AMRITA
VISHWA VIDYAPEETHAM

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

AMRITA SCHOOL OF MEDICINE

Amrita Centre for Allied Health Sciences

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PROGRAM
BSc Neuroelectrophysiology

(With effect from 2014-2015 onwards)

A Super Speciality Tertiary Care Hospital Accredited by ISO 9001-2008, NABL & NABH

Our Chancellor

SPIRITUAL PRINCIPLES IN EDUCATION

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

"Satguru Mata Amritanandamayi Devi"

Introducing AIMS

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

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

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

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

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

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

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Part I
Rules and Regulations

Under Graduate Programmes (Bachelor of Sciences)

I.1. Details of Under Graduate Courses :			
Sl. No.	**Course**	**Duration**	**Conditions of Eligibility for admission to the course**
1	Medical Laboratory Technology (MLT)	4 years	Pass in plus Two with 50% marks with Physics, chemistry and Biology
2	Medical Radiologic Technology (MRT)	4 Years	First class in plus two with Mathematics, Physics, Chemistry, and Biology
3	Emergency Medical Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
4	Anaesthesia Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
5	Respiratory Therapy (RT)	3 Years + one year Internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
6	Dialysis Therapy	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology
7	Physician Assistant	3 years + one year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
8	Cardio Vascular Technology (CVT)	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
9	Echocardiography Technology	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
10	Cardiac Perfusion Technology (CPT)	3 Years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
11	Diabetes Sciences	3 years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
12	Optometry	3 Years + One year Internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
13	Optometry (Lateral Entry)	2 Years + One year Internship	Pass in two year Diploma in Optometry
14	Bachelor of Audiology & Speech Language Pathology (BASLP)	3 years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.
15	Neuroelectrophysiology	3 years + One year internship	Pass in plus two with 50% marks in Physics, Chemistry and Biology.

Program Outcomes (PO)

1. PO1: Fundamental knowledge on the subject
2. PO2: Effective communication skills.
3. PO3: Knowledge in professional ethics
4. P04: Leadership qualities and team work
5. PO5: Problem Analysis and solving skills
6. PO6: Basic knowledge on research methodology
7. PO7: Higher Technical skills and competences
8. PO8: Higher study options in many fields
9. PO9: Employability in various sectors
10. PO10: Better employment opportunities

Program Specific Outcomes (PSO)

1. PSO1: To develop Technical skills needed to conduct the various diagnostic procedures and their interpretations
2. PSO2: Technical expertise in Electromyography (EMG) procedures.
3. POS3: To perform an interprete Nerve conduction studies (NCV)
4. POS4: Theoretical, technical and basic knowledge of procedures like Visual Evoked Po- tential (VEP), Somatosensory Evoked Potential (SSEP), Brainstem Auditory Evoked Response (BAER).
5. PSO5: Conduct the various clinical and technical tests in the autonomic lab.
6. PSO6: professional communication skills

ELECTIVE COURSE AND COURSE OUTCOMES

BNEP40 Value Based Education

CO1: The attitude to be a good human being, with the curiosity to continue lifelong learning.

CO2: The conviction to do service to humanity - to put the interests of the individual patient as the foremost priority. Acquisition of values of gender sensitivity, environment & sustainability.
CO3: Acquisition of the "skills for life" in addition to the skills to live.
CO4: Acquisition of positive lifelong values including ethics and etiquette.
CO5: The "practical applications" of the right values

I.2. Medium of Instruction:

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

I.3. Eligibility:

Generally Science Graduates with Physics, Chemistry, and Biology are eligible for admission to the Under Graduate Courses except in respect of certain specialties for which other qualification or subjects are specifically called for. Essential qualifications for eligibility are mentioned under clause I.1

II. General Rules:

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

II.1. Duration of the Course

Duration details are mentioned under clause No.I.1 of this booklet.

Duration of the course	: 4 Years (3 years + 1 year Internship except for courses at serial number 1 and 2 in clause I.1)
Weeks available per year	: 52 weeks
Vacation / holidays	: 5 weeks (2 weeks vacation + 3 weeks calendar holidays)
Examination (including preparatory)	: 6 weeks
Extra curricular activities	: 2 weeks
Weeks available	: 39 weeks
Hours per week	: 40 hours
Hours available per academic year	: 1560 (39 weeks x 40 hours)

Internship wherever specified are integral part of the course and needs to be done in Amrita Institute of Medical Sciences, Kochi itself.

II.2. Discontinuation of studies

Rules for discontinuation of studies during the course period will be those decided by the Chairman /Admissions, Amrita School of Medicine, and Published in the "Rules and Regulations" every year.

II.3. Educational Methodology

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

II.4. Academic Calendar

Course will follow an annual scheme as per details mentioned under:

FIRST YEAR

Commencement of classes	– August
First sessional exam	– November
Second sessional exam	– February
Model Exam (with practical)	– May - June (one week study leave)
University exam (with practical)	– June - July (10 days study leave)
Annual Vacation	– 3 weeks after the University examination.

SECOND YEAR

Commencement of classes	– August
First sessional exam	– January
Model Exam (with practical)	– May - June (one week study leave)
University exam (with practical)	– June - July (10 days study leave)
Annual Vacation	– 2 weeks after the University examination

THIRD YEAR

Commencement of classes	– August
First sessional exam	– January
Model Exam (with practical)	– May (one week study leave)
University exam (with practical)	– June (10 days study leave)
Annual Vacation	– 1 week after the University examination.
Date of completion of third academic year	– 31st July

INTERNSHIP

Commencement of internship	– 01 August

Completion of internship – 31 July

III. Examination Regulations:

III.1. Attendance:

75% of attendance (physical presence) is mandatory. Medical leave or other types of sanctioned leaves will not be counted as physical presence. Attendance will be counted from the date of commencement of the session to the last day of the final examination in each subject.

III.2. Internal Assessment:

For the first year at least three sessional examinations in theory and preferably one practical examination should be conducted in each subject. The following second/third year shall have one sessional and one model examination.

1. The period for sessional examinations of first academic year are as follows:

   First Sessional Exam : November

   Second Sessional Exam : February

   Model Exam : May /June

2. The period for sessional examinations of second and third academic year are as follows:

   Sessional Exam : January

   Model Exam : May /June

3. The last internal assessment examination will be the model examination which shall follow the pattern of the University Examination. Average of best of two examinations and the marks obtained in assignments/viva/practical also shall be taken to calculate the internal assessment.
4. A candidate should secure a minimum of 35% marks in the internal assessment in each subject (separately in theory and practical) to be eligible to appear for the University examination.
5. Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.
6. Day to day assessment will be given importance during internal assessment, Weightage for internal assessment shall be 20% of the total marks in each subject.

7. Pre-University examinations (model exam) shall be held three to four weeks prior to the University Examination. Final internal assessment report shall be made available to the Principal ten days prior to the commencement of the university examination.

III.3. University Examinations:

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

III.4. Eligibility to appear university Examination:

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

III.5. Valuation of Theory – Revaluation Papers:

1. Valuation work will be undertaken by the examiners in the premises of the Examination Control Division in the Health Sciences Campus.
2. Failed candidates will have the option of revaluation for all the University examinations. Fees for revaluation will be decided by the Principal from time to time.

3. Application for revaluation should be submitted within 5 days (or the time as decided by the Principal) from date of result of examination declared and it should be submitted to the office with payment of fees as decided by the Principal.

III.6. Supplementary Examinations:

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

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

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

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

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

III.7. Rules regarding carryover subjects:

A candidate will not be permitted to continue the second and third year respectively of the course if he/she has failed in more than 3 subjects in the first or second year university examinations.

A candidate must have passed in all subjects of all the three years to become eligible to undergo compulsory internship of one year. For the candidates who have not passed all the subjects the duration of the third year shall be extended until they become eligible to undergo compulsory internship subject of course to the conditions mentioned under III.3.v &vi of these Rules.

IV. Criteria for Pass in University Examination - Regulations:

IV.1. Eligibility criteria for pass in University Examination:

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

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

IV.2. Evaluation and Grade:

1. Minimum mark for pass shall be 50% in each of the theory and practical papers separately (including internal assessment) in all subjects except English. Only a minimum of 40% is required to pass in English
2. A candidate who passes the examination in all subjects with an aggregate of 50% marks and above but less than 65% shall be declared to have passed the examination in the second class.
3. A candidate who passes the examination in all subjects in the first attempt obtaining not less than 65% of the aggregate marks for all the three years shall be declared to have passed the examination with First Class.
4. A candidate who secures an aggregate of 75% or above marks is awarded distinction. A candidate who secures not less than 75% marks in any subject will be deemed to have passed the subject with distinction in that subject provided he / she passes the whole examination in the first attempt.
5. A candidate who takes more than one attempt in any subject and pass subsequently shall be ranked only in pass class.
6. A Candidate passing the entire course is placed in Second class / First class / Distinction based on the cumulative percentage of the aggregate marks of all the subjects in the I, II and III (Final) university examinations
7. Rank in the examination: - Aggregate marks of all three year regular examinations will be considered for awarding rank for the B.Sc Graduate Examination. For the courses where the number of students are more than 15 only, rank will be calculated as under :
    - Topmost score will be declared as First Rank.
    - Second to the topmost will be declared as Second Rank.
    - Third to the topmost will be declared as Third Rank.
    - There will be no ranking if the number of candidates is less than 15.

V. Internship:

V.1. Eligibility for Internship - Regulations:

Wherever internship is a part of the curriculum, students will have to do the internship in Amrita Institute of Medical Sciences, Kochi itself. A candidate must have passed in all subjects to become eligible to undergo compulsory internship of one year or a period fixed in the curriculum.

"Internship has to be done continuously for a period provided in the syllabus except in extra ordinary circumstances where subject to the approval of the Principal the same may be done in not more than two parts with an interruption not exceeding six months. In any case Internship shall be completed within 18 months from the date of acquiring eligibility to do the internship.

V.2. Attendance and leave details during Internship:

For 30 days of duty an intern will be eligible for casual leave and weekly off. A Student will become eligible to receive his/her degree only after completion of internship to the complete satisfaction of the Principal.

VI. General considerations and teaching / learning approach:

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

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

VII. Project:

Each student should submit a project in consultation with HOD and guidance under Project Guide, 3 months prior to their final year university exam. The student will be eligible to appear for the final year examination only after submission of the project.

VIII. Maintenance of Log Book

- Every graduate student shall maintain a record of skills he/she has acquired during the training period certified by the various Heads of Departments/Program Coordinator under whom he/she has undergone training.
- In addition, the Head of the Department shall involve their graduate students in Seminars, Journal Club, Group Discussions and participation in Clinical, Clinical-Pathological meetings.
- The Head of the Departments/Program coordinator shall scrutinize the logbook in every month.
- At the end of the course, the student should summarize the contents and get the log book certified by the Head of the Department.

The log book should be submitted at the time of practical examination for the scrutiny of the Board of Examiners.

Part II
Syllabus

INTRODUCTION AND ADVANCEMENT

Neurotechnology is a fast developing field in medical science. It operates the crossing of neurosciences, cellular engineering and signal processing.
This course enables the neurotechniologist to perform and interpret electrophysiology procedures. The students will acquire skills to assess the patient and plan various electrodiagnostic procedures and implement them.

Exclusiveness of the course
The students will have hands on training in

- Sleep studies
- Autonomic function tests
- Presurgical evaluation of epilepsy
- EEG (including Neonatal and long term monitoring)
- Nerve conduction studies, Electromyogram, Visual evoked potential, Brainstem auditory evoked potential, Somatosensory evoked potential

Employment opportunities
As neurotechnology is an integral part of neurology, the neurotechnologists are highly in demand in all hospitals. Easily placements with high remuneration are available for the neurotechnicians. Amrita neurotechnologists have high placement records in International hospitals (USA, UK, Canad, Middle East) etd and is highly in demand nationwide. There is also ample scope for neurotechnologists to pursue higher studies, research and doctorate in our institution

MAIN OBJECTIVES OF THE COURSE

Ability and skills to perform and interpret electrophysiology procedures
Ability to search online, use information technology to his/her advantage and critically evaluate medical literature and draw his/her own conclusion.
The student should be able to assess the patient and plan various electrodiagnostic procedures and implement them.

<u>The student should be able to achieve the following.</u>

- Technical skills needed to conduct the various diagnostic procedures and their interpretations as a part of the training.
- In the **EEG** lab, plan montages and do the recording without artifacts. He / She should also be well versed with the technical aspects and preparations of provisional reports. They should be familiar with semiology of various seizure types, giving first aid in case of emergency and seek timely medical help when needed.
- In the neurophysiology lab, assist neurologists in Electromyography **(EMG)** procedures.

- Nerve conduction studies **(NCV)** – procedures to be performed independently and basic interpretation of the findings.
- Theoretical, technical and basic knowledge of procedures like Visual Evoked Potential **(VEP),** Somatosensory Evoked Potential **(SSEP)**, Brainstem Auditory Evoked Response **(BAER).**
- Conduct the various clinical and technical tests in the autonomic lab.
- Hands on training in sleep lab – patient instructions, clinical interpretations, sleep staging based of Epworth's scale and procedure skills in Polysomnography (PSG) to be acquired.

Procedures the student will be trained during the 3 year course

EEG

1. Routine EEG
2. Video EEG
3. Prolonged EEG
4. Neonatal EEG

NEUROPHYSIOLOGY

5. Nerve Conduction Studies **(NCV)**
6. Electro Myography studies **(EMG)**
7. Visual Evoked Potential **(VEP)**
8. Somatosensory Evoked Potential **(SSEP)**
9. Brainstem Auditory Evoked Response **(BAER)**

Sleep studies

10. Polysomnography
11. Multiple sleep latency test
12. Maintenance of wakefulness test

Autonomic function studies

13. Tilt table test
14. Sympathetic skin response
15. Valsalva maneuver
16. Heart rate variability

FIRST YEAR

During the first year the students will have didactic lecture in the medical college from 10 am to 4 pm

Internal Assessment

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

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Paper I –AHS11A
ANATOMY

COURSE OBJECTIVE:
An outline of anatomy with special emphasis on applied aspects is provided to the students for better understanding of the technical and diagnostic procedure.

Course Outcome:

- Knowledge of general anatomy and locomotion.
- Knowledge of basic human anatomy and histology of CVS and Respiratory systems.
- Knowledge of basic human anatomy and histology of CNS, GI, excretory and reproductive systems.
- Knowledge of basic human anatomy and histology of endcorine system and special senses.

1. The human body as a whole **1 hour**

Definition
Sub divisions of anatomy
Terms of location and positions
Fundamental planes, Vertebrate structure of man
Organization of body cells and tissues

2. Locomotion and Support **8 hours**

The Skeletal System
Types of bones
Structure and growth of bones
Divisions of the skeleton
Appendicular skeleton, Axial skeleton
Name of all the bones and their parts
Joints: Classification, Types of movements with examples
Muscles: Structure, classification, muscles of abdominal wall, muscles of Respiration, pelvic diaphragm, muscles of head and neck

Practicals: **2 hours**

Demonstrations of all bones:

Showing parts
Joints, X-rays of all normal bones and joints
Muscles: Classification of muscle

3. Anatomy of nervous system **6 hours**

Introduction and divisions of nervous system
Central nervous system: Spinal cord, Anatomy, and functions, Reflex arc
The Brain:
Location, gross features, parts, functional areas
Hindbrain, Midbrain, fore brain
Coverings of brain and peripheral nervous system
anatomy of cerebral blood supply& coverings
Spinal cord –gross features, extent, blood supply and coverings
Injuries to spinal cord and brain
Peripheral nervous system – organization& structure of a typical spinal nerve

Practicals: **1 hour**

Demonstration of brain and spinal cord

4. Anatomy of Cardiovascular system

Gross anatomy & Structural features of the Heart and Great vessels:

Heart **2 hours**

Location, size, surface features, pericardium & valves
Right Atrium :- structural features
Venous area, Septum and atrial appendage
Right Ventricle :- structural features, inflow & Out flow characteristics
Left Atrium :- structural features, venous area, Septum and appendage
Left ventricle :- structural features, inflow & out flow characteristics
Valves :- valve apparatus, location
Structure & functions of each valve
Blood Supply of heart :- coronary arteries, cardiac cycle
Innervations :- sympathetic and parasympathetic sensory
Pulmonary circuit-names of the arteries and veins & positions
Lymphatic drainage of the Heart

Great Vessels **2 hours**

Structure of blood vessels and its organization
Aorta
Pulmonary artery & pulmonary vein
General plan of systemic circulation
Pulmonary circulation

PRACTICALS **2 hours**

Demonstration to illustrate normal angiograms.
Demonstration of surface features & interior of the heart
Demonstration of aorta and its branches
Histology of cardiac muscles and artery

5. Anatomy of the Respiratory system **4 hours**

Organs of Respiratory System:
Conducting portion, respiratory portion.
(Nose –nasal cavity, paranasal air sinuses
Larynx,trachea,bronchial tree)
Muscles of Respiration
Cross structure and the interior features of nose & nasal cavity
Para nasal air sinuses
Cross structure and interior features of the pharynx and larynx
Cross structures and interior features of the trachea and bronchial tree
Gross structure, histology, position and coverings of the lungs
Pulmonary circulation – pulmonary arteries pulmonary veins & bronchial arteries
Nerve supply to the respiratory system

Practicals **2 hours**

Demonstration of the parts and function
Demonstration of the different parts of the respiratory system with special emphasis
On lungs
Histology of lungs

6. Anatomy of the digestive system **1 hour**

Components of the digestive system
Alimentary tube
Mouth, tongue, tooth
Salivary gland, liver, biliary apparatus and its secretion, pancreas and pancreatic
Secretion, movements of intestine defecation, GI hormones malabsoption and

Practicals **1 hour**

Demonstrations of the parts and functions
Normal x-rays

7. Anatomy of excretory system & Reproductive system
1 hour

Organization of the renal system
Kidneys: location, gross features, structure, blood supply and nerve supply
Excretory ducts, ureters, urinary bladder, urethra location gross features and structure

Male reproductive system: **2 hours**

Testis, Duct system, Prostate
Female Reproductive system:
Ovaries, duct system, accessory organs

Practicals **1 hour**

Demonstration of Kidneys, ureter, bladder
Histology of kidney

8. Anatomy of endocrine system **1 hour**

Name of all endocrine glands and their positions
Hormones and their functions

9. Histology **6 hours**

General Slides:

Hyaline cartilage, Fibro cartilage, Elastic cartilage, T.S & L.S of bone, Blood vessels, Tonsils, Spleen, Thymus, Lymph node, Epithelial tissue, Skeletal and cardiac muscle, Peripheral nerve and optic nerve

Systemic Slides **5 hours**

- G.I.T
- Lung-Trachea
- Kidney, Ureter, Urinary bladder
- Endocrine- Adrenal,pancreas,pituitary,thyroid and parathyroid
- Uterus, Ovary, testis

Reference books:

Human Anatomy- Regional and Applied Volume
B.D Chaurasia
Clinical Anatomy For Medical Students
Richard S.Snell

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Paper II PHYSIOLOGY (AHS 11B)

Course outcome:

- CO1: Knowledge of general physiology, nerve-muscle physiology and haematology.
- CO2: Knowledge of basic human physiology with respect to CVS, Respiratory system and GI system.
- CO3: Knowledge of basic human physiology of excretion and CNS.
- CO4: Knowledge of basic human physiology of special senses and endocrine system.

1. INTRODUCTION TO PHYSIOLOGY AND GENERAL PHYSIOLOGY-1 hr

2. MUSCLE and NERVE - 3 hrs

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

3. HAEMATOLOGY - 9 hrs

- Fluid compartments, Composition & functions of blood, Plasma protein – names, functions.
- Erythrocyte - Morphology, Count, Function, Erythropoiesis, Factors affecting erythropoiesis, Structure of Haemoglobin, Erythrocyte Sedimentation rate, Anaemia, Polycythemia, Fate of RBC, Jaundice.
- Leucocytes - Morphology, Types, Properties & Functions, variations in count.

- Thrombocytes- Morphology, Count, Function, Variations.
- Hemostasis. Coagulation and its disorders.
- Blood groups and its importance, Blood transfusion.
- Tissue fluid and Lymph
- Immunity.

4. CARDIOVASCULAR SYSTEM - 10 hrs

- Organisation of CVS, Properties of Cardiac Muscle, Origin and spread of cardiac impulse
- Cardiac Cycle – Electrical (ECG)and mechanical events,
- Cardiac output, Measurement, (Fick's Principle) regulation
- Blood pressure, measurement & variation, determinants, regulation, Shock.
- Regional circulation.(Salient features only)-coronary, Pulmonary, Cerebral, Cutaneous

5. RESPIRATORY SYSTEM - 8 hrs

- Introduction. Functional anatomy, Mechanics of ventilation, Pressure changes, volume changes, Surfactant, Compliance, Airway resistance.
- Alveolar ventilation, Dead space, Ventilation perfusion ratio and its significance,
- Spirogram
- Diffusion of gases, O_2 transport, CO_2 transport.
- Regulation of respiration – Voluntary, Neural, Chemical.
- Abnormalities of respiration Hypoxia, Cyanosis, Dyspnea, Asphyxia, High altitude,
- Dysbarism.

6. DIGESTIVE SYSTEM - 7 hrs

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

7. Excretion - 7 hrs

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

8. ENDOCRINOLOGY - 6 hrs

a) Introduction to endocrinology (Different glands, hormones)
b) Pituitary gland (Anterial and posterior glands, actions and applied aspects.
c) Thyroid gland (Actions and applied aspects)
d) Calcium homeostasis (Parathyroid, Vitamin D, Calcitonin, actions and applied aspects

e) Pancreas (Endocrine part – insulin, glucagon – actions and applied aspects
f) Adrenal cortex and medulla (Actions and applied aspects)

9. REPRODUCTIVE SYSTEM - 3 hrs

- Male Reproductive System- Different parts, spermatogenesis, hormones
- Female reproductive system – Different parts, Sexual cycles – Menstrual cycles – Ovarian, endometrium
- Lactation, Pregnancy & Contraception (Basics only)

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

a) Organization of Nervous system.
b) Synapse, Properties & Function
c) Reflexes, Reflex action, Property ,Function.
d) Sensory system – Receptor, Ascending sensory pathway (basics only), Thalamus, sensory cortex
e) Motor System – Spinal control of Motor activity, Motor areas in Cerebral Cortex,
f) Pyramidal & extra pyramidal tracts (basics only),
g) Basal ganglia & Cerebellum.
h) Hypothalamus
i) Autonomous nervous system
j) Cerebro spinal fluid- formation and functions.

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

- Audition
- Vision

Revision and evaluation session – 4-5 hours

Reference books:

Essentials of Medical Physiology
Anil Baran Singha Mahapatra

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Paper III– AHS12A
BIOCHEMISTRY

Course outcome:

- CO1: Knowledge of biochemistry of cell structure, functions, digestion, enzymes and protreins.
- CO2: Knowledge of biochemistry of carbohydrates, minerals and vitamins.
- CO3: Knowledge of biochmestry of liver and renal function tests, specialized laboratory investigations and lipids.
- CO4: Knowledge of biochemistry of metabolism, homeostasis, nucleic acids and cancer.

I. CELL STRUCURE & FUNCTIONS **1hr**

1 Mitochondria
2 Endoplasmic reticulum, Lysosomes
3 Fluid mosaic model for membrane structure

II. DIGESTION AND ABSORPTION OF NUTRIENTS **2hrs**

- Digestion of carbohydrates
- Fats

- Enzymes in digestion of proteins

III. ENZYMES **1hr**

- Normal serum range and diagnostic importance of serum AST, ALP,ALT,CK,GGT and AMYLASE.

IV. PROTEINS **1hr**

- Essential amino acids
- Plasma proteins
- Immunoglobulins

V. CARBOHYDRATES **2hr**

- Diabetes mellitus- symptoms and complications
- Glucose tolerance test
- Action of insulin and glucagon on carbohydrate metabolism

VI VITAMINS **2hrs**

- Deficiency manifestations of Vitamin A, C, D, E, K
- Vit B Complex

VII MINERALS **1hr**

- Factors maintaining serum calcium level and important functions of calcium
- Importance of trace elements

VIII HEMOGLOBIN **1hr**

- Hemoglobin metabolism

IX LIVER FUNCTION TESTS **1hr**

- Jaundice and types of jaundice
- Enzymes in liver disease

X RENAL FUNCTION TESTS **1hr**

- Serum Creatinine

XI SPECIALIZED LABORATORY INVESTIGATIONS **1hr**

Principle and applications of

- Radioimmunoassay (RIA)
- ELISA
- Colorimetry

XII LIPIDS **1hr**

- Essential fatty acids (EFA)
- Poly unsaturated fatty acids (PUFA)
- Phospholipids

XIII METABOLISM 1**hr**

- TCA cycle (steps only)

XIV MAINTENANCE OF HOMEOSTASIS **1hr**

1. Plasma buffers
2. Renal mechanisms in pH regulation
3. Anion gap
4. Metabolic acidosis,

XV NUCLEIC ACIDS **1hr**

- DNA and RNA
- Purine and pyrimidine bases,

XVI CANCER **1hr**

- Chemical and physical carcinogens
- Tumor markers.

Reference books:

The Text Book of Biochemistry
Dr. D.M.Vasudevan, Sreekumari.S

Text Book of Biochemistry
T.N.Pattabhiraman

Essentials of Biochemistry
U.Sathyanarayanan

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Paper IV – AHS13A
MICROBIOLOGY

Course Outcome:

- CO1: To understand the morphological characters of bacteria.
- CO2: To master the preparation of smear, fixation and staining of bacterial smears and its quality control methods
- CO3: Learn to use microscope , autoclave, hot air oven, water bath, steamer, filters
- CO4: To differentiate between innate and adaptive immunity, and explain the main defences lines as well as biological barrier to the infections.
- CO5: Employ antigen –antibody interaction to conduct different immunological and serological tests in the laboratory

Introduction to medical microbiology	- 1 hr
Morphology and physiology of bacteria	- 1 hr
Sterilization and disinfection	- 2 hrs
Normal Microbial flora of the human body	- 1 hr
Infection	- 2 hrs
Antibiotics	- 1 hr
Hospital infections and prevention	- 2 hrs
Immunity	- 1 hr
Antigen, Antibody, Antigen-antibody reactions	- 1 hr
Immune response	- 1 hr
Hypersensitivity	- 1 hr
Immunoprophylaxis	- 1 hr
Tuberculosis	- 1 hr
Typhoid	- 1 hr
Virus infections	- 1 hr
HIV/AIDS	- 1 hr
Hepatitis viruses	- 1 hr
Medical Mycology	- 1 hr
Medical Parasitology	- 1 hr
Malaria	- 1 hr
Urinary Tract Infections	- 1 hr
Respiratory Tract Infections	- 1 hr

Gastrointestinal Infections	- 1 hr
Sexually Transmitted Disease	- 1 hr
Infections of the nervous system	- 1 hr
Practical Demonstrations	
Gram Staining	- ½ hr
Acid Fast Staining	- ½ hr
Antibiotic Susceptibility Testing	- ½ hr
CSSD Visit	- ½ hr
Theory Class Hours	- 28 hrs
Practical Demonstration hours	- 2 hrs
Total hours	**- 30 hrs**

Referrence books:

Text Book of Medical Paracytology

C.K.Jayaram Panicker

Text Book of Microbiology

Anand Narayan

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Paper V (AHS 14) – Section A: INTRODUCTION TO COMPUTER APPLICATION

Course outcome:

- CO1: basic under-standing of use of computer.
- CO2: Applications of computer in clinical departments.
- CO3: Deatiled knowledge on how to use hospital information system.

Coure Description: This course is designed for students to develop basic understanding of used of computer and its applications in Clinical Departments

Unit	Time (hours) Th.	Pr.	Learning Objective	Content	Teaching Learning activities	Assessment Methods
1	**10**	**5**	**Identify & define various concepts used in computer Identify application of computer**	Introduction * Concepts of computers * Hardware and Software * Trends and Technology * Application of Computers	* Lecture cum discussion * Explain using charts * Panel discussion	* Short answer questins * Objective Type
II	**5**	**10**	**Describe and use of Disk Operating System (DOS) Demonstrate skill in the use of MS Office**	Introduction to Disk Operating System * DOS * Windows (all version) * MS Word * MS Excel with Pictorial Presentation * MS - Access * MS-Power Point	* Lecture * Discussion * Demonstration * Practice session	* Short answers * Objective Type * Practical Exam and Viva voice
III	**10**	**5**	**Demonstrate skill in using multimedia** **Identify features of computer aided teaching and testing**	* Multimedia : types & uses * Computer aided teaching & testing	* Lecture * Discussion * Demonstration	* Short answers * Objective Type * Practical Exam and Viva voice

IV	**10**	**5**	**Describe and use of the statistical packages**	* Statistical packages: Types and their features	* Lecture * Discussion * Demonstration * Practice Session	* Short answers * Objective Type * Practical Exam and Viva voice
V	**5**	**5**	**Describe the use of Hospital Management System**	* Hospital Management System : Types and uses * Electronic patient records	* Lecture * Discussion * Demonstration	* Short answers * Objective Type * Practical Exam and Viva voice

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Paper V – Section B: QUALITY ASSURANCE AND ACCREDITATION

Course outcome:

- CO4: Introduction and basic concept of quality.
- CO5: Standardization and Implementation

Course Objectives:

Modernization and its brand conscious make an organization thrive towards perfection in the comparative world of business. The underlying factor that allows an organization to stand the test of time is quality. The students are given the working knowledge of the subject.

Course Content:

Introduction to quality - 2 hrs
Definition, Concept, Benefits - 2 hrs
Function - 2 hrs
Design - 2 hrs
Formulation - 2 hrs
Standardization - 2 hrs
Implementation - 2 hrs
Factors affecting quality - 2 hrs
Need for quality - 2 hrs
Quality cycle - 2 hrs
Quality objectives - 2 hrs
Quality policy - 2 hrs
Quality measurable - 2 hrs
Quality Control, Quality Standards, Q C Tools - 6 hrs
Quality Documents, QC Records, Kazen techniques - 2 hrs

Such as Market-in, TOC, Q C Circles,	- 2 hrs
Suggestion scheme, TPM, Kanban,	- 2 hrs
JIT, Zero defect programme	- 2 hrs
ISO	- 4 hrs
Quality management system Quality manual	- 4 hrs
Quality procedures	- 4 hrs
Quality records	- 4 hrs
Quality audit	- 4 hrs
Correlative and preventive action	- 2 hrs
SQC (Statistical Quality Control techniques)	- 2 hrs
Cost effectiveness	- 2 hrs
Cost of quality system	- 2 hrs
Benefit in total cost	- 4 hrs
Cost measuring system	- 4 hrs
TQM- Concept, awareness, aspects train	- 4 hrs
Total	**- 80hrs**

Detailed Course Plan

Unit- I

Introduction to quality –Definition, concept, Benefits-Functions-Design- Formulation-Standardization

Unit-II

Implementation –Factors affecting quality –Need for Quality Cycle –Quality objectives- Quality policy

Unit-III

Quality measurable –Quality Control Quality Standards. Q C Tools –NABH, NABL, JCI~Quality Documents, QC Records. Kazen Technique such as Market-in, TQC .Q C Circles –Suggestion scheme. TPM, Kanban –JIT, Zero defect programmes

Unit-IV

ISO- Quality management system- Quality manual-Quality procedure- Quality records- Quality audit

Unit- V

Corrective and preventive action –SQC (Statistical Quality Control technique) Cost effectiveness- Cost of quality system- Benefit in total cost –Cost Measuring system- TOM- concept, awareness, aspects training

Reference Text:

1. Dale H Bester field. Carol Bester field, Glen H Bester field, Mary Bester field –Scare, Total Quality Management .Wesley Logman (Singapore)Pte.Ltd. Indian Branch, 482F.I.E, Patparganj, Delhi 110092, India
2. K.Shridhara bhat, Total Quality management .Himalaya Publishing Hollse. "Ramdoot" Dr Bhalerao Mag. Girgaon, Mumbai-400004

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Paper VI (AHS 15): ENGLISH

Course Description : The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written.

Course Outcome

- CO1: Develop their intellectual, personal and professional abilities.
- CO2: Acquire basic language skills (listening, speaking, reading and writing) in order to communication with speakers of English language
- CO3: Acquire the linguistic competence necessarily required in various life situations

Unit	Time (Hours)	Learning Objective	Content	Teaching Learning activities	Assessment Methods
1.	**10**	**Speak and write grammatically correct English**	* Review of grammer * Remedial study of grammer * Building vo cabulary * Phonetics * Public speaking	* Demonstrate use of dictionary * Class Room conversation * Exercise on use of grammer * Practice in public speaking	* Objective type * Fill in the blanks * Para Phrasing
II	**10**	**Develop ability to read, understand and express meaning fully, the prescribed text**	* Read and comprehend prescribed course books	Exercise on : * Reading * Summarizing * Comprehension	* Short answers * Essay Type
III	**8**	**Develop writing skills**	* Various forms of Composition * Letter writing * Note taking * Precise writing * Anecdotal re cords * Diary writing * Reports on health Problems etc. * Resume / CV	Exercise on writing : * Letter * Note * Precise * Diary * Anecdote * Health problems * Story writing * Resume / CV * Essay Writing * Discussion on written reports / documents	* Assessment of the skills based on the check list

IV	**6**	**Develop skill in spoken English**	Spoken English * Oral report * Discussion * Debate * Telephone conversation	Exercise on : * Debating * Participating in Seminar, panel, Symposium * Teleponic Conversation	* Assessment of the skills based on the check list
V	**2**	**Develop skill in listening comprehension**	Listening Comprehension * Media, audio, video, Speeches etc.	Exercise on : * Listening to audio, video, tapes and identify the key points	* Assessment of the skills based on the check list
VI	**4**	**Develop skill in Grammer**	Grammer * Transformation of Sentences * Correction of sentence * Vocabulary Building * Composition * Essay writing - on topics of every day life	Exercise on : * Voice * The Sentence * Parts of Speech * Direct and Indirect Speech * Affirmative and Negative * Change the Question Tag * Correction of Syllabus * Idioms * Letter writing – Personal, Official matters connection with daily life	* Assessment of the skills based on the check list

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SECOND YEAR

During the second year the students will be posted in the clinical area from 8 am to 5 pm including one hour didactic lecture from 3 PM to 4 PM.

Internal Assessment

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

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Paper VII – PHARMACOLOGY AHS12B

1. CO1: Basic knowledge in pharmacology
2. CO2: Detailed systemic pharmacology
3. CO3: Detailed knowledge of drugs and groups of drugs

1. General Pharmacology – 4 hours
2. Evaluation of drugs in man, drug prescribing and drug interactions – 3 hours
3. Sedatives, hypnotics and pharmacotherapy of insomnia – 1 hour
4. Drugs effective in convulsive disorders – 1hour
5. Opioid analgesics – 1 hour
6. Analgesic – antipyretics and non-steroidal anti-inflammatory drugs – 1 hour
7. Psychopharmacology – 1 hour
8. Drug therapy of parksinsonism and other degenerative disorders of the brain – 1 hour
9. Local anesthetics – 1 hour
10. Adrenergic and adrenergic blocking drugs – 1 hour
11. Histamine and anti histamic drugs – 1 hour
12. Pharmacotherapy of cough – 1 hour
13. Pharmacotherapy of bronchial asthma and rhinitis – 1 hour
14. Digitalis and pharmacotherapy of cardiac failure – 1 hour
15. Vasodilator drugs and pharmacotherapy of angina pectoris – 1 hour
16. Pharmacotherapy of hypertension – 1 hour
17. Drugs and blood coagulation – 1 hour
18. Drugs effective in iron deficiency and other related anemias – 1 hour
19. Diuretics – 1 hour
20. Emetics, drug therapy of vomiting, vertigo and diarrhea – 1 hour
21. Pharmacotherapy of constipation – 1 hour
22. Pharmacotherapy of peptic ulcer – 1 hour
23. Sulfonamides, Trimethoprim, cortimoxazole, nitrofurans and quinolones – 1 hour
24. Penicillins and antibiotics effective mainly against gram positive organisms – 1 hour
25. Aminoglycosides and other antibiotics effective mainly against gram negative

organisms – 1 hour

26. Antibiotics effective against both gram positive and gram negative organisms – 1 hour
27. General principles of chemotherapy of infections – 1 hour
28. Chemotherapy of urinary tract infections – 1 hour
29. Antiseptics, disinfectants and insecticides – 1 hour
30. Thyroid and antithyroid drugs – 1 hour
31. Insulin and antidiabetic drugs – 1 hour
32. Adrenal cortical steroids – 1 hour
33. Vitamins and antioxidants – 1 hour
34. Drugs, pregnancy and the newborn – 1 hour

Reference books:

Essentials of Medical Pharmacology
Tripathi
Basics and Clinical Pharmacology
Katzung

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Paper VIII – PATHOLOGY AHS13B

1. CO1: Knowledge of general and systemic pathology.
2. CO2: Knowledge of pathology of neoplasms.
3. CO3: Knowledge of basics of community health.

1. Introduction to Pathology **3 hrs**

- Histopathology- Methods and techniques
- Cytology-FNAC,Exfoliative advantages and limitations of cytology
- Hematology-Sample collection.
- Immunohistochemistry,Immunofluorescence, Electron microscopy, Flow cytometry

2. Cell injury & adaptations **1 hr**

- Etiology
- Reversible & - Irreversible cell injury
- Necrosis & Apoptosis
- Gangrene - Dry - Wet
- Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia. Fatty change

3. Inflammation & Repair **2hrs**

- What is inflammation

- Signs of inflammation, Acute and chronic inflammation, Types of inflammation, Giant cells, Macrophages, Ulcer, abscess, Acute inflammation, Systemic effects of acute inflammation

- Factors affecting healing- Complications of healing

4. Hemodynamic Disorders **2 hrs**

-Definition of edema and causes of edema

- Exudate and transudate

Shock – Definition and types of shock

Thrombosis

Embolism- Definition and types of emboli ,- Pulmonary thromboembolism

5. Neoplasia **2 hrs**

- Definition

- Difference between benign and malignant cells, Nomenclature of tumors

- Routes of metastasis of tumours,- Staging of tumour,- Etiology of cancers - Diagnosis of cancer, including tumour markers

6. CVS **1hr**

- Definition of Ischaemia, Infarction, Aneurysm

- Rheumatic heart disease, Infective endocarditis, Atherosclerosis

- Myocardial infarction,Hypertension and pericardial effusion

7. Respiratory system **1hr**

- Tuberculosis, Pleural effusion, Pneumonia, COPD and tumours

8. GIT **1hr**

- Peptic ulcer, - Carcinoma of oesophagus, Stomach & Colon,

- Inflammatory bowel disease (UC & Crohns)

9. Liver and GB **1h**

- Hepatitis. Cirrhosis, Tumours of liver

◦ Cholecystitis and GB calculi

10. Renal **1hr**

- Glomerulonephritis & Pyelonephritis

- Renal calculi-Nephrotic syndrome, Renal tumors, Polycystic renal diseases-

11. MGS **1hr**

- Cryptorchidism,Orchitis, epididymitis, Prostatic hyperplasia
- Carcinoma penis, Testicular tumors

12. FGS & Breast **1hr**

Ovarian tumours,- Fibroid- Carcinoma cervix- Carcinoma endometrium pap smear Fibroadenoma breast, Carcinoma Breast-Predisposing factors & TNM

13. CNS **1hr**

- Meningitis & encephalitis.- Alzheimer's disease,

Tumours - Meningioma, Gliomas, Metastasis

CSF collection, indication and contraindication, tests performed, cytocentrifuge

14. Skin & soft tissue **1hr**

Skin- SCC, Melanoma,BCC inflammatory lesions lipoma,

15. Bone **1hr**

Osteoporosis, Osteomyelitis,Rickets ,Osteomalacia

Tumours – Osteosarcoma, Osteoclastoma , Ewings sarcoma & Arthritis

16. Endocrine **1hr**

Organs, Pituitary, Adrenal brief;Thyroid – Goitre thyroiditis and tumours

Diabetes and its complications

17. Anaemias - Types of anaemia **1hr**

18. WBC disorders Non neoplastic and neoplastic **1hr**

19.Lymphoreticular system- Lymphadenitis, Lymphomas **1hr**

20. Platelet and coagulation abnormalities-Primary & Secondary Hemostasis **2hrs**

21 .Clinical Pathology I Blood collection, anticoagulants used,vacuettes and their color code.complete hemogram and the various parameters ,Bone marrow – Indication of BM study & collection procedure, PT ,APTT sample collection **1hr**

22. Clinical Pathology II –Urine analysis –Physical,Chemical, microscopic, Dipstick parameters **1hr**

23 Transfusion Medicine- Blood grouping, cross matching, Screening of donor, Precautions to take when you start blood transfusion,Monitoring during transfusion,Transfusion reactions, Blood components. **1Hr**

Internal assessment **Exam -1 ½ hrs**

Lab visit: Histopathology lab-1hr

Hematology lab &blood bank:1 hr

Cytology lab:1hr

Total Hours: 29 hrs lecture+3hrs exam+3 hrs lab visit=35 hrs

Referrence Books:

Basic Pathology: An introduction to the mechanisms of disease
Sunil R Lakhani, Susan A Dilly,Caroline J Filayson

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Paper IX: BASIC ELECTROENCEPHALOGRAPHY BNEP21

1. CO1: Basic knowledge in principles of EEG
2. CO2: Principles of EEG recording
3. CO3: Basic knowledge in Recording techniques, Electrodes placement
4. CO4: Basic knowledge in Normal Adult EEG
5. CO5: Basic knowledge in Video EEG, Polysomnography

Basic Principles

5. Amplification
6. Patient Preparation
7. Electrodes
8. Signal Processing
9. Analogue – Digital conversion
10. Sampling rate
11. High and low frequency, filters, time constant
12. Data acquisition and storage
13. Impedance
14. Averaging
15. Calibration
16. Arifacts
17. Electrode paste
18. CMRR
19. Triggering – Principles and applications
20. Signal delay
21. Power transformers

22. Voltage divider

- Principles of EEG recording
- Recording techniques
- Electrodes placement
  - 10 – 20 system
  - 10 – 20 system
  - T1 – T2 Electrodes
  - Sphenoid Electrodes
- Normal Adult EEG
  - Awake
  - Sleep
  - EEG Rhythms
- Video EEG
- Polysomnography

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Paper X:BNEP22
SECTION A
Physics and Electronics

1. CO1: Basic knowledge in Physics and Electronics
2. CO2: Basics of Nerve conductions
3. CO3: Basics of EMG
4. CO4: Basic knowledge in Evoked Potentials

- Resistors, Capacitors, transistor
- Filters
- Analog – Digital Converter
- Sampling Rate
- Amplifiers
- Simple Circuits
- Impedance
- Electrical Safety
- Transducers
- Basics of Electronics
- Block Diagrams of
- EEG Machine
- ENMG Machine
- EP systems
- Storage Devices
- Creation of files and folders
- Storing data
- Microsoft Office
- Simple Circuits

- Maintenance of systems and accessories
- Block diagrams of EEG , ENMG systems
- Electrode maintenance
- Electrode application
- Basic electricity and electronics
- Role of technologists

Paper X: SECTION B

Section B: Basic Nerve Conduction Studies

Nerve conductions

- Principles of Nerve Conduction
- Motor Nerve Conduction
- Sensory Nerve Conduction
- Late response: H – reflex & F – response
- Repetitive Nerve Stimulation

Electromyography

- Principle
- Electrodes
- Qualitative EMG
- Spontaneous activity
- Motor unit action potential
- Interference pattern

Evoked Potentials

- Principles of Evoked Potentials
- Averaging
- Visual Evoked Potentials
- Audiotory Evoked Potentials
- Somatosenosory Evoked Potentials

Practicals

- Electrodes Identification
- Electrode Application
- Care of Electrodes
- Maintenance of Electrodes and EEG – ENNG machinery
- Normal EEG
    - Awake
    - Sleep
        - Calculation of Nerve Conduction Parameters

- Interpretation of basic Nerve Conductions studies
- Recording of EEG

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THIRD YEAR

During the second year the students will be posted in the clinical area from 8 AM to 5 PM and one hour didactic lecture from 3 PM to 4 PM.

Internal Assessment

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

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Paper XI: ADVANCED ELECTROENCEPHALOGRAPHY BNEP31

1. CO1: Advanced knowledge in EEG
2. CO2: Advaced knowledge in Epilepsies
3. CO3: Advanced knowledge in evoked potenitals

- Normal EEG (awake & sleep)
- Pediatric EEG
- EEG maturation
- Epilepsies
  - Primary generalised Epilepsies
  - Generlised tonic clonic
  - Absence
  - Myoclonic
- Partial epilepsies
  - Simple parital seizures
  - Complex parital seizures
  - Partial with secondary generlised seizures
- EEG in metabolic disease of cerebrum

- EEG changes in CNS infections
- EEG in head trauma, strokes, tumors
- Video EEG
- Spike detection

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Paper XII: ADVANCED NERVE CONDUCTION STUDIES BNEP32

CO1: Advanced knowledge in Nerve Conduction Techniques
CO2: Advanced knowledge in EMG
CO3: Advanced knowledge in evoked potenitals
CO4: Basic knowledge in Magetoencephalography

- **Nerve Conduction Techniques**
- Physiological variables of nerve conductions
- Nerve Conductions in pathological states
    - Demyelination
    - Axonopathy
    - Entrapment
    - Plexopathy
    - Radiculopathy
    - Repetitive Nerve Stimulation
    - H- Reflex and R – Response
    - Long loop reflex

Electromyography

- Qualitative EMG
- Quantitative EMG
- EMG in myopathy and neuropathy
- Single fiberEMG
- Macro EMG
- Turns amplitude ratio

Evoked Potenitals

- Visual Evoked Potentials
- Auditory Evoked Potenitals
- Somatosensory Evoked Potentials
- Evoked potentials in
    - CNS disorders
    - PNS disorders
- Event related potentials
- Electorconvulsive therapy

- Surface recording of EMG in movement disorder
- Magetoencephalography
- Cardiopulmonary resuscitation – basic cardiac life support – Advanced cardiac life support
- Intensive care unit (ICU) & recovery room concepts

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Paper XIII: AUTONOMIC FUNCTION STUDIES AND SLEEP STUDIES BNEP33

1. CO1: Basic knowledge in Sleep Studies
2. CO2: Basic knowledge in Autonomics function test

Sleep Studies

a) Polysomnography level I, II, II & IV
b) Multiple sleep latency test
c) Maintainence of wakefulness
d) PLMS and RLS

Autonomics function test

- Symptomatic skin response
- R – R analysis
- Valsalva maneuver
- Tilt table
- Heart rate variabilty

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Practicals:

1 Nerve conduction
2 Recording R – R variation
3 Recording sympathetic skin response
4 Recording evoked potentials
5 Interpretation of EEG and Nerve conduction graph
6 Factual reporting of Nerve conduction studies and evoked potentials
7 Recording of EEG
8 Reporting of EEG
- Factual reporting
- Interpretation
- Video EEG recording

References

Manual of Nerve Conduction Velocity and Somatosensory
Evoked potentials: Joel A Delisa
Current practice of Clinical electroencephalography - Third edition
Timothy.A.Pedley.

Electroencephalography, 4 th ed, Basic principles, clinical applications& related fields; Ernst Niedermeyer

Neurology in clinical practice – fourth edition, Walter. G.Bradley

Principles of Neurology – 8th edition: Alan.H.Rapper & Robert Brown

Anatomical guide for the electroencephalographer – Third edition Phyllis.B.Hammeond

Treatment of epilepsy; Principles & practice; Wylie

Sleep Disorders;Chokroverthy

Principles of clinical EMG- Case studies; Shin.J.Oh

Electrodiagnosis in diseases of nerves & muscles: Kimura

Clinical Neurophysiology: U.K Misra & J. Kalitha

FOURTH YEAR

Internship

Description:

One-year compulsory internship in various clinical areas in Amrita Institute of Medical Sciences during which the students get to hone their skills and knowledge acquired in the three years of rigorous study. During this period their work is very similar to what is expected from them after the completion of their training. The training ensures their readiness to approach a patient in any setting.

Eligibility:

Student who has successfully completed his/her theory and practical in the first three years of the programme.

Duration:

One year (compulsory Internship) at Amrita Institute of Medical Sciences.

SCHEME OF EXAMINATION

B.Sc Neuroelectrophysiology Degree Examination
Distribution of Marks for each subject

Paper Code	Subject Name	Theory				Paper Total	Aggregate
		University	Internal	Oral	Subject Total		
FIRST YEAR							
I	Anatomy	70	10	20	100	100	1650
II	Physiology	70	10	20	100	100	
III	Biochemistry	70	10	20	100	100	
IV	Microbiology	70	10	20	100	100	
V	Section A – Introduction to Computer Application	50	-	-	50	100	
	Section B - Quality Assurance and Accreditation	50	-	-	50		
VI	English	50	-	-	50	50	
SECOND YEAR							
VII	Pharmacology	70	10	20	100	100	
VIII	Pathology	70	10	20	100	100	
IX	Basic Electroenchephalography	100	20	30	150	150	
X	Section A: Physics and Electronics	50	10	15	75	150	
	Section B: Basic Nerve Conduction Studies	50	10	15	75		
THIRD YEAR							
XI	Advanced Electroencephalography	100	20	30	150	150	
XII	Advanced Nerve Conduction Studies	100	20	30	150	150	
XIII	Autonomic Function Studies and Sleep Studies	100	20	30	150	150	
XIV	Practical +Viva (100) Project (50)	-	-	-	-	150	

PATTERN OF QUESTION PAPERS

Paper I to Paper IV and VII & VIII

The duration of each theory paper will be three hours; the paper will have only one section for a total of 70 marks.

Pattern of Question Paper

Structured Essay (2 out of 3)	- 30 marks (2 x 15 marks)
Short Notes (5 out of 6)	- 25 marks (5 x 5 marks)
Short answer question (5 out of 7)	- 15 marks (5 x 3 marks)
Total Marks	- 70 marks

Paper V

The duration of the paper will be three hours; the paper will have two sections (Section A & Section B) each carrying 50 marks and a total of 100 marks.

Pattern of Question Paper

Structured Essay (2 out of 2)	- 20 marks (2 x 10 marks)
Short Notes (3 out of 4)	- 15 marks (3 x 5 marks)
Short answer question (5 out of 7)	- 15 marks (5 x 3 marks)
Total Marks	- 50 marks

Paper VI

The duration of Paper V will be two hours; the paper will have only one section for a total of 50 marks.

Pattern of Question Paper

English Grammar	- 20 marks
English Writing	- 30 marks
Total Marks	- 50 marks

Paper IX to Paper XIII

The duration of each theory paper will be three hours; the paper will have only one section of 100 marks.

Pattern of Question Paper

Structured Essay (2 out of 2)	- 30 marks (2 x 15 marks)
Short Answer Question (10 out of 12)	- 70 marks (10 x 7 marks)
Total Marks	- 100 marks

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