair, Nerve supply, Cell- junctions. Surface - modifications, cilia, microvilli, stereocilia

**Nice to Know**

Myoepithelial cells, Basement membrane

**Connective Tissue****Must Know**

Classification, structure, fibres, Ground substance.

**Desirable to Know**

Mucosubstances in ground substance, cells.

**Nice to Know**

Inflammation, Oedema, hyaluronidase enzyme, Scurvy.

**Cartilage****Must Know**

Classification, types, perichondrium, functions.

**Desirable to Know**

Nutrition and repair

**Nice to Know**

Chondroma.

**Bones****Must Know**

Classification, structure, periosteum developing bone, bone cells, osteon.

**Desirable to Know**

Nutrition & repair.

**Nice to Know**

Growth Hormones, Osteoma, Osteomyelitis.

**Muscle****Must Know**

Classification, Structure, Functions, Myofilaments.

**Desirable to Know**

E.M. picture of striated muscle, Intercalated disc. Syncytium, sarcoplasmic reticulum, connective tissue Coverings.

**Nice to Know**

'T' system Red & White fibres. Atrophy, hypertrophy, hyperplasia, myasthenia gravis.

**Nervous System****Must Know**

Neurons, Classification, parts, Nerve fibres.

**Desirable to Know**

Synapses, myelinations, ganglia, nucleus

**Nice to Know**

Connective tissue coverings, injury, walarian degeneration.

**Vessels****Must Know**

Classification, Coats, Lining epithelium, functions.

**Desirable to Know**

Arterioles, Capillary, Sinusoids, Pericytes.

**Nice to Know**

Atherosclerosis, Aneurysm.

**E) LYMPHOID SYSTEM**

Thymus, spleen, palatine tonsil, Lymph node.

**Must Know**

Classification, identification criteria, parts & functions.

**Desirable to Know**

T Cells, B. Cells. Immunity with types. Germinal center, splenic circulation.

**Nice to Know**

Autoimmunity, Blood thymus barrier, Organ transplantation, Graft rejection.

**F) INTEGUMENTARY SYSTEM**

Skin and its appendages.

**Must Know**

Classification-Thick & Thin, parts, epithelium. Various cells, functions, structure of appendages.

**Desirable to Know**

Repair, Blood & Nerve supply.

**Nice to Know**

Applied- Albinism, Melanoma, Acne.

**II) SYSTEMIC HISTOLOGY**

**Oral Cavity**

Lip, Tongue, Tooth, Salivary Glands.

**Must Know**

Structure identification, parts, classification, Papillae in tongue.

**Desirable to Know**

Taste buds, striated ducts, E.M. picture of serous cells.

**Nice to Know**

Applied, Periodontal lig, structure of Enamel, Incremental lines.

**G.I.Tract**

Oesophagus, stomach fundic & Pyloric, duodenum, jejunum , ileum, vermiform Appendix, Colon.

**Must Know**

Basic 4 layer Organization, modification, Identification, Glands, Types of Glands, Secretions.

**Desirable to Know**

Differentiation of muscle coat, function of secretions, Lymphoid tissue.

**Nice to Know**

E.M.picture of gland cells, Ulcer, 'M'cells.

**Glands**

Liver, Gall bladder, pancreas.

**Must Know**

Type of Gland, Coats or parts, structure & functions, Islet's

**Desirable to Know**

Hepatic lobule, Portal Lobule, centro- acinar cells, islets or Langerhans, Kuffer cells.

**Nice to Know**

Hepatic acinus, fatty degenerations of liver, & cells of Pancreas, Diabetes mellitus.

**Respiratory System**

Epiglottis, Trachea, Lung

**Must Know**

Coats structure with lining epithelium, differentiation between different parts.

**Desirable to Know**

Pneumocyte I, Pneumocyte II, dust cells, Claracells.

**Nice to Know**

Heart failure cells, Bronchial Asthma, Hyaline membrane disease.

## **Urinary System**

Kidney ,Ureter, Urinary Bladder, Urethra.

### **Must Know**

Nephron, parts, Cortex & medulla, functions, Lining epithelium, Collecting system, coats in ureter and Urinary bladder.

### **Desirable to Know**

Juxtaglomerular apparatus , cells in transitional epithelium, podocytes.

### **Nice to Know**

Diabetes insipidus, essential hypertension, Renal stones.

## **Male reproductive system**

Testis, epididymis, vas deferens, seminal vesicle, Prostate, Penis.

### **Must Know**

Identification coats, lining epithelium, Functions.

### **Desirable to Know**

Blood testis barrier, stereocilia of penis Hormone secretion. Leydig cells, spermatogenesis.

### **Nice to Know**

Prostatic concretion, vasectomy, semen examination, Immotile sperm.

## **Female Reproductive System**

Ovary, Uterine tube, Uterus in different stages, active & passive mammary gland, vagina placenta, umbilical cords.

### **Must Know**

Identification, coats with structure, different stages of follicles, Whatons jelly.

### **Desirable to Know**

Harmonal control, blood placental barrier, phases of menstrual Cycle, remnants seen in umbilical cord. Corpus Luteum.

### **Nice to Know**

Milk secretion, Colostrums, Haufbauer Cells.

## **Endocrine system**

Pituitary, Thyroid, Parathyroid, Adrenal

### **Must Know**

Identification, parts Structure, Hormones secreted.

### **Desirable to Know**

Hypothalamo- hypophyseal system, pituicytes Herring Bodies, 'C' Cells of Thyroid, Development of Adrenal, Cortex & Medulla.

### **Nice to Know**

Gigantism, Acromegaly, Cushing syndrome pheochromocytoma.

## **G) NERVOUS SYSTEM**

Peripheral- Craniospinal ganglion Autonomic ganglion. Central- Spinal Cord, Cerebellum, Cerebrum.

### **Must Know**

Identification, Structure, parts, functions.

### **Desirable to Know**

Connections, Development, Neuroglia.

### **Nice to Know**

Applied Degeneration, Syndromes.

## **H) SPECIAL SENSES**

Cornea, Retina, Lacrimal Gland, Eyelid, Sclerocorneal junctions, lens. Optic Nerve entry, Organ of Corti.

**Must Know**

Identification. Layers, structure, function

**Desirable to Know**

M.Picture, Canal of Schlemm, spaces of Fontana.

**Nice to Know**

Epiophora, Chalazion, Cataract, Glaucoma.

**I) EMBRYOLOGY****DEVELOPMENTAL ANATOMY****Introduction Scope of Embryology**

Term of Reference - e.g. Cranial, rostral, caudal, dorsal, ventral.

**Mitosis & Meiosis****Must Know**

Various phase.

**Desirable to Know**

Various subphases of Meiosis.

**Nice to Know**

Non disjunction, Cell culture.

**Gametogenesis**

Organs of reproduction in male & female stages of gametogenesis.

**Must Know**

stages of gametogenesis. regulation of Ovulation.

**Desirable to Know**

Structure of sperm and ovum.

**Nice to Know**

Sperm count, Viability of ovum, sperm. Safe period, contraception.

**Menstrual cycle**

Various Phases - structural changes in the endometrium.

**Must Know**

Various Phases.

**Desirable to Know**

Hormonal Control of menstrual cycle.

**Nice to Know**

Time of Ovulation- Various tests

**Fertilization Cleavage- Implantation**

Various stages of fertilization, cleavage, formation of blastocyst. implantation.

**Must Know**

Various stages- Effects of fertilization Normal sites.

**Desirable to Know**

Acrosomal reaction, Zonal reaction, Ectopic pregnancy.

**Nice to Know**

In vitro-fertilization- IVF. Parthenogenesis.

**Formation of Germ Layers:**

Formation endoderm, Ectoderm, Yolk sac, Amniotic Cavity- Bilaminar & laminar- disc.

Intra Embryonic Mesoderm - Primitive Streak, formation of notochord, Somites.

**Must Know**

Formation of three germ layers folding of embryo.

**Desirable to Know**

Congenital mal-formations, Nucleus Pulposus- remnant's of notochord.

**Nice to Know**

Signs of pregnancy- Pregnancy test Role of Teratogens Congenital anomalies, allantois.

### **Differentiation of germ layers**

Derivatives of mesoderm, Endoderm, Ectoderm.

#### **Must Know**

Fate of each germ layer. Intra- embryonic mesoderm, Fate of somites.

### **Foetal Membranes**

Chorion Amnion, Yolk sac, Allantois umbilical cord.

#### **Must Know**

Placental villi- Different types- formation- Circulation, Full term placenta. Function, placental barrier. Formation, functions fate of Amnion, Yolk sac, Umbilical Cord & anomalies.

#### **Desirable to Know**

Various anaomalies of placenta.

#### **Nice to Know**

Chorion villus biopsy & amniocentesis.

### **Multiple Pregnancies**

#### **Must Know**

Monozygotic & dizygotic twins,

#### **Desirable to Know**

Siamese twins.

### **Integument**

#### **Must Know**

Development of mammary gland, skin & appendages.

#### **Desirable to Know**

Anomalies of mammary gland.

## **SYSTEMIC EMBRYOLOGY**

### **Cardio- vascular System**

#### **Must Know**

Development of heart chambers, septa. Foetal circulation and changes at birth.

Development of major veins. aortic arch arteries- Formation & fate.

#### **Desirable to Know**

Anomalies of heart. Anomalies of Aortic arch arteries.

#### **Nice to Know**

Development of Inf. Vena Cava & Various anomalies .

### **Respiratory System**

#### **Must Know**

Development of larynx, trachea, Bronchi, Lungs.

#### **Desirable to Know**

Anomalies of Respiratory system. Tracheoesophageal fistulae.

#### **Nice to Know**

Respiratory distress syndrome.

### **Alimentary System**

#### **Must Know**

Development of fore gut - Oesophagus, Stomach, Duodenum. Hepato biliary apparatus, pancreas, spleen. Midgut- Rotation & fixation. Caecum appendix- meckel's diverticulum  
Hind gut - Fate of cloaca Development of Rectum, Anal Canal. Development of diaphragm.

#### **Desirable to Know**

Anomalies of mid gut rotation. Non rotation of gut, situs invertus, pertrophic pyloric Stenosis. Omphalocele, Hernias- diaphragmatic.

## **Urogenital System**

### **Must Know**

a) Development of kidneys & ureters. Urinary bladder, Urethra. Development of ovary & testis. Fate of Mesonephric & paramesonephric ducts in male & Female.

### **Development of Ext. Genitals**

Development of Ext. genitalia, differentiation.

### **Desirable to Know**

Anomalies of kidney urinary bladder, Male urethra, Testis, ovary.

### **Nice to Know**

Hermaphroditism.

## **Pharyngeal arches, Pouches & clefts**

### **Must Know**

Fate of Pharyngeal arches pouches & clefts.

### **Desirable to Know**

Anomalies- Branchial cyst. Fistula.

## **Development of tongue, thyroid gland**

### **Must Know**

Development of Tongue & Thyroid gland.

### **Desirable to Know**

Anomalies of Tongue & thyroid gland.

## **Development of face & palate**

### **Must Know**

Formation of face & palate.

### **Desirable to Know**

Anomalies of face & palate.

## **Development of nervous system**

### **Must Know**

Neural tube. Fate of fore brain Mid brain & Hind brain Vesicles. Hypophysis cerebri, Fate of Neural Crest cells.

### **Desirable to Know**

Anomalies of C.N.S. Spina bifida, Anencephaly. Hydrocephalus.

## **Development of eye ball**

### **Must Know**

Development of retina, Choroid, cornea, lens.

### **Desirable to Know**

Anomalies of Eye ball.

## **K) GENETICS**

### **Introduction**

Mendelism, classification of chromosomes, Karyotyping, sex chromatin and Lyon's Hypothesis.

### **Chromosomal Anomalies**

A) Structural- Deletion, translocation, insertion Ring formation, Isochromosomes & inversion. B) Numerical Anomalies - Monosomy - Turner's syndrome Trisomy - a) Autosomes - Down's syndrome Edward's syndrome, Patau syndrome. b) Sex chromosomes Klinefelter's syndrome. Triple X, X Y Y syndrome.

### **Modes of inheritance**

Pedigree pattern Autosomal dominant inheritance. Autosomal recessive, Sex linked inheritance X linked recessive & X linked - dominant inheritance.

## **Blood groups and Genetics**

A B O & Rh blood group system.

## **Desirable to Know**

incompatibility.

## **Genetic Counselling**

Eugenetics.

## **L) RADIOLOGICAL ANATOMY**

### **Introduction**

Principles of X-ray, Historical aspect And how to read skiagrams. Principles of USG, C T and M R I. Identification of gross anatomical features in skiagrams And C T of H.N.F. and Abdomen. Contrast Radiographs - indication, preparation, dye used, Procedure and interpretation. Interpretation of U S G. Estimation of age. Any common abnormalities seen.

### **Limb**

a. Upper Limb : Plane X-ray shoulder, elbow and hand. Contrast X-ray Angiogram. b. Lower Limb : Plane X-ray- Thigh, Hip, Knee region, leg, ankle, foot. Contrast X-ray Angiogram. c. Abdomen : Plane X-ray- KUB X-ray, pregnancy, C, T. Scans. Contrast X-ray- Barium meal, Barium enema, oral & IV Cholecystography, Ascending & descending pyelography. Cystography Hysterosalpingography, Myelography, Angiography. d. Thorax : Plane X-ray- Ap & P A view, oblique and Lateral view. Contrast - Barium swallow, Bronchogram, C. T. e. Head, Neck, Face & Brain : Plane X-ray Front view, Lateral view, Water's view. Contrast : Carotid angiogram, ventriculography. C. T.

## **M) SURFACE ANATOMY**

### **Surface Marking**

Vessels - Axillary, Brachial, Radial, Ulnar. Lower Limb - Nerves - Femoral, Sciatic, tibial, common peroneal. Vessels - Femoral, popliteal, dorsalis pedis artery, Great saphenous vein. Abdomen - Quadrants of Abdomen Viscera - Stomach, Caecum Appendix, Spleen, Kidneys From behind, Rectum and canal. Vessels - Aorta, Inf. Vena Cava, Portal Vein. Other - Inguinal Canal. Thorax - Viscera - Heart, Lung, Pleura, Trachea. Arch of Aorta, Sup. Vena Cava Branches of arch of aorta. Head, Face, Neck : Glands - Parotid with its duct, thyroid palatine tonsil. Nerves - Vagus, accessory (spinal), Hypoglossal. Vessels - Common carotid, Internal carotid, external Carotid, facial, Internal jugular vein. Superior Sagittal sinus. Brain - Central sulcus, medial longitudinal fissure, motor area, sensory area

### **Surface Anatomy - Living**

#### **a) Upper Limb**

Bony Landmarks - Clavicle, spine of scapula, coracoid process, acromial angle, epicondyles of Humerus, inf. angle of scapula. Olecranon process, Head of Radius & ulna, Tubercle of Scaphoid, pisiform Hook of Hamate, Head of metacarpals. Movements - Shoulder girdle, abduction at shoulder, supination & Pronation, movements of Thumb, abduction and Adduction of fingers. Make muscles prominent - Trapezius, Lattisimus dorsi, Deltoid, Biceps Brachii, Brachioradialis, pectoralis major, Lumbricals & interossei, Flexor carpi radialis.

Nerves - Ulnar, cutaneous Nerve supply of Hand. Vessels - Axillary, Brachial, Radial. Miscellaneous - Axillary Group of Lymph nodes, Anatomical Snuff box.

#### **b) Lower Limb**

Bony landmarks - Ant. Sup. Iliac spine, iliac crest, post sup. Iliac spine, ischial tuberosity, pubic tubercle, Pubic crest. Greater trochanter, adductor tubercle, Head & neck of fibula, Tibial tuberosity, patella, shin of tibia Lat and Medial Malleolus, Navicular tuberosity, Styloid process of 5<sup>th</sup> metatarsal. Movements - Knee, Inversion Eversion. Muscles - Ext. Haullicis longus, Gastrocnemus, Hamstrings Tibialis anterior. Nerves - Common peroneal, Nerve, Cutaneous Nerve supply of toes. Vessels - Femoral



popliteal, ant. Tibial, post tibial, dorsalis pedis artery. Miscellaneous - Ligamentum patellae.

**c) Abdomen**

Muscle - Rectus abdominis; Palpate - Liver, Kidney, spleen; Points - McBurney's pt. Murphy's pt. Renal angle; Lumbar Triangle.

**d) Thorax**

Bony land marks - Sternal angle, counting of ribs, counting of spines.; Joints - Manubriosternal, sternoxiphisternal.; Others - Apex beat, positions of nipple, apex of lung, Triangle of Auscultation

**e) H.N.F.**

Bony landmarks - Nasion, Glabella, Inion, pterion, Asterion, Zygomatic arch mastoid process, suprameatal Triangle, Angle of mandible, Head of mandible, Ext. occipital protuberance. Joints - Muscles of mastication, sternocleidomastoid. Nerves - Testing of cranial Nerves. Vessels - Superficial temporal & facial artery, Common Carotid. Others - Midline structures in neck, Suprasternal notch.

**Recommended Books**

- a. Grays Anatomy - Latest Edition
- b. Human Anatomy - Datta - Text book
- c. Chaurasiya Human Anatomy - Text book
- d. Cunningham's Manual of Practical Anatomy- all volumes- Tex book.
- e. Regional Anatomy by Last
- f. Surgical Anatomy - Mc Gregor
- g. Sahana's Human Anatomy
- h. Anatomy for surgeons - Hollinshed.
- i. Human Histology - Inderbir - Singh - Text book
- j. Atlas of Human Histology - Diflore - Text book
- k. Histology - Ham
- l. Histology - Wheater
- m. Human Embryology - Inderbir - Sing - Text book
- n. Medical embryology - Langman
- o. Embryology - Hamilton Boyd
- p. Clinical Embryology - Snell
- q. General Anatomy - Chaurasia
- r. General Anatomy - Datta
- s. Neuro Anatomy - Inderbirsingh
- t. Neuro Anatomy - Clinical - Snell
- u. Neuro Anatomy - Carpenter
- v. Genetics - Gangane
- w. Medical Genetics - Emeric
- x. Surface Anatomy & Radiology - Omar
- y. Surface Anatomy & Radiology - Halim Das
- z. J.S.P.Lumbley at all - M.Cq.in Anatomy.
- aa. Clinical Anatomy - Vishram Sing
- bb. Cross Sectional Human Anatomy - David Dean & (Sprial Bpund) - T.E. Herbener.
- cc. Digital Human Anatomy & Endoscopic Ultrasonography - Bhutani

**Teaching Methods and Hours**

1.	<b>Total No. of Hours</b>	-	<b>655 hrs.</b>
	Theory didactic lectures	-	175 hrs.
	Non lecture teaching	-	140 hrs.
	Practical/Demonstration	-	340 hrs.

2. Topic wise/System wise distribution of teaching hours :

Sr. No.	Topic/System	No. of Hours
1.	Histology (Gen & Syst)	112 hrs.
2.	Embryology	035 hrs.
3.	Genetics	006 hrs.
4.	General Anatomy	010 hrs.
5.	Cross sectional & Endo. Anatomy	018 hrs.
6.	Upper extremity	067 hrs.
7.	Lower extremity	067 hrs.
8.	Thorax	044 hrs.
9.	Abdomen	115 hrs.
10.	Head, Neck and Face	131 hrs.
11.	Brain	040 hrs.
12.	Radiology & Surface Anatomy	010 hrs.

**SCHEME OF EXAMINATION**

**Internal Assessment**

Midterm (Periodic) I and II		Terminal Examination + Preliminary Examination			
Theory	Practicals	Theory	Viva	Total Theory	Practicals
25 + 25 = 50	25 + 25 = 50	60 + 50 + 50	20 + 20	200	40 + 40 = 80
A	B	C			D
50/5 = 10	50/5 = 10	200/20 =10			80/8 = 10

1) Theory Marks to be send to the University out of 20 = (A) + (C) = 20

2) Practical Marks to be send to the University out of 20 = (B) + (D) = 20

**University Examination -Distribution of Marks**

	PATTERN OF EXAMINATION	ANATOMY
1.	THEORY Written Paper No. of Papers & Maximum Marks for each paper	2 Papers 50 Marks each
2.	Viva-Voce	20
3.	Internal Assessment (Theory)	20
A.	<b>TOTAL THEORY</b>	<b>140</b>
	<b>PRACTICAL</b>	
1.	Practicals	40
2.	Internal Assessment (Practical)	20
B.	<b>TOTAL PRACTICALS</b>	<b>60</b>
	<b>GRAND TOTAL A+B</b>	<b>200</b>

**NATURE OF QUESTION PAPER**

Paper I - 50 marks

Paper II - 50 marks

**Section - A**

Q. No.1 Multiple Choice Question ( 30 - MCQs ) - 15 marks

**Section B**

Q. No. 2 Write in brief (Five out of Six) - 10 marks

Q. No.3 Write short notes ( any two of three ) - 8 marks

**Section C**

Q. No. 5	Long question( anyone of two )	-	9 marks
Q. No. 6	Write short notes (Any two out of three)	-	8 marks

**PATTERN OF VIVA VOCE AND PRACTICAL EXAMINATION**

(i) Viva examination (Orals)	: Total marks	-	20 marks
(ii) Practical examination	: Total marks	-	40 marks

## HUMAN PHYSIOLOGY

### **GOAL:**

The broad goal of teaching undergraduate students in Physiology aims at providing the students comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and diseases.

### **EDUCATIONAL OBJECTIVES:**

At the end of the course, the students will be able to :

- 1) Describe the normal functions of all the organ systems, their regulatory mechanisms and interactions of the various systems for well-coordinated total body function.
- 2) Understand the relative contribution of each organ system in the maintenance of the milieu interior (homeostasis).
- 3) Explain the physiological aspects of normal growth and development. Analyze the physiological responses and adaptation to environmental stresses.
- 4) Comprehend the physiological principles underlying pathogenesis and treatment of disease.
- 5) Correlate knowledge of physiology of human reproductive system in relation to National Family Welfare Program.

### **SKILL:**

At the end of the course the student shall be able to :

- 1) Conduct experiments designed for study of physiological phenomena.
- 2) Interpret experimental/investigative data.
- 3) Distinguish between normal & abnormal data derived as a result of tests which he/she has performed and observed on experimental animals/human subjects in the laboratory.

### **INTEGRATION:**

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

## **COURSE CONTENT THEORY**

### **MEDICAL ETHICS**

#### **Must know:**

Principles of essentiality, Principle of voluntaries, informed consent and community agreement, Principles of non-exploitation, Principles of privacy and confidentiality, Principles of precaution And Risk minimization, Principles of professional competence, Principles of accountability and transparency, Principles of maximization of the public interest and of distributive justice, Principles of institutional arrangements, Principles of public domain, Principles of totality of responsibility, Principles of compliance

### **SOCIAL ENVIRONMENT**

#### **Must know:**

Introduction, Social organization, social institution, Social dynamics, Traditions and customs, Interaction between the social and the physical environments, Brain, behavior and environment, memory, intelligence, personality, Social stress and disease, Social concept of health, Further reading

### **GENERAL PHYSIOLOGY**

#### **Must know:**

Introduction to Physiology, Branches of Physiology, Functional organization of human body, External and internal environment, Homeostasis, Biofeedback mechanisms, Cell Physiology, Cell as a living unit of body and its' organelles, Transport across cell membrane.

**Desirable to know :**

Genes and Genetic code.

**HEMATOLOGY**

**Must know**

Composition of blood, Functions of blood, Plasma proteins : types, concentration, functions; Erythrocytes : morphology, functions, anemia, & polycythemia.; Haemopoiesis : general concepts; Erythropoiesis :stages, sites, regulation, Hemoglobin-functions, normal values, Fate of erythrocytes, life span, catabolism of Hb, bilirubin metabolism, jaundice, Physiological basis of anemia, classification of anemia, nutritional anemia, Polycythemia : primary & secondary, Leukocytes : differences between R.B.C. & W.B.C., types of W.B.C.s; normal count , properties, functions of W.B.C.; Granulopoiesis - stages, regulation, Lymphopoiesis; Pathological variations in total & differential W.B.C. count; Immunity : definition, concept of antigen & antibody, types of Immunity, mechanism of immunity, Diseases due to disturbance in immune mechanism with special; reference to AIDS. Primary & secondary response, basis of vaccination, Blood groups : Landsteiner's law, ABO System , Rh System, inheritance of blood groups, relation to transfusion, Rh incompatibility & Erythroblastosis foetalis, Blood transfusion : indications, storage of blood & changes during, storage, transfusion reactions, Monocyte : macrophage system : classification, functions, functions of spleen, Hemostasis : definition, basic mechanisms of hemostasis. Platelets : structure, normal count & variations and functions, Blood coagulation : Coagulation factors in plasma, basic mechanism, of blood clotting, role of calcium in coagulation, role of vitamin K. fate of clot, plasmin system, Anticoagulants : commonly used anticoagulants & their mechanism of actions, Blood coagulation tests : bleeding time, clotting time, Coagulation disorders - Hemophilia, ITP, Body fluid compartments, role of water in body & its distributions, different body fluid Compartments & composition of their fluid Blood volume, normal value, physiological & pathological variations, blood volume regulation in detail (To be taken at end of lectures on C.V.S., kidney and endocrines)

**Desirable to know :**

Plasma proteins, role of liver in plasma protein synthesis, relationship of diet & plasma protein synthesis, Common Haemoglobinopathies (Hbs, Hbc, Thalassaemia), Types of jaundice, Polycythemia - effects on haemodynamics, Blood group : M.N. system, other blood groups, Thrombocytosis, thrombocytopenia purpura, Classification of haemorrhagic diseases, D.I.C.

**Nice to know**

Blood component therapy, Effects of splenectomy, Plasmapheresis,

**NERVE-MUSCLE**

**NERVE**

**Must know**

Distinctive histological features relevant to functions of nerve fibers, Classification of nerve fibers, based on structure, diameter and functions, R.M.P. definition, Genesis & maintenance, method of measurement and significance, Action potential :definition, phases, ionic basis of depolarization & repolarisation, Generation & propagation of A.P., properties of A.P., Significance, Properties of nerve fibers, Strength duration curve: chronaxie and factors affecting it. Factors affecting conduction in a nerve fibres. Degeneration and regeneration in nerve fiber.

**Desirable to know:**

Experimental techniques to study the mechanism of genesis of R.M.P. & A.P. patch clamp, voltage clamp Methods of recording of A.P.

**Nice to know :**

Methods of measurement of Nerve conduction velocities in Human subjects. Diseases affecting nerve conduction velocity.

## **MUSCLE**

### **Must know**

Neuromuscular transmission - physiological anatomy, events at N-M Junction, N-M blocking agents & their clinical significance. Applied aspect - Myasthenia Gravis, Classification of muscles, Gross structure of skeletal, smooth and cardiac muscles. Electron microscopic structure of skeletal muscle. Muscle proteins - structural, enzymatic and contractile. Sarcoplasmic tubular system - concept of sarcoplasmic triads & their Functions, Properties of skeletal muscle Excitation - contraction coupling Molecular basis of skeletal muscle contraction, sliding filament theory, power stroke, Energetics : fuel used by skeletal muscle at rest & in exercise, metabolic pathways involved to yield A.T.P. Oxygen debt : definition, types (lactic & alactic), causes of oxygen debt, repaying the debt and its significance. Isotonic and isometric muscle contraction, Factors affecting development of tension in the muscle: Length - tension relationship, Heat liberated during various phases of muscle contraction, Fenn Effect, Smooth muscle : structure, distribution, types, molecular mechanism of contraction, properties, regulation of contraction and disorders.

### **Desirable to know**

Heat liberated during various phases of contraction, Fenn effect Recording of muscle activity E.M.G. (in brief)

### **Nice to know**

Myopathies and other Muscles disorders

## **RESPIRATORY PHYSIOLOGY**

### **Must know**

Physiological anatomy of respiratory airway. Respiratory and non respiratory functions of lungs. Mechanics of breathing: Muscles of respiration, Pressures in respiratory tract. Compliance, work of breathing, surface tension forces & role of surfactant, airway resistance, elastic resistance, Gas Laws, Pulmonary ventilation, alveolar ventilation, alveolar dead space, - applied aspect, Diffusion of Gases: Exchange of respiratory gases in alveoli - respiratory membrane, factors affecting diffusion through respiratory membrane Transport of oxygen, role of Hemoglobin, oxygen dissociation curve & factors affecting it. Transport of carbon dioxide, Control of Breathing: Neural control - higher centers, reflexes, Chemical control - central & peripheral chemoreceptors role of CO<sub>2</sub>, O<sub>2</sub>, H<sup>+</sup> periodic breathing Pulmonary circulation : Characteristics, Ventilation perfusion ratio Hypoxia types, Asphyxia, cyanosis, dyspnoea, Acclimatization, Dysbarism, Pulmonary function tests - principles

### **Desirable to know**

Method of determination of dead space, residual volume, functional residual capacity, Oxygen therapy - indications, uses & hazards of hyperbaric oxygen, Space Physiology.

### **Nice to know**

Positive pressure breathing

## **CARDIOVASCULAR PHYSIOLOGY**

### **Must know:**

Introduction, functions & importance of the system, General organization - Greater and lesser circulation, Structure of heart, pericardium, myocardium, endocardium, nerve supply, histology, details of cell junctions, syncytium, contractile & conducting fibers, Properties of cardiac muscle, Junctional tissues of heart, pacemaker potential, action potential of cardiac muscle, Generation & conduction of cardiac impulse ECG, lead arrangement, normal waves & their significance with reference to lead II, Cardiac cycle-pressure - volume changes, heart sounds & their clinical significance, correlation of pressure, volume, ECG, and heart sounds in cardiac cycle. Heart rate & its regulation, Haemodynamics - definition, blood flow, resistance, Cardiac output, normal values, physiological variations, factors affecting cardiac output - details, regulation, measurement - principles, Blood pressure, Normal levels, measurement, determinants,

short term & long term, regulation - details, Local blood flow & regulation, Regional circulation, Physiologic anatomy, factors affecting special features coronary, cerebral, foetal circulation. Hemorrhagic shock - stages & compensatory mechanisms, effects on body, physiological basis of treatment in brief.

**Desirable to know:**

Ion channel & receptors (physiological, pharmacological & clinical significance), E.C.G. - electrical axis of heart, heart blocks, arrhythmia's, ischaemia, infarctions, murmurs & their clinical significance, Cardiac failure

**Nice to know:**

Patho - physiology of oedema, hypertension, angina and MI

## **RENAL PHYSIOLOGY**

**Must know:**

General introduction, structure & functions of kidney with special reference to nephron in detail, Renal circulation, special features from functional point of view, Formation of urine, Glomerular stage - GFR (definition, dynamics, factors affecting & measurement), Concept of clearance to study renal physiology for Tubular stage - Reabsorption & secretion of: Sodium, potassium, glucose : details of handling of water - concentration & dilution of urine, Secretion of H<sup>+</sup> ions. Role of kidney in acid - base balance, Physiology of micturition, basic reflex & control, cystometrogram, Disorders of micturition, Artificial kidney, basic principles of dialysis, Renal function tests

**Desirable to know:**

Experimental studies for renal functions

**Nice to know**

Renal transplant and diuretics

## **BODY TEMPERATURE REGULATION**

**Must know:**

Skin - structure, blood flow and functions, Regulation of body temperature, Hyperthermia, Hypothermia

## **ALIMENTARY SYSTEM**

**Must know:**

General introduction & organizational plan, innervations and blood Supply of smooth muscles and glands, Basic electrical rhythm, General principles & basic mechanisms of secretion Salivary secretion: composition and functions of saliva, mechanism & regulation of salivary secretion , experimental methods to study regulation, Mastication and deglutition: Three phases of deglutition - hysiological anatomy, mechanism, & control, experimental methods to study mastication and deglutition, Gastric secretion, Functional anatomy, histology, functions of stomach, composition of gastric juice, cellular mechanism of gastric secretion, phases of gastric secretion, regulation of gastric secretion. Experimental methods to study gastric secretion, Gastric motility, Electrical activity of stomach, pylorus, emptying of the stomach-pyloric, pump, regulation & factors promoting & inhibiting emptying. Abnormal gastric motility - vomiting, Pancreatic secretion, Structure of pancreas, composition & mechanism of secretion of electrolytes & enzymes, regulation of secretion, Liver & gall bladder, Microscopic structure, functions of liver, composition of bile, cellular mechanism of bile formation, enterohepatic circulation of bile salts, control of secretion, concentration & storage of bile in gall bladder filling & evacuation of gall bladder functions of gall bladder, Intestinal secretion, Composition & mechanism of secretion of small intestinal juice, regulation of secretion, Secretion of large intestine mucous, water, electrolyte, Motility of small intestine, rhythmic segmenting contractions peristalsis, control - neural & hormonal functions of ilcocecal valve, Motility of large intestine, Structure & innervation, mixing & mass movements, defecation reflex and its control, G.I. hormones in brief, Digestion and absorption.

**Desirable to know:**

Gastric mucosal barrier, disorders of secretion, peptic ulcer, inhibitors of gastric secretion, Effects of vagotomy, Barium meal studies, endoscopy, biopsy, Patho - physiology of small intestinal motility, paralytic ileus, diarrhea, obstruction, Patho - physiology of colonic motility, irritable bowel syndrome, drugs used, constipation, Gall stone

**Nice to know:**

disturbances of esophageal motility, spasm, achalasia, hiatus hernia

**NUTRITION :****Must to know:**

Concept of balanced diet, Factors affecting caloric requirements, Requirements of various nutrients, sources, daily needs, Nutrition under special conditions - pregnancy, lactation, growing child, SDA of food and BMR, Control of food intake.

**ENDOCRINE SYSTEM****Must know:**

Introduction, General mechanism of hormone action, Endocrine functions of Hypothalamus - releasing hormones, Anterior pituitary hormones : functions, regulation, disorders, Posterior pituitary hormones : ADH, Oxytocin functions, regulation, Disorders, Thyroid hormone : synthesis, fate, functions, regulation, disorder, Parathyroid hormone : synthesis, functions, regulation, disorders - Tetany, calcium metabolism, regulation of blood calcium level, Adreno-cortical and medullary hormones : secretion, functions, regulation, disorders, Pancreatic hormones : secretion, functions, regulation, disorders, GTT, regulation blood glucose level.

**Desirable to know:**

Radioimmuno assays

**Nice to know:**

Experimental studies

**REPRODUCTIVE PHYSIOLOGY****Must know:**

Sex chromosomes sex determination, sex differentiation, Functional anatomy of reproductive system, Puberty changes in males & females and its control, Spermatogenesis : stages & regulation, Testosterone actions & regulation, Male sexual act, Menstrual cycle & ovarian cycle, Phases & hormonal regulation, Menopause, Ovulation indicators & importance, Fertilization, implantation of ovum, contraception.

**PREGNANCY AND PERINATAL PHYSIOLOGY****Must Know:**

Functions of placenta, Physiology of pregnancy, Maternal changes during pregnancy, Parturition : in brief - stages and mechanism, Lactation initiation & maintenance and control, Advantages of breast-feeding.

**Desirable to know:**

Sex chromosomes : Barr bodies, Development of genitals & gonads

**Nice to know:**

Precocious & delayed puberty, IVF

**SPECIAL SENSES****Must know:****Eye**

Functional anatomy of eye, optics, refractive error, microscopic, structure of retina with retinal circuits, image formation. Pupillary reflexes, accommodation reaction, colour vision - physiological & neural basis, accepted theory of colour vision, classifications, basis of colour blindness and tests of colour blindness, significance. Aqueous humor - formation, circulation & functions, Glaucoma Structure of rods and cones, receptor potential and Photo chemistry, of vision (photopic & scotopic vision,



dark & light adaptation). Visual pathway - processing of information at different levels in visual pathway, organisation of visual cortex. Effect of lesion at different levels in visual pathway.

#### **Ear**

Physics of sound, decibel system. Functions of external ear. Functional anatomy of middle ear, functions of middle ear in detail, assessment of functions of middle ear, Functional anatomy of cochlea, functions of inner ear, place principle, theories of hearing and Cochlear microphonics. Auditory pathway & important features, auditory cortex (role in hearing & speech development)

#### **Taste**

Functional anatomy of taste buds, different taste modalities, pathway, factors affecting taste sensation.

#### **Smell**

Functional anatomy of receptors, primary olfactory sensations, pathway, factors affecting smell sensation, disorders of smell & taste

#### **Desirable to know:**

Resolution of images, Electro-physiology of internal ear : cochlear micro phonics (endocochlear potential)

#### **Nice to know:**

Electro-physiology of retina, Theories of hearing

### **AUTONOMIC NERVOUS SYSTEM**

#### **Must Know:**

Introduction, The control of visceral functions, Divisions of the autonomic nervous system, Organization of the autonomic nerves, The sympathetic division, The parasympathic division, Chemical transmitters, Adrenergic receptors, Cholinergic receptors, Visceral afferent fibres, Special features of autonomic functions, Higher control of autonomic functions.

### **CENTRAL NERVOUS SYSTEM**

#### **Must know:**

Outline of nervous system, Synapse; definition, physiological anatomy, sequence of events of synaptic transmission, properties, (state the property & its significance), significance of synaptic transmission, applied aspect, Neurotransmitters - in brief, Receptors : definition, classification, properties, significance, Sensations : different modalities , classification with examples and significance, Sensation of touch, pain proprioception, details of each Reflexes, definition, classification (basis of classification with example), reflex arc & its components, properties (state each property with basis & importance), Polysynaptic reflexes : withdrawal reflex, Stretch reflex - definition, muscle spindle (details with innervation, role of gamma motor neurons) role of supra spinal control - in brief, functions of stretch reflex (regulation of muscle tone) inverse stretch reflex.

#### **Tracts**

Ascending & descending tracts, details of each tracts - (situation & extent in spinal cord, origin, course & termination, collaterals, applied aspect tests) Ascending tracts : Basic plan of somato sensory pathway for conscious sensation, pathway from head, face region Descending tracts : pyramidal tracts - details, extra pyramidal tracts Differences between UMN & LMN lesions Sections at various levels in CNS: Spinal transection - spinal animal Complete - 3 stages - spinal shock, stage of recovery, stage of reflex failure - details of each stage Incomplete transection Hemisection, Low midbrain section - decerebrate animal : decerebrate rigidity (classical & ischaemic) mechanisms, characteristics features, physiological significance, High midbrain section - High decerebrate animal Thalamic or Decorticate animal.

#### **Posture & equilibrium**

Definition, classification of postural reflexes (Details of each reflex and its function), Regulation of posture (integrating centers at various levels of CNS), Vestibular apparatus

: Physiological anatomy, mode of function of utricle, & saccule and semicircular canals, vestibulocochlear & vestibulospinal, reflexe

### **Thalamus**

Functional classification of thalamic nuclei, with their connections of different nuclear groups, functions of thalamus, thalamic syndrome.

### **Hypothalamus**

Functional classification of different hypothalamic nuclei, connections in brief, functions in details.

### **Limbic system**

Parts of limbic system , connections in brief, functions.

### **Reticular formation**

Introduction, anatomy in brief, functional division, Ascending reticular activating system - details with connections & role in wakefulness-sleep cycle, applied aspect Descending reticular system - role in regulation of muscle tone by pontine & medullary regions Visceral centers.

### **E.E.G.**

Definition, different waves, characteristics & functional significance of each wave, physiological variation, clinical application in brief.

### **Wakefulness and sleep**

Concept of alertness & wakefulness with their physiological basis, Definition of sleep, sleep cycle - types of sleep, functions of sleep.

### **Cerebellum**

Introduction, functional classification, intracortical circuit, deep cerebellar nuclei, connections of different lobes, functions of cerebellum, cerebellar function tests, effects of lesion in brief

### **Basal Ganglia**

Introduction, classification of nuclei, connections, intracortical circuits, functions, lesions - Parkinsonism

### **Cerebral Cortex**

Gross anatomy & divisions, concept of Broadmann's mapping with diagram, Parietal lobe - anatomical & functional divisions, details of each functional part as regards connections, topographic organisation, and functions Frontal lobe - excitomotor cortex - anatomical & functional parts, details of each part as regards connections, topographic organization, functions. Prefrontal cortex - different areas, connections in brief, functions, effects of lobectomy Temporal lobe, occipital lobe : functions

### **Speech**

Afferent and efferent mechanisms and role of cortical centers in speech, concept of cerebral dominance, development of speech, vocalization.

### **Memory**

Definition, stages, types, physiological basis, factors affecting, applied amnesia in brief.

### **Learning**

Definition, types with examples, stages, factors influencing, role of motivation (positive & negative reinforcement, reward & punishment), physiological basis - role of different parts of CNS, structural, biochemical changes.

### **Conditional reflexes**

Definition, difference between unconditional & conditional reflexes, development of conditional reflexes, properties, significance.

### **CSF**

Introduction, composition, normal CSF pressure, formation & circulation, functions, applied aspect brief, blood brain barrier, blood CSF barrier.

### **Desirable to know:**

General nervous system, Neurotransmitters - details susceptibility of synapse to hypoxia drugs etc., Mechanisms of referred pain, differences between superficial & deep pain, central analgesia system, supra-spinal control of stretch reflex - details. Thalamus - applied aspects - effects of lesions, Hypothalamus - applied aspects - effects of lesions,

Reticular formation - effects of lesion EEG - Method of recording, abnormal patterns, Cerebellum - Embryology, evolution, effects of stimulation & ablation, Cerebral cortex - effects of stimulation & ablation in different regions

**Nice to know:**

Experimental studies - effects of stimulation & ablation, Sleep, wakefulness - effects of sleep deprivation, disorders

**Specialized integrative physiology**

**Must know**

Respiratory adjustments in exercise, Adaptation of cardiopulmonary system to various grades of exercise. Body fluid compartments, role of water in body and its distribution, Different body fluids. Blood volume, normal value, physiological and pathological variations and its regulation in detail. Physiology of growth and behavioral development.

**Lecture demonstrations.**

**Must know**

Reticulocyte and its clinical significance Bone marrow structure and cellular elements. Lung volumes and capacities, measurements , physiological values and clinical significance Audiometry. Blood transfusion

**Practical**

**A) Hematology**

Study of Microscope, Study of Human and Frog RBC Separation of cells and plasma, Estimation of Hb% and study of Neubauer chamber, Total RBC count, Total WBC count, Differential WBC count, B.T.C.T., Blood groups and Blood indices

**B) Clinical examination and Human experiments**

Stethography, Spirometry, Ergography, Perimetry, Tests for physical fitness. Clinical examination of all systems.

**Demonstrations**

Reticulocyte count, Platelet count, P.C.V., E.S.R. fragility bone marrow examination, triple response and capillary circulation. E.M.G. S.D. curve, conduction velocity of nerve (Human), E.C.G., E.E.G., Audiometry, H.R.T. (Human reaction time). Visit to blood bank. Visit to the wards to show common disorders or video tapes (list given in appendix I), X-rays (list given in appendix II).

Animal experiments on frogs (demonstrations only)

**Skeletal muscle (G.S. Preparation)**

Effect of graded stimuli, Simple muscle twitch, Effect of variation of temperature on G.S.Preparation. Effect of two successive stimuli, Genesis of tetanus, Effect of load on skeletal muscle, Demonstration of fatigue. Decerebrate & spinal animal preparation

**Cardiac muscle**

Normal cardiogram, effect of variation of temperature on frogs heart. Properties of cardiac muscle, Effect of vagal stimulation and phenomenon of vagal escape, Effect of drugs (Acetyl choline, Adrenaline, Nicotine) on frog's heart, Perfusion of isolated frogs heart with effects of Na<sup>+</sup>, K<sup>+</sup> and Ca<sup>++</sup>, and demonstration of Starling's law.

**Books recommended:**

1) Textbooks of Physiology

- |             |   |                                  |
|-------------|---|----------------------------------|
| Guyton      | - | Textbook of Physiology           |
| Ganong      | - | Review of Medical Physiology     |
| Jain AK     | - | Text Book of Physiology          |
| Sembulingam | - | Essentials of Medical Physiology |

2) Reference Books

- Best and Taylor - Physiological basis of medical practice  
 Berne & Levy - Principles of Physiology  
 Bijlani -

3) Practicals:

- C.L. Ghai - Text book of Practical Physiology

Teaching Methods and Hours

1. Total No. of Hours - 480 hrs.  
 Theory didactic lectures - 167 hrs.  
 Non lecture teaching - 113 hrs.  
 Practical / Demonstration - 200 hrs.

2. Topic wise / System wise distribution of teaching hours :

Sr. No.	Topic / system	No. of Hours
1.	General Physiology, cell	05 hrs.
2.	Blood	15 hrs.
3.	Nerve & Muscle	12 hrs.
4.	Respiratory	15 hrs.
5.	Cardiovascular	20 hrs.
6.	Renal Physiology	10 hrs.
7.	Alimentary system	12 hrs.
8.	Nutrition	02 hrs.
9.	Endocrine	10 hrs.
10.	Reproductive	08 hrs.
11.	Special senses	08 hrs.
12.	CNS (Central Nervous system)	50 hrs.

**SCHEME OF EXAMINATION**

Internal Assessment

Midterm (Periodic) I and II		Terminal Examination + Preliminary Examination			
Theory	Practicals	Theory	Viva	Total Theory	Practicals
25 + 25 = 50	25 + 25 = 50	60 + 50 + 50	20 + 20	200	40 + 40 = 80
A	B	C			D
50/5 = 10	50/5 = 10	200/20 = 10			80/8 = 10

1) Theory Marks to be send to the University out of 20 = (A) + (C) = 20

2) Practical Marks to be send to the University out of 20 = (B) + (D) = 20

University Examination -Distribution of Marks

	PATTERN OF EXAMINATION	PHYSIOLOGY
1.	THEORY Written Paper No. of Papers & Maximum Marks for each paper	2 Papers 50 Marks each
2.	Viva-Voce	20

3.	Internal Assessment (Theory)	20
A.	<b>TOTAL THEORY</b>	<b>140</b>
	<b>PRACTICAL</b>	
1.	Practicals	40
2.	Internal Assessment (Practical)	20
B.	<b>TOTAL PRACTICALS</b>	<b>60</b>
	<b>GRAND TOTAL A+B</b>	<b>200</b>

#### NATURE OF QUESTION PAPER

Paper I - 50 marks

Paper II - 50 marks

#### Section - A

Q. No.1 Multiple Choice Question ( 30 - MCQs ) - 15 marks

#### Section B

Q. No. 2 Write in brief (Five out of Six) - 10 marks

Q. No.3 Write short notes ( any two of three ) - 8 marks

#### Section C

Q. No. 5 Long question( anyone of two ) - 9 marks

Q. No. 6 Write short notes (Any two out of three) - 8 marks

#### PATTERN OF VIVA VOCE AND PRACTICAL EXAMINATION

(i) Viva examination (Orals) : Total marks - 20 marks

(ii) Practical examination : Total marks - 40 marks

## HUMAN BIOCHEMISTRY

### **Goal :**

The main goal of teaching Biochemistry to undergraduates is to have a sound knowledge of various biomolecules present in living cells and organisms. To orient them towards molecular level of all the chemical reactions associated with living cells and apply this knowledge in maintenance of health and effective treatment of diseases.

### **Educational Objectives :**

At the end of the course the student should

- 1) be able to describe the structural and functional organization of cell and its subcellular components.
- 2) understand the chemistry and biological significance of various biomolecules like carbohydrates, proteins, lipids and hemoglobins.
- 3) have a sound knowledge of enzymes in respect to mechanism of action, classification and their use in medicine.
- 4) have clear concept about digestion, absorption, interconversion and assimilation of various nutrients in our diet.
- 5) know metabolisms of major biomolecules with their integration and regulations.
- 6) be able to comprehend genes, their expression, the principles and the application of genetic engineering.
- 7) be able to explain inborn errors of various metabolisms.
- 8) know the mechanism of body defense, detoxification and homeostasis of body fluids and pH.
- 9) have thorough understanding about nutrition in respect with vitamins, minerals, malnutrition and obesity.
- 10) be able to outline biochemical basis of cancer, free radicals, radioisotopes and environmental health.
- 11) get familiar with conventional biochemical investigations and their interpretations.

### **Skills:**

At the end of the course the student should

- 1) able to handle routine/special biochemical instruments/techniques, which are used in confirming the clinical diagnosis.
- 2) know to analyze the biochemical data with proper interpretation.
- 3) be able to demonstrate commonly done biochemical screening tests.
- 4) be able to opine on clinical case with reference to biochemical investigations.

### **Integration:**

The knowledge acquired in biochemistry during the course should help the student to integrate it with other sciences for better understanding of molecular events taking place in human body during health and disease.

## COURSE CONTENT THEORY

### Introduction

#### Must know

Introduction to Biochemistry as a basic science for the study of Medicine. Its importance in clinical practice.

### Cell

#### Must know

Structure of cell membrane, brief account of functions of its components. Organization of cellular organelles and their functions. Introduction to different transport mechanisms.

### Enzymes

#### Must know

Definition, Classification. Nature of active site and mechanism of enzyme action. Coenzymes, cofactors and proenzymes. Factors affecting enzyme activity,  $K_m$  and its significance. Enzyme specificity and inhibition. Clinical application of enzymes and isoenzymes.

#### Desirable to Know

Isoenzymes with respect to LDH, CPK, ALP.

### Chemistry of proteins and amino acids :-

#### Must know

General nature of amino acids. Various ways of classification of amino acids. Properties of amino acids. Biologically important peptides. Classification of proteins. Properties and biological importance of proteins. Plasma proteins-functions, methods of separations ( only names )and clinical significance. Structural organization of protein molecules.

#### Desirable to Know

Non proteogenic amino acids and its clinical importance with various examples.

### Metabolism of Protein and amino acids :-

#### Must know

Dietary Proteins and its importance. Digestion and absorption of proteins. Fate of amino acids in the body (Deamination, Transamination, Transamidation, Transdeamination, Transmethylation, Decarboxylation). Formation and fate of ammonia, Synthesis of glutamate, glutamine and urea (urea cycle), Disorders of urea cycle. Metabolism of Glycine and its disorders. Metabolism of sulphur containing amino acids and their disorders. Metabolism of aromatic amino acids and their disorders.

#### Desirable to Know

Maple Syrup urine disease , FIGLU test, Marphan syndrome ( in brief ).

### Chemistry and metabolism of purines and pyrimidines

#### Must know

Purine and pyrimidine bases, Nucleosides, Biologically important for nucleotides and their functions. Synthetic nucleotides and its importance. Biosynthesis of purines ( only sources of purine ring & Regulatory steps ), salvage pathway and breakdown of purines. Gout and Lesch - Nyhan syndrome.

#### Desirable to Know

Biosynthesis and end products of pyrimidine breakdown.

## **Chemistry of Nucleic acids**

### **Must know**

Structure and functions of DNA and RNAs. Genetic code. Replication of DNA. Transcription, Translation - Protein biosynthesis (Activation amino acids, Initiation, Elongation and Chain termination), Inhibitors of protein biosynthesis.

### **Desirable to Know**

Post - Transcriptional and post translational changes. Molecular mechanism of gene expression and regulation-Lac operon model, Mutations- types, causes and its consequences.

## **Genetic Engineering**

### **Must know**

Recombinant DNA, vector, plasmid and cosmid. Restriction endonucleases. Applications of Recombinant DNA technology. Polymerase Chain Reaction and its application.

### **Desirable to Know**

Chimeric molecule and Gene Library. DNA sequencing and Gene therapy.

## **Hemoglobin**

### **Must know**

Chemistry and functions of hemoglobin. Types of normal and abnormal hemoglobins. Hemoglobin derivatives.

## **Metabolism of hemoglobin**

### **Must know**

Synthesis and breakdown of hemoglobin. Fate of bilirubin. Different types of Jaundice.

### **Desirable to Know**

Porphyrias ( in brief ).

## **Biological oxidation**

### **Must know**

General concept of oxidation and reduction. Role of enzymes and co-nzymes. Electron transport chain. Substrate level and oxidative phosphorylation. (Different theories in brief with mainly principles). Role of uncouplers and inhibitors.

## **Molecular concepts of body defense and their application in medicine**

### **Must know**

Introduction to immunology. Immunoglobulins. Types, their structure and functions ; Free radicals, enzymatic and non-enzymatic antioxidants.

## **Vitamins**

### **Must know**

General nature, Classification, Sources, Active forms, Metabolic role, Deficiency manifestations, Daily requirement and hypervitaminosis (as applicable ). Fat soluble vitamins: Vitamin A, D, E and K. Water soluble vitamins: Thiamine, Riboflavin, Niacin, Folic acid, Vitamin, B12, Pyridoxine, Biotin and Vitamin C.

### **Desirable to Know**

Pantothenic acid.



## **Nutrition**

### **Must know**

Calorific value of food, BMR, SDA, Biological value of food, balanced diet. Dietary sources of nutrients. Role of dietary fibres.

### **Desirable to Know**

Protein energy malnutrition (PEM) - Kwashiorkor, Marasmus, Obesity.

## **Chemistry of carbohydrates**

### **Must know**

Definition and classification of carbohydrates : Monosaccharides - Definition, Structure, Classification and their Significance. Isomerism and its significance. Properties of sugars : Oxidation, Reduction, Amination, Esterification, Action of acids, Action of alkalies, Acetylation, Osazone reaction and their significances. Oligosaccharides - Disaccharides : their structure and importance ( Maltose, Lactose and Sucrose ). Polysaccharides - Homopolysaccharides : their structure and importance. (Starch, Glycogen, Cellulose, Dextrin, Inulin & Dextran). Mucopolysaccharides : Occurrence, constituent monosaccharides, their derivatives and their importance.(Chondroitin sulphate A, B & C, Hyaluronic acid, Heparin, Keratan sulphate and Blood group substances).

### **Desirable to Know**

Glycosides and their importance.

## **Metabolism of carbohydrates**

### **Must know**

Dietary Carbohydrates and their importance. Biochemical aspects of digestion and absorption of carbohydrates. Glycogenesis and Glycogenolysis. Glycolysis. Citric acid cycle. Gluconeogenesis. HMP shunt and its significance. Blood sugar level and its regulation. Biochemical aspects of diabetes mellitus, GTT and glycosuria..

### **Desirable to Know**

Regulation of glycogenesis and glycogenolysis, Glycogen storage diseases Cori's cycle. Rapaport Leubering cycle. Uronic acid pathway (only its significance). Metabolism of galactose and galactosemia. Metabolism of fructose and fructosuria.

## **Chemistry Lipids**

### **Must know**

Bloor's Definition and Classification of lipids (inclusive of phospholipids and fatty acids classification ). Biological importance of fatty acids and triacylglycerol. Composition and biological importance of phospholipids, glycolipids, lipoproteins and steroids. Eicosanoids :role of prostaglandins.

### **Desirable to Know**

Leukotrienes and thromboxanes ( role in brief ). Rancidity ,acid number & iodine number.

## **Metabolism of Lipids**

### **Must know**

Dietary Lipids and their importance. Digestion, absorption and transport of lipids. Fatty acid oxidation  $\beta$  oxidation of saturated ( even and odd carbons ) fatty acids (Detailed calculation of energetics of palmitic acid). Role of carnitine in the oxidation of long chain fatty acids. Biosynthesis of fatty acids and its regulation (Saturated fatty acids ). Fatty acid chain elongation-mitochondrial and microsomal. Formation and utilization of ketone bodies. Regulation of ketogenesis and ketosis. Cholesterol

metabolism - Biosynthesis and regulation. Blood level, transport of cholesterol and hypercholesterolemia. Fatty liver and lipotropic factors.

**Desirable to Know**

Metabolism of triglycerides and phospholipids (in brief). Adipose tissue metabolism. Degradation of cholesterol and its regulation. Biochemical changes in atherosclerosis. Alcohol metabolism.

**Metabolism**

**Desirable to Know**

Interrelationship of carbohydrate, lipid and protein metabolism.

**Mineral metabolism**

**Must know**

Sources, RDA, Biochemical role, distribution, and their Disorders : Calcium, phosphorus, Sodium, Potassium, Chlorine. Regulation of serum calcium (in brief). Sources, RDA, Biochemical role, distribution and Disorders of Trace elements : Iron, Iodine, Zinc, Fluoride, selenium and Copper.

**Desirable to Know**

Magnesium, sulphur, cobalt and manganese

**Must know**

Water and electrolyte balance, imbalance and role of hormones in their regulation.

**Desirable to Know**

Metabolic changes during starvation.

**Nice to know**

Acid base balance and imbalance.

**Mechanism of hormone action.**

**Must know**

Definition, classification and mechanism of hormone action. Role of Second messenger - cAMP, Ca<sup>++</sup> and phosphatidylinositol.

**Environmental biochemistry**

**Desirable to Know**

Effects of cold and heat exposure, chemical stress and water and air pollutants.

**Organ function test**

**Must know**

a) Liver function tests classification and their interpretations :  
Determination of proteins, bilirubin, prothrombin time, alkaline phosphatase, Glutamate pyruvate transaminase ( GPT ), glutamate oxaloacetate transaminase (GOT), lactate dehydrogenase. Hepatic markers for detection of types of hepatitis.  
b) Renal function tests - classification, urea clearance test, Creatinine clearance test and their interpretations :

**Desirable to Know**

c) Thyroid function tests classification and interpretations : T3, T4, TSH and thyroxine binding globulin (TBG).

**Detoxication mechanisms**

**Must know**

Reactions involved in detoxication - Oxidation, Reduction, Hydrolysis and Conjugation.

### **Desirable to Know**

Role of mixed function oxidase system (MFOS) : emphasis on cytochrome P 450 as an integral part of MFOS.

### **Biochemical basis of cancer and carcinogenesis**

#### **Must know**

Introduction, Etiology of cancer, Carcinogens and their mode of action.

#### **Desirable to Know**

Viral oncogenesis - Oncogenes and protooncogenes, DNA viruses, RNA, viruses and Oncogenic products. Biochemical mechanisms for the activation of protooncogene to oncogene. Tumour markers, Apoptosis.

### **Radioisotopes**

#### **Must know**

Diagnostic & therapeutic applications and radiation hazards.

### **Investigation techniques**

#### **Must know**

Colorimetry, Electrophoresis, Chromatography, Flame photometry, Determination of pH and Estimation of AST & ALT (Enzymology).

### **Practical**

1. Tests for monosaccharides : molisch's test, Barfoed's test, feh test, Seliwanoff's test, Rapid furfural test and test for osazones.
2. Tests for disaccharides : Molisch's test, Benedict's test, Barfoed's test, seliwan test, inversion test for sucrose and test for osazones.
3. Colour reactions of proteins : Biuret test, xanthoproteic test, million's test, cole aldehyde test, sakaguchi test, lead acetate test, ninhydrin test.
4. Precipitation reactions of proteins : Heller's test, lead acetate test, sulphosalic acid test, trichloroacetic test, precipitation by alcohol, half saturation test, full saturation test and heat coagulation test.
5. Spectroscopic examination of Hb-derivatives (oxy-Hb, Deoxy-Hb and Meth-Hb, Carboxy-Hb)
6. Estimation of Blood sugar - God pod method.
7. Estimation of Blood urea - Dam method
8. Estimation of serum creatinine, creatinine in urine- jafee's method
9. Estimation of serum total proteins, albumin and A/G ration - Biuret. BCG.
10. Estimation of serum total bilirubin - Diazo method
11. Estimation of serum cholesterol- Chod-PAP kit.
12. Estimation of serum calcium - OCPC method, trinder's method.
13. Estimation of serum phosphorus (inorganic) - kit method, Fiske Subbarao
14. Estimation of SGPT - (ALT) - kit method
15. Estimation of SGOT (AST) - kit method.
16. Estimation of serum alkaline phosphatase - kit method, King Armstrong method.
17. Estimation of serum amylase - Iodometric
18. Urine : Physical characteristics and normal, organic and inorganic constituents.
19. Urine : abnormal constituents of urine.

**Demonstration**

1. Colorimetry
2. Flamephotometry
3. Electrophoresis
4. Chromatography
5. Determination of Ph.

**Recommended Books**

1. Satyanarayana
2. Vasudevan
3. Chatterjee & Rana Shinde

**Teaching Methods and Hours**

1. Total No. of Hours	-	240 hrs.
Theory didactic lectures	-	80 hrs.
Non lecture teaching	-	90 hrs.
Practical/Demonstration	-	70 hrs.

## 2. Topic wise/System wise distribution of teaching hours :

Sr. No.	Topic/System	No. of Hours
1.	Introduction to Biochemistry, Cell structure and function	02 hrs.
2.	Chemistry of Carbohydrates	15 hrs.
3.	Chemistry of Proteins	15 hrs.
4.	Chemistry of Lipids	09 hrs.
5.	Chemistry of Nucleoproteins	08 hrs.
6.	Enzymes	21 hrs.
7.	Biological Oxidation	05 hrs.
8.	Chemistry & Functions of Hb. Abnormal Hb.	09 hrs.
9.	Carbohydrate Metabolism	15 hrs.
10.	Protein Metabolism	15 hrs.
11.	Lipid Metabolism	15 hrs.
12.	Integration Metabolism & Metabolic changes during starvation	03 hrs.
13.	Mechanism of Hormonal Action	03 hrs.
14.	Vitamins (water & Fat soluble)	11 hrs.
15.	Nutrition	05 hrs.
16.	Purines & Pyrimidines Metabolism, Chemistry & Functions of Nucleic Acids; Protein Biosynthesis, Gene Expression, Mutations Genetic Engineering & its applications	15 hrs
17.	Biochemistry of Cancer	03 hrs.
18.	Radioisotopes	03 hrs.
19.	Hb. Metabolism, liver function tests	13 hrs.
20.	Detoxification mechanisms	03 hrs.
21.	Kidney function tests, Thyroid function tests	13 hrs.

22.	Mineral Metabolism	17 hrs.
23.	Water & Electrolyte Balance	07 hrs.
24.	Acid-Base Balance	07 hrs.
25.	Environmental Biochemistry	03 hrs.
26.	Molecular concept of body defense	05 hrs.

#### SCHEME OF EXAMINATION

##### Internal Assessment

Midterm (Periodic) I and II		Terminal Examination + Preliminary Examination			
Theory	Practicals	Theory	Viva	Total Theory	Practicals
25 + 25 = 50	25 + 25 = 50	60 + 50 + 50	20 + 20	200	40 + 40 = 80
A	B	C			D
50/5 = 10	50/5 = 10	200/20 = 10			80/8 = 10

- 1) Theory Marks to be send to the University out of 20 = (A) + (C) = 20
- 2) Practical Marks to be send to the University out of 20 = (B) + (D) = 20

#### University Examination -Distribution of Marks

	PATTERN OF EXAMINATION	BIOCHEMISTRY
1.	THEORY Written Paper No. of Papers & Maximum Marks for each paper	2 Papers 50 Marks each
2.	Viva-Voce	20
3.	Internal Assessment (Theory)	20
A.	<b>TOTAL THEORY</b>	<b>140</b>
	<b>PRACTICAL</b>	
1.	Practicals	40
2.	Internal Assessment (Practical)	20
B.	<b>TOTAL PRACTICALS</b>	<b>60</b>
	<b>GRAND TOTAL A+B</b>	<b>200</b>

#### NATURE OF QUESTION PAPER

Paper I - 50 marks

Paper II - 50 marks

#### Section - A

Q. No.1 Multiple Choice Question ( 30 - MCQs ) - 15 marks

#### Section B

Q. No. 2 Write in brief (Five out of Six) - 10 marks

Q. No.3 Write short notes ( any two of three ) - 8 marks

#### Section C

Q. No. 5 Long question( anyone of two ) - 9 marks

Q. No. 6 Write short notes (Any two out of three) - 8 marks

**PATTERN OF VIVA VOCE AND PRACTICAL EXAMINATION**

<b>(i) Viva examination (Orals)</b>	<b>: Total marks</b>	<b>-</b>	<b>20 marks</b>
<b>(ii) Practical examination</b>	<b>: Total marks</b>	<b>-</b>	<b>40 marks</b>

## PREVENTIVE & SOCIAL MEDICINE

### Goals :

Teaching / training in Community Medicine to undergraduate students leading to prepare graduates to function as Community physician (problem based training) and inculcate effective leadership qualities.

### Educational Objectives :

- 1) Orientation to social aspects of ill health including dynamics of demography in context of rural and urban communities.
- 2) Understand impact of urbanization / industrialization.
- 3) Study the cultural factors related to health and disease.
- 4) Study dynamics of community behaviors.
- 5) Observe the principles and practice of preventive medicine in hospital and community settings.
- 6) Describe existing health care delivery systems and its impact on the country.
- 7) Evaluation of National Health Programs.
- 8) Describe National Family Welfare program and Population Control.
- 9) Appreciate role of the individual, family, community and socio-cultural factors in health & disease.
- 10) Describe the hazards of occupations in different settings.
- 11) To know health information systems and its utilization in planning of health services.
- 12) Enunciate the principles of Primary Health Care and the National Health Policy.
- 13) Study the deleterious effects of environmental factors.
- 14) Understand the principles of health economics and communication process.
- 15) Use of principles of research methodology.

### Skills :

At the end of the course, the student shall be able to

- 1) Provide services as the first level physician at periphery.
- 2) Know the principles and practice of preventive medicine.
- 3) Learn art of communication as effective tool for health education.
- 4) Use of epidemiology as a tool for rational decisions relevant to community and individual level intervention.
- 5) Use of bio-statistics in research work including collection, analysis interpret and present hospital and community data.
- 6) Diagnose and manage common health ailments viz. nutrition, communicable and non-communicable diseases.
- 7) Handle common health emergencies.
- 8) Plan, implement & evaluate Health Education programmes using A.V. aids.
- 9) Active participation in health care services.
- 10) Use of computers in analysis & presentation of data.

## COURSE CONTENT

### THEORY

#### Must Know

Introduction, Health - Definition, spectrum, factors affecting, indications, Health problems - world - India; Health information system; Health care delivery system - India; Demography - Definition, cycle, trends in India, uses; Fertility & factors affecting; Family planning methods; Sociology - social factors affecting health, cultural factors. Social problems in India. Doctors patient relationship, family & health, learning, intelligence, social security, social organizations; Medical ethics; Health education & communication.

**Desirable to know**

Evolution of community medicine; Demography - factors affecting trend, malthus theory, National Population, Methods of census; Sociology - Health economies, concepts in sociology and psychology, hospital sociology; Hospital management.

**Bio-statistics****Must know**

Introduction & uses; Data types, collection & Presentation; Central tendency; Variation; Normal Distribution; Sample methods, variability; S.E. Means; S.E.X<sup>2</sup> - test; 't' tests.

**Desired to know**

Sample size determination; Correlation & Regression; ANOVA.