AMRITA SCHOOL OF MEDICINE

Centre for Allied Health Sciences

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PROGRAM
BSc Anesthesia Technology

(Revised 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"

Amrita Institue of Medical Sciences

Since its inception, Amrita Institute of Medical Sciences (AIMS) in fifteen short years has grown from a 115 bed specialty hospital to a 1250 bed super-specialty tertiary care health centre with an attached medical school and hospital. On the 17th of May 1998, AIMS was inaugurated by the Prime Minister of India, Shri Atal Bihari Vajpayee, in the presence of Her Holiness, Sri Mata Amritanandamayi Devi. The Amrita Institute of Medical Sciences is the adjunct to the term "new universalism" coined by the World Health Organisation. This massive healthcare infrastructure with over 9,00,000 sq. ft of built-up area spread over 100 acres of land supports a daily patient volume of approx 3000 outpatients and an average of 135 admissions. Annual patient turnover touches an incredible figure of over 9,00,000 outpatients and nearly 41,000 inpatients.

With extensive facilities comprising 25 modern operating theatres, 200 equipped intensive-care beds, a fully computerised and networked Hospital Information System (HIS), a fully digital radiology department, a 24/7 telemedicine service and a comprehensive well-equipped clinical laboratory, AIMS offers a total and comprehensive health solution comparable to the best hospitals in the world. AIMS features one of the most advanced hospital computer networks in India. The network supports more than hundruds computers and has computerised nearly every aspect of patient care including all patient information, lab testing and radiological imaging. The AIMS team comprises physicians, surgeons and other healthcare professionals of the highest calibre and experience. Our Hospital services are accredited by ISO 9001-2008 and National Accreditation Board for Hospitals & Healthcare Providers (NABH) and lab services by National Accreditation Board for Testing and Calibration Laboratories.

The educational institutions of Amrita Institute of Medical Sciences, which include the Amrita School of Medicine, the Amrita School of Dentistry, the Amrita College of Nursing, the Amrita School of Pharmacy and Amrita Centre for Allied Health Sciences are 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 Institute of Medical Sciences 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.

Based on evaluation of all our University campuses and programs by a peer review committee, the university has been accredited by the National Assessment and Accreditation Council (NAAC) with an 'A' grade. Amrita has also been ranked in the Ivy League of Indian Universities along with Indian Institute of Science, Bangalore, Tata Institute of Fundamental Research (TIFR), Mumbai etc. in a review of deemed universities by the Ministry of Human Resource Development (MHRD) of the Government of India. In a recent review of Deemed Universities by a high-power committee of reputed academicians, popularly known as the Tandon Committee, set up by the Ministry of Human Resources Development, Amrita Vishwa Vidyapeetham was placed in Category 1. In Tamil Nadu, besides Amrita, only the Chennai Mathematical Institute, a Deemed University, was given this recognition.

Table of Contents
Part I – Rules and Regulations

Table of Contents
Part II – Syllabus

Part I
Rules and Regulations

I. Under Graduate Programmes (Bachelor of Sciences)

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 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.

2. Medium of Instruction:

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

3. Eligibility:

Generally Science Graduates with Physics, Chemistry, Biology are eligible as detailed under 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 No. I.

II. General Rules:

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

1. Duration of the Course

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

Duration of the course	: 4 Years (3 years + 1 year Internship)
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, Centre for Allied Health Sciences, Kochi itself.

2. Discontinuation of studies

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

3. Educational Methodology

Learning occurs by attending didactic lectures, as part of regular work, from 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.

4. Academic Calendar

Annual Scheme

FIRST YEAR

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

SECONDER YEAR

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

THIRD YEAR

Commencement of classes – August
First sessional exam – 20 October - 30 October
Second sessional exam – 20 January - 30 January
Model Exam (with practical) – 01 May - 30 May (includes 10 days study leave)
University exam (with practical) – 01 June - 30 June (includes 10 days study leave)
Annual Vacation – 15 days after the theory and practical exam.
(For the successful completion of the course the students should complete the entire tenure of the course till 31st July in the parent departments)

INTERNSHIP

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

III. Examination Regulations:

1. Attendance:

80% of attendance (physical presence) is mandatory. Medical leave or other types of sanctioned leaves will not be counted as physical presence. For those who possess a minimum of 75% attendance, deficiency up to 5% may be condoned on medical or other genuine grounds by the Principal at his sole discretion and as per the recommendation of the Heads of Departments concerned. Students are allowed such condonation only once for entire course of study. Condonation fee as decided by the Principal has to be paid. Attendance will be counted from the date of commencement of the session to the last day of the final examination in each subject.

2. Internal Assessment:

1. **Regular periodic assessment shall be conducted throughout the course. At least two sessional examinations in theory and preferably two practical examinations should be conducted in each subject. The model examination should be of the same pattern of the University Examination. Average of the two examinations and the marks obtained in assignments / oral / viva / practicals also shall be taken to calculate the internal assessment.**
2. **A candidate should secure a minimum of 35% marks in the internal assessment in each subject (separately in theory and practical) to be eligible to appear for the University examination.**
3. **The internal assessment will be done by the department twice during the course period in a gap of not more than six months and final model exam which will be the same pattern of university examination as third sessional examination. The period for sessional examinations of academic year are as follows :**
    - **First Sessional Exam : October**
    - **Second Sessional Exam : January**
    - **Model Exam : May /June**

4. Each student should maintain a logbook and record the procedures they do and the work patterns they are undergoing. It shall be based on periodical assessment, evaluation of student assignment, preparation for seminar, clinical case presentation, assessment of candidate's performance in the sessional examinations, routine clinical works, logbook and record keeping etc.

5. Day to day assessment will be given importance during internal assessment, Weightage for Internal assessment shall be 20% of the total marks in each subject.
6. Sessional examination as mentioned above and the marks will be conducted and secured by the students along with their attendance details shall be forwarded to the Principal (Result of the first sessional examination should reach before December 1st week of the academic year and result of the second sessional examination should reach to the Principal before March 1st week of the academic year)
7. Third sessional examinations (model exam) shall be held three to four weeks prior to the University Examination and the report shall be made available to the Principal ten days prior to the commencement of the university examination.

3. University Examinations:

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

4. Eligibility to appear university Examination:

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

5. Valuation of Theory – Revaluation Papers:

1. Valuation work will be undertaken by the examiners in the premises of the Examination Control Division in the Health Sciences Campus.
2. There will be **Re-Valuation** 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 from date of result of examination declared and it should be submitted to the office with payment of fees as decided by the Principal.

6. Supplementary Examinations :

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

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

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

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

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

7. Rules regarding carryover subjects:

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

A candidate must have passed in all subjects 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.

IV. Criteria for Pass in University Examination - Regulations:

1. Eligibility criteria for pass in University Examination:

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

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

2. Evaluation and Grade:

1. Minimum mark for pass shall be 50% in each of the theory and practical papers separately (including internal assessment) in all subjects 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 and less than 65% shall be declared to have passed the examination in the second class.
3. A candidate who passes the examination in all subjects in the first attempt obtaining not less than 65% of the aggregate marks for 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 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

V. Internship :

1. Eligibility for Internship - Regulations :

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

"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 the internship.

2. Attendance and leave details during Internship :

For 30 days of duty an intern will be eligible for casual leave and one weekly off. For all Under Graduate courses, the period of internship will be one year and so an intern is eligible for one casual leave and one weekly off in a month and total 12 days casual leave is permitted during internship for a student. For example if a student has taken more than 15 days leave in an emergency situation, then he/she is permitted 12 days as casual leave and the remaining 3 days she / he has to compensate by doing duty for 3 days.

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

VI. General considerations and teaching / learning approach:

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

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

Part II
Syllabus

INTRODUCTION AND ADVANCEMENT

An anaesthesia technician an allied healthcare professional who assists in administration and monitoring of anaesthesia and has an extensive knowledge of anaesthesia techniques, instruments, supplies, and technology. Anaesthesia technicians are mainly employed by anaesthesia departments or operating theatre suites, but can be found in other areas of clinical practice including emergency departments, intensive care units (ICU) and day surgery clinics. Anaesthesia Technicians work as a member of a multi-disciplinary team that includes doctors, nurses and support staffs.

Job description

Anaesthesia technicians are involved with all aspects of the delivery of a patient's perioperative anaesthetic care taking into account the patients' religious and cultural beliefs and respecting their right to medical privacy and dignity at all times.

Prior to anaesthesia

Anaesthesia technicians prepare equipment needed for the patient to safely undergo anaesthesia.

This involves:

- Checking and setting up the anaesthetic machine
- Preparing intravenous drugs
- Preparing intravenous therapy administration equipment
- Preparing a range of devices to maintain the patient's airway (e.g. laryngeal masks, endotracheal tube)
- Communicating with the patient when they arrive into the operating theatre
- Establish peripheral intravenous access.
- Applying anaesthetic monitoring to help assess the patients' condition whilst under anaesthesia. This may include electrocardiography (ECG), blood pressure and oxygen saturation devices. The monitoring of other parameters such as anaesthesia depth monitors (EEG, bispectral index etc.) may also be necessary.

During anaesthesia

The anaesthesia technicians role includes assisting with:

- Inducing and maintaining adequate anaesthesia.
- Establishing and securing an airway.
- Making sure that patients are positioned in such a way NOT to cause discomfort or injury during their procedure.
- Monitoring patients' vital signs and anaesthesia depth.
- Temperature monitoring and regulation.
- Collection and analysis of patient (blood) samples.

- Acquiring transfusion fluids and equipment.

After anaesthesia

Anaesthesia technicians assist the anaesthetist with:

- waking the patient.
- removing airway devices.

Other activities

Regional variations exist, but anaesthesia technicians may also be involved with:

- Intra-operative intra-aortic balloon pump setup, operating and monitoring.
- Swan-Ganz pulmonary artery catheter insertion and monitoring.
- Intra-operative blood salvage setup, operating and monitoring.
- Arterial blood gas analysis, including maintenance of analysers.
- Arterial line insertion and monitoring.
- Peripheral IV line insertion.
- Cardiopulmonary resuscitation.
- Central IV lines.
- TEG Sampling.

Amrita Institute of Medical Sciences has 24 operation theatres and 175 intensive care beds, with sate-of-the-art equipment giving students exposure to the most modern techniques in critical care.

MAIN OBJECTIVES OF THE COURSE

At the end of the course the candidate should be able to:

- Prepare the operation theatre for the conduct of anaesthesia
- Assist the Anaesthesiologists with all procedures in the conduct of anaesthesia
- Handle and maintain all equipment and monitors used in anaesthesia
- Handle all medications used in anaesthesia

Employment:

Those who successfully complete the course will have very good opportunities in all leading hospitals in India and abroad.

Program Outcomes (PO):

PO1: Fundamental knowledge on the subject
PO2: Effective communication skills.
PO3: Knowledge in professional ethics
P04: Leadership qualities and team work
PO5: Problem Analysis and solving skills
PO6: Basic knowledge on research methodology
PO7: Higher Technical skills and competences

PO8: Higher study options in many fields
PO9: Employability in various sectors
PO10: Better employment opportunities

Program Specific Outcomes (PSO)

PSO1: Expertise in Preparton the operation theatre for the conduct of anaesthesia.
PSO2: Expertise in Assisting the Anaesthesiologists with all procedures in the conduct of anaes-thesia.
POS3: Expertise in **Handling and maintaining all equipment and monitors used in anaesthesia.**
POS4: Detailed knowledge in **Handling all medications used in anaesthesia.**

Units:

Unit 1: The basis of patient care – ideas about the needs of the patient – economics of the patient and the family when there is sickness.
4 hours
Unit 2: What does it mean to be a caregiver. Skills for life – positive values4 hours
Unit 3: What is it that the society expects from a hospital and caregivers. 4 hours
Unit 4: Practical application of good behaviour - peer feedback – reflections
4 hours
Unit 5: Assessment through daily evaluation, 360 degree evaluation.

COURSE STRUCTURE

First year

Theory classes and practicals of following subjects
Anatomy
Physiology
Biochemistry
Pharmacology
Microbiology
Pathology
Introduction to Computer application
Quality Assurance & Accreditation
English

Second year

Theory class and posting in the clinical area
Applied Basic Sciences
Basics of Anesthesia Technology

Third year

Theory class and posting in the clinical area

Perioperative Pharmacology
Anesthesia Equipment
Clinical Anesthesia

Fourth Year

Fourth year is internship in the clinical area

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 –AHS11
Section A: 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:

1. CO1: Knowledge of general anatomy and locomotion.
2. CO2: Knowledge of basic human anatomy and histology of CVS and Respiratory systems.
3. CO3: Knowledge of basic human anatomy and histology of CNS, GI, excretory and reproductive systems.
4. CO4: 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**

1. G.I.T
2. Lung-Trachea
3. Kidney, Ureter, Urinary bladder
4. Endocrine- Adrenal,pancreas,pituitary,thyroid and parathyroid
5. 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 I – Section B: PHYSIOLOGY

Course outcome:

1. CO1: Knowledge of general physiology, nerve-muscle physiology and haematology.
2. CO2: Knowledge of basic human physiology with respect to CVS, Respiratory system and GI system.
3. CO3: Knowledge of basic human physiology of excretion and CNS.
4. 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 II – AHS12
Section A: BIOCHEMISTRY

Course outcome:

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

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

- Mitochondria
- Endoplasmic reticulum, Lysosomes
- 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**

1 Factors maintaining serum calcium level and important functions of calcium
2 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**

- Plasma buffers
- Renal mechanisms in pH regulation
- Anion gap
- 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 II – Section B: PHARMACOLOGY

Course outcome:

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

Course

- General Pharmacology – 4 hours
- Evaluation of drugs in man, drug prescribing and drug interactions – 3 hours
- Sedatives, hypnotics and pharmacotherapy of insomnia – 1 hour
- Drugs effective in convulsive disorders – 1hour
- Opioid analgesics – 1 hour
- Analgesic – antipyretics and non-steroidal anti-inflammatory drugs – 1 hour
- Psychopharmacology – 1 hour
- Drug therapy of parksinsonism and other degenerative disorders of the brain – 1 hour
- Local anesthetics – 1 hour
- Adrenergic and adrenergic blocking drugs – 1 hour
- Histamine and anti histamic drugs – 1 hour
- Pharmacotherapy of cough – 1 hour
- Pharmacotherapy of bronchial asthma and rhinitis – 1 hour
- Digitalis and pharmacotherapy of cardiac failure – 1 hour
- Vasodilator drugs and pharmacotherapy of angina pectoris – 1 hour
- Pharmacotherapy of hypertension – 1 hour
- Drugs and blood coagulation – 1 hour
- Drugs effective in iron deficiency and other related anemias – 1 hour
- Diuretics – 1 hour
- Emetics, drug therapy of vomiting, vertigo and diarrhea – 1 hour
- Pharmacotherapy of constipation – 1 hour
- Pharmacotherapy of peptic ulcer – 1 hour
- Sulfonamides, Trimethoprim, cortimoxazole, nitrofurans and quinolones – 1 hour
- Penicillins and antibiotics effective mainly against gram positive organisms – 1 hour
- Amonoglycosides and other antibiotics effective mainly against gram negative organisms – 1 hour

- Antibiotics effective against both gram positive and gram negative organisms – 1 hour
- General principles of chemotherapy of infections – 1 hour
- Chemotherapy of urinary tract infections – 1 hour
- Antiseptics, disinfectants and insecticides – 1 hour
- Thyroid and antithyroid drugs – 1 hour
- Insulin and ant diabetic drugs – 1 hour
- Adrenal cortical steroids – 1 hour
- Vitamins and antitoxidants – 1 hour
- Drugs, pregnancy and the newborn – 1 hour

Reference books:

Essentials of Medical Pharmacology
Tripathi
Basics and Clinical Pharmacology
Katzung

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Paper III – AHS 13
Section A: MICROBIOLOGY

Course Outcome:

1. CO1: To understand the morphological characters of bacteria.
2. CO2: To master the preparation of smear, fixation and staining of bacterial smears and its quality control methods
3. CO3: Learn to use microscope , autoclave, hot air oven, water bath, steamer, filters
4. CO4: To differentiate between innate and adaptive immunity, and explain the main defences lines as well as biological barrier to the infections.
5. 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 III – Section B: PATHOLOGY

Course Outcome:

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-

Internal assessment Exam -1 ½ hrs

11. MGS **1hr**

- Cryptorchidism,Orchitis, epididymitis, Prostatic hyperplasia

– Carcinoma penis, Testicular tumors

12. FGS & Breast **1hr**

Ovarain 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 IV (AHS 14) – Section A: INTRODUCTION TO COMPUTER APPLICATION

Course outcome:

1. CO1: basic under-standing of use of computer.
2. CO2: Applications of computer in clinical departments.
3. 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 IV – Section B: QUALITY ASSURANCE AND ACCREDITATION

Course outcome:

1. CO4: Introduction and basic concept of quality.
2. 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 V (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

1. CO1: Develop their intellectual, personal and professional abilities.
2. CO2: Acquire basic language skills (listening, speaking, reading and writing) in order to communication with speakers of English language
3. 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 {Depending on the OT schedule} and regular didactic lectures.

Internal Assessment

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks along with performance in the clinical posting.

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Paper VI: APPLIED BASIC SCIENCES BAIT21

Course Outcome:

1. CO1: Basic knowledge in applied basic sciences of respiratory system
2. CO2: Basic knowledge in applied basic sciences of cardiovascular system
3. CO3: Basic knowledge in applied basic sciences of CNS
4. CO4: Basic knowledge in applied basic sciences of renal system
5. CO5: Basic knowledge in Sterilization and Disinfection

Course Content:

1 Respiratory system

- 1.1 Upper airway
  - 1.1.1 Open mouth view
- 1.2 Larynx
  - 1.2.1 Laryngoscopic view
- 1.3 Lower airway
- 1.4 Lobes of lungs
- 1.5 Muscles of respiration
- 1.6 Physiology of respiration
  - 1.6.1 Dead space
  - 1.6.2 Normal lung volumes
  - 1.6.3 Alveolar ventilation
  - 1.6.4 Gas exchange
  - 1.6.5 Transport of gases
  - 1.6.6 Control of respiration
  - 1.6.7 Effects of anaesthesia on RS

2 Cardiovascular system (CVS)

- 2.1 Anatomy of the heart
- 2.2 Cardiac cycle –an outline
- 2.3 Cardiac output
- 2.4 Systemic circulation
- 2.5 Pulmonary circulation
- 2.6 Coronary circulation
- 2.7 Regulation of Cardiovascular function
- 2.8 Effects of anesthesia on CVS
- 2.9 Basic ECG knowledge

3 Central nervous system (CNS)

- 3.1 Anatomy
  - 3.1.1 Anatomy of brain and spinal cord
  - 3.1.2 Coverings of brain
  - 3.1.3 Subarachnoid space
  - 3.1.4 Epidural and caudal space
  - 3.1.5 Brachial plexus - anatomy
- 3.2 CSF
- 3.3 Effects of anaesthesia on CNS
- 3.4 Autonomic Nervous system- brief outline

4 Renal system

- 4.1 Anatomy in brief
- 4.2 Functions of kidney
- 4.3 Basic ABG interpretation

5 Hepatobiliary system

- 5.1 Anatomy in brief
- 5.2 Functions of liver

6 Special anatomical areas

- 6.1 Great veins of the neck
- 6.2 Stellate ganglion
- 6.3 Antecubital fossa
- 6.4 Wrist

- 6.5 Femoral triangle
- 6.6 Ankle

7 Sterilization and Disinfection

- 7.1 Definitions – sterilization, disinfection, bacteriostatic, bactericidal
- 7.2 Cleaning of equipment used in ICU and Anaesthesia
- 7.3 Methods of sterilization and disinfection
  - 7.3.1 Pasteurization
  - 7.3.2 Steam sterilization
  - 7.3.3 Chemical disinfection and sterilization
  - 7.3.4 Gas sterilization
- 7.4 Sterilization of ICU and Anaesthetic equipment
- 7.5 Proper Techniques For Scrubbing in /out

8 Physics in relation to anaesthesia

- 8.1 Physical Principles
  - 8.1.1 Phases of matter
  - 8.1.2 Melting Point, Boiling Point and Vapour Pressure
  - 8.1.3 Critical Temperature and Pseudocritical Temperature
  - 8.1.4 Poynting effect and Adiabatic Processes
  - 8.1.5 Heat Capacity and Specific Heat
  - 8.1.6 Latent Heat
  - 8.1.7 Transfer of Heat
- 8.2 Gas laws
  - 8.2.1 Boyle's law
  - 8.2.2 Charles' law
  - 8.2.3 Third perfect gas law
  - 8.2.4 Dalton's law and Amagat's law
  - 8.2.5 Henry's law
  - 8.2.6 Fick's law
  - 8.2.7 Graham's law
- 8.3 Behaviour of Fluids
  - 8.3.1 Fluid flow and Viscosity
  - 8.3.2 Laminar flow and Turbulent flow

8.3.3 Bernoulli's law; Venturi effect and Coanda effect

8.3.4 Surface tension and Capillary action

8.4 Measurement of Pressure and Gas Flow

8.4.1 Force, Pressure and Flow

8.4.2 Atmospheric Pressure and Partial Pressure

8.4.3 Absolute, Differential and Gauge Pressures

8.4.4 Methods of measuring pressure

8.4.5 Measurement of Gas Flow

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Paper VII: BASICS OF ANESTHESIA TECHNOLOGY BAIT22

Course outcome:

1. CO1: Basic knowledge in Medical Gas Supplies and Piped Services.
2. CO2: Basic knowledge in Airway Equipment.
3. CO3: Basic knowledge in Equipment for local anaesthesia

Course Content:

1 Medical Gas Supplies and Piped Services

1.1 Properties of medical gases

1.2 Medical gas cylinders

1.2.1 Components and sizes

1.2.2 Cylinder filling and maintenance

1.2.3 Cylinder identification and colour coding

1.2.4 Cylinder valves

1.2.5 Storage of medical gas cylinders

1.3 Cylinder Manifolds

1.3.1 Storage

1.3.2 Safety precautions

1.4 Bulk Oxygen Supply Systems

1.5 Oxygen Concentrators

1.6 Identification of symptoms of Oxygen Toxicity

1.7 Medical Compressed Air

1.8 Medical Gas Piped Services

1.8.1 Alarm and Indication systems for Piped gases

1.8.2 Distribution Systems

1.8.3 Tests and Checks for Medical Gas Piped Services

2 Airway Equipment

2.1 Face masks

2.1.1 General description

2.1.2 Specific types

2.1.3 Mask straps/ harness

2.1.4 Complications

2.1.5 Advantages and Disadvantages over other Devices

2.2 Airways

2.2.1 Purpose

2.2.2 General description

2.2.3 Oropharyngeal airways

2.2.4 Nasopharyngeal airways

2.2.5 Complications

2.2.6 Temporary Airway in Emergencies

2.3 Laryngoscopes

2.3.1 Parts

2.3.2 Types

2.3.3 Cleaning

2.4 Endotracheal tube

2.4.1 Materials of construction

2.4.2 Description

2.4.3 Size/ length/ marking / cuff/ inflation system

2.4.4 Device to measure cuff pressure

2.4.5 Uses- choosing right tube, checking, preparation

2.4.6 Complications

2.4.7 Safety features

3 Equipment for local anaesthesia

- 3.1 Spinal Needles
- 3.2 Epidural Needles and catheters
- 3.3 Equipment for peripheral nerve blocks

4 Manual resuscitators
- 4.1 Components
- 4.2 Oxygen enrichment devices

5 Medical suction apparatus
- 5.1 Components
- 5.2 Vacuum units

6 Oxygen therapy
- 6.1 Principle
- 6.2 Devices

7 Humidification
- 7.1 Normal mechanism of humidification
- 7.2 Effect of anaesthesia
- 7.3 Effect of inhaling dry gases
- 7.4 Devices
  - 7.4.1 Heat and Moisture exchanger
  - 7.4.2 Humidifiers
  - 7.4.3 Nebulizers

8 Atmospheric Pollution
- 8.1 Control of pollution in operating room
- 8.2 Scavenging systems
- 8.3 Absorption systems

9 Alarm Devices
- 9.1 Alarm Prioritization
- 9.2 Signals
- 9.3 Alarm limits
- 9.4 False alarms

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THIRD YEAR

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

Internal Assessment

Three sessional examinations will be conducted in this year. Average marks of these sessional examinations will be counted as internal marks along with performance in the clinical posting.

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Paper VIII: PERIOPERATIVE PHARMACOLOGY BAIT31

Course outcome:

1. CO1: Detailed knowledge in Emergency drugs
2. CO2: Detailed knowledge in Drugs used in anaesthesia
3. CO3: Detailed knowledge in Miscellaneous Drugs
4. CO4: Detailed knowledge in Basics of Antibiotic therapy.

Course content:

1 Emergency drugs

- 1.1 Adrenaline, Vasopressin
- 1.2 Atropine, glycopyrrolate
- 1.3 Other emergency drugs
  - 1.3.1 Sodium bicarbonate
  - 1.3.2 Calcium gluconate
  - 1.3.3 Potassium chloride
  - 1.3.4 Magnesium sulphate
  - 1.3.5 Lignocaine (iv)
  - 1.3.6 Amiodarone
  - 1.3.7 Adenosine
  - 1.3.8 Insulin
- 1.4 Vasopressors and Inotropes
  - 1.4.1 Dopamine
  - 1.4.2 Dobutamine

1.4.3 Noradrenaline

1.4.4 Phenylephrine

1.4.5 Phenoxybenzamine

1.4.6 Milrinone

1.4.7 Levosimendan

1.4.8 Isoprenaline

1.4.9 Ephedrine

1.5 Vasodilators and antihypertensives

1.5.1 Nitroglycerine

1.5.2 Sodium nitroprusside

1.5.3 Betablockers

1.5.3.1 Esmolol, Metoprolol, Labetolol

1.5.4 Calcium channel blockers

1.5.4.1 Diltiazem, Verapamil

2 Drugs used in anaesthesia

2.1 Intravenous anaesthetic agents

2.1.1 Thiopentone

2.1.2 Ketamine

2.1.3 Propofol, Fospropofol

2.1.4 Etomidate

2.2 Benzodiazepines

2.2.1 Midazolam

2.2.2 Diazepam

2.3 Opioids

2.3.1 Legal issues in storage and handling

2.3.2 Morphine

2.3.3 Pethidine

2.3.4 Buprenorphine

2.3.5 Pentazocine

2.3.6 Fentanyl

2.3.7 Sufentanil

2.3.8 Remifentanil

2.3.9 Tramadol

2.4 Inhalational agents

2.4.1 Ether

2.4.2 Halothane

2.4.3 Isoflurane

2.4.4 Sevoflurane

2.4.5 Desflurane

2.4.6 Nitrous Oxide, Entonox

2.4.7 Xenon

2.5 Skeletal muscle relaxants

2.5.1 Depolarizing agents

2.5.1.1 Succinyl choline

2.5.2 Nondepolarizing agents

2.5.2.1 Pancuronium

2.5.2.2 Vecuronium

2.5.2.3 Atracurium, Cisatracurium

2.5.2.4 Rocuronium

2.6 Local anaesthetics

2.6.1 Lignocaine

2.6.2 Bupivacaine, Levobupivacaine

2.6.3 Ropivacaine

2.6.4 EMLA

2.7 Intralipid

2.8 Anticholinesterase agents

2.8.1 Neostigmine

3 Anaesthetic Adjuvants

3.1 Clonidine

3.2 Dexmedetomidine

4 Miscellaneous Drugs

4.1 Analgesics

4.1.1 NSAIDs – Ketorolac, Diclofenac

4.1.2 Paracetamol

4.2 Antiemetics and antacids

4.2.1 Metoclopramide, Ondansetron

4.2.2 Ranitidine, Pantoprazole

4.3 Anticoagulants and fibrinolytics

4.3.1 Heparin, LMWH

4.3.2 Protamine

4.3.3 EACA

4.3.4 Tranexamic acid

4.4 Oxytocin

4.4.1 Oxytocin

4.4.2 Methyl ergometrine

4.5 Corticosteroids

4.5.1 Hydrocortisone

4.5.2 Dexamethasone

4.5.3 Methylprednisolone

4.6 Bronchodilators

4.6.1 Aminophylline

4.6.2 Salbutamol

4.6.3 Ipratropium

4.6.4 Salmetrerol

4.7 Diuretics

4.7.1 Furosemide

4.7.2 Mannitol

4.7.3 ACE inhibitors

4.8 Dantrolene sodium

5 Basics of Antibiotic therapy

5.1 Types

5.2 Allergic manifestations

5.3 Drug administration

5.4 Identification of Adverse Reaction

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Paper IX: ANESTHESIA EQUIPMENT BAIT32

Course Outcome:

1. CO1: Detailed knowledge in Anaesthesia Workstation
2. CO2: Detailed knowledge in Circle absorber
3. CO3: Detailed knowledge in Anesthesia breathing system.
4. CO4: Detailed knowledge in Anaesthesia Vaporizers.
5. CO5: Detailed knowledge in Equipment for Paediatric Anaesthesia

1 Anaesthesia Workstation

- 1.1 Electrical components
  - 1.1.1 Master switch
- 1.2 Pneumatic components
  - 1.2.1 High pressure system
    - 1.2.1.1 Placing a cylinder in yoke
  - 1.2.2 Intermediate system
  - 1.2.3 Low pressure system
- 1.3 Checking of anaesthesia machine
- 1.4 Safety mechanism in anesthesia machine

2 Circle absorber

- 2.1 Components
  - 2.1.1 Absorber
  - 2.1.2 Absorbent
    - 2.1.2.1 Soda lime
    - 2.1.2.2 Baralime
    - 2.1.2.3 Storage and handling and use of absorbent
    - 2.1.2.4 Changing of absorbent
  - 2.1.3 Valves
  - 2.1.4 Breathing tubes
  - 2.1.5 Reservoir bag
- 2.2 Y piece
- 2.3 Advantages and disadvantages
- 2.4 Checking of circle

3 Anesthesia breathing system

- 3.1 Components
  - 3.1.1 . Connectors and adaptors

3.1.2 . Reservoir bag

3.1.3 . Breathing tubes

3.1.3.1 PEEP valve

3.1.4 . Airway pressure release valve

3.1.4.1 Position of valve during spontaneous and controlled ventilation

3.2 Classification of breathing system- Mapleson's

3.2.1 Mapleson A

3.2.1.1 Magill system

3.2.1.1.1 Modification

3.2.1.1.2 Technique for use

3.2.1.1.3 Hazards

3.2.2 Mapleson D

3.2.2.1.1 Classic form

3.2.2.1.2 Bain modification

3.2.2.1.3 Technique for use

3.2.2.1.4 Hazards

3.2.2.2 Mapleson E

3.2.2.2.1 T piece

3.2.2.2.2 Technique for use

3.2.2.2.3 Hazards

3.2.2.2.4 Modifications

3.2.2.3 Mapleson F

3.2.2.3.1 Jackson Rees modification of Ayre's Tpiece

3.2.2.3.2 Technique for use

3.2.2.3.3 Hazards

3.3 Checking of various circuits

4 Anaesthesia Vaporizers

4.1 Classification depending upon method of vaporization

4.2 Factors affecting output

4.3 Hazards

4.4 Various types

4.5 Safety mechanism

4.6 Filling devices and filling of various vaporizers

5 Anaesthesia ventilator

5.1 Relationship of ventilator to breathing system

5.2 Components

5.3 Setting up of ventilator

6 Advanced Airway Equipment

6.1 Supraglottic airway devices

6.1.1 Laryngeal mask airway family

6.1.2 Soft seal laryngeal mask

6.1.3 Ambu laryngeal mask

6.1.4 Intubating laryngeal airway

6.1.5 Other supraglottic airway devices

6.2 Special tubes

6.2.1 Preformed tubes

6.2.2 Spiral embedded tube

6.2.3 Micro laryngeal surgery tube

6.2.4 Endotrol tube

6.2.5 Tubes for laser surgery

6.2.6 Combitube

6.3 Lung isolation devices

6.3.1 Double lumen tubes

6.3.2 Single lumen bronchial tubes

6.3.3 Bronchial blocking devices

6.4 Difficult airway gadgets and difficult airway algorithm

7 Equipment for Paediatric Anaesthesia

7.1 Differences between adults and children

7.2 Equipment

7.2.1 Anaesthesia machine

7.2.2 Airway management devices

7.2.3 Anesthetic breathing systems

7.2.4 Ventilators used for paediatric anaesthesia

7.2.5 Circulatory access

8 Infusion Equipment

8.1 Simple infusion systems

8.2 Target controlled infusion

8.3 Patient-controlled analgesia

8.4 Filtration

8.5 Ultra-Filtration

8.6 Autotransfusion and cell saver device

9 Pacemakers and defibrillators

9.1 Pacemakers

9.1.1 Pacing terminology

9.1.2 Temporary pacing

9.1.3 Permanent pacing

9.2 Defibrillators

9.3 Electromagnetic interference

9.4 Implantable Cardioverter Defibrillators

10 Surgical diathermy

10.1 Physical principles
10.2 Accidents due to diathermy
10.3 Diathermy and pacemakers
10.4 Diathermy and laparoscopic surgery

11 Lasers

11.1 Principles
11.2 Clinical Applications
11.3 Safety aspects

12 Information technology and the anaesthetic workstation

12.1 Record keeping
12.2 Computerized anaesthetic records

13 Equipment for the Magnetic Resonance Imaging Environment

13.1 Basic Principles
13.2 Problems
13.3 Specific Equipment
13.4 Personnel Hazards

14 Basics of ultrasonography

14.1 Principles
14.2 Care of machine
14.3 Procedures
14.4

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Paper X: CLINICAL ANESTHESIA BAIT33

Course Outcome:

1. CO1: Detailed knowledge in Blood & blood products transfusion
2. CO2: Detailed knoledge in Monitoring.
3. CO3: Basic knowledge in Anaesthesia for various specialty.
4. CO4: Detailed knowledge in Procedures in anaesthesiology.
5. CO5: Basic knowledge in Electrical and environmental Safety

Course Content:

1 Blood & blood products transfusion

- 1.1 Blood groups and cross matching
- 1.2 Blood transfusion
- 1.3 Transfusion reactions
- 1.4 Blood products
- 1.5 Methods of blood conservation in brief

2 Fluid therapy

- 2.1 Crystalloids
- 2.2 Colloids

3 Positioning in anesthesia

- 3.1 Various positions
- 3.2 Care to be taken during positioning
- 3.3 Complications

4 Monitoring

- 4.1 Arterial pressure monitoring
  - 4.1.1 Invasive
  - 4.1.2 Non invasive
- 4.2 End tidal carbon dioxide monitoring
- 4.3 Monitoring anaesthetic gases
- 4.4 Airway pressure monitoring
- 4.5 Monitoring oxygen saturation
  - 4.5.1 Pulse oximeter
  - 4.5.2 Probes
  - 4.5.3 Sites

4.5.4 Testing

4.6 Neuromuscular monitoring

4.6.1 Equipment

4.6.2 Electrodes

4.6.3 Choice of monitoring site

4.6.4 Hazards

4.7 Temperature monitoring

4.7.1 Basic physiology of thermoregulation in brief

4.7.2 Sites of temperature monitoring

4.7.3 Care of probes

4.7.4 Complications

4.7.5 External warming devices

4.8 Arterial blood gas monitoring

4.8.1 Collection of sample

4.8.2 Storage of sample before transport

4.9 Thrombo elastogram

4.10 Glucose monitoring and its significance

4.11 Central venous pressure monitoring

4.12 Cardiac output monitoring

4.12.1 Entering data in cardiac output monitor

4.12.2 Continuous cardiac output

4.12.3 Intermittent bolus technique

4.12.4 Non-invasive cardiac output monitoring

4.13 Monitoring depth of Anaesthesia

5 Regional anaesthesia

5.1 Advantages

5.2 Subarachnoid block

5.3 Epidural block

5.4 Caudal epidural

5.5 Upper limb blocks

5.6 Lower limb blocks

5.7 Other blocks

5.8 Intravenous regional anaesthesia

5.9 Tourniquet and its complications

6 Anaesthesia for various specialty

6.1 Cardiac anaesthesia

6.2 Neuro anaesthesia

6.3 Orthopedics and trauma

6.4 Obstetric anaesthesia

6.5 Paediatric anaesthesia

6.6 Day case anaesthesia

6.7 Thoracic and vascular anaesthesia

6.8 ENT, Ophthalmology, maxillofacial surgery

6.9 Gastro surgery, Bariatric surgery and laparoscopic surgery

6.10 Genitourinary surgery

6.11 Organ transplantation

6.12 Remote Location Anaesthesia

7 Complications during Anaesthesia

7.1 Cardiovascular

7.2 Respiratory

7.3 Nervous system

7.4 Temperature

7.5 Adverse drug effects

7.6 Injury

8 Post anaesthesia care unit (PACU)

8.1 Concept

8.2 Positioning

8.3 Monitoring

8.4 Common complications

9 Care during transport of a patient

9.1 Post-surgical

9.2 Trauma

9.3 Vitals monitoring

10 Procedures in anaesthesiology

10.1 Venous Cannulation

10.1.1 Peripheral

10.1.2 Central

10.2 PA catheter insertion

10.3 Arterial Cannulation

10.4 Emergency cricothyroidotomy

10.5 Fibreoptic bronchoscopy

10.6 Transoesophageal echocardiography

10.7 Percutaneous Coronoary Angiogram

11 Electrical Safety in Operating Room

11.1 Fire triangle

11.2 Ignition Sources

11.3 Fuels

11.4 Oxidizers

12 Environmental Safety in Operating Room

12.1 Waste gases

12.2 Radiation

12.3 Infection

12.4 Chemical dependence

13 Cardiopulmonary resuscitation

13.1 Basic life support

13.2 Preparations of adult and neonatal resuscitation trolley

13.3 Knowledge of codes and drug protocols

Elective Course

Value Based Education - **BAIT40**

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 & sustainablity.
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

The Course will extend over the entire duration of the program. The students will be evaluated by their peers and the faculty via 360 degree evaluation.

SCHEME OF EXAMINATION

B.Sc Anesthesia Technology Degree Examination
Distribution of Marks for each subject

Paper Code	Subject Name	Theory				Paper Total	Aggregate
		University	Internal	Oral	Subject Total		
FIRST YEAR							
I	Section A - Anatomy	50	10	15	75	150	1500
	Section B - Physiology	50	10	15	75		
II	Section A - Biochemistry	50	10	15	75	150	
	Section B - Pharmacology	50	10	15	75		
III	Section A - Microbiology	50	10	15	75	150	
	Section B - Pathology	50	10	15	75		
IV	Section A – Introduction to Computer Application	50	-	-	50	100	
	Section B - Quality Assurance and Accreditation	50	-	-	50		
V	English	50	-	-	50	50	
SECOND YEAR							
VI	Applied Basic Sciences	100	20	30	150	150	
VII	Basics of Anesthesia Technology	100	20	30	150	150	
THIRD YEAR							
VIII	Peri operative Pharmacology	100	20	30	150	150	
IX	Anesthesia Equipment	100	20	30	150	150	
X	Clinical Anesthesia	100	20	30	150	150	
XI	Practical +Viva (100+50)	-	-	-	-	150	

PATTERN OF QUESTION PAPERS

1. Paper I to Paper IV

The duration of each theory 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

Essay Questions* (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

2. Paper V

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

Essay Questions* (2 out of 2)	- 20 marks (2 x 10 marks)
Short Note (5 out of 7)	- 30 marks (5 x 6 marks)
Total Marks	- 50 marks

3. Paper VI to Paper X

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

Pattern of Question Paper

Essay Questions* (4 out of 4)	- 40 marks (4 x 10 marks)
Short Notes (6 out of 8)	- 30 marks (6 x 5 marks)
Short answer question (10 out of 12)	- 30 marks (10 x 3 marks)
Total Marks	- 100 marks

* Marks distribution should be subdivided and specified

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