

Kerala University of Health Sciences Thrissur



SYLLABUS for Bachelor of Science in Anaesthesia Technology (B.SC. Anaesthesia Technology)

Course Code: 034

2024-25 Admission onwards

2. COURSE CONTENT

2.1 Title of course

Name of the course shall be the “BACHELOR OF SCIENCE IN ANAESTHESIA TECHNOLOGY” – B.Sc. (Anaesthesia Technology)

2.2. Objectives of course

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

1. Prepare the operation theatre for the conduct of anaesthesia.
2. Assist the anaesthesiologists in all procedures related to anaesthesia
3. Handle all medications used in anaesthesia.
4. Handle and maintain all equipment and monitors under anaesthesia and critical care.
5. Assist in non-operating room anaesthesia services like for CT, MRI, extracorporeal shock wave lithotripsy (ESWL), labour analgesia, various endoscopic procedures etc.
6. Provide Basic Life Support (BLS) and assist in Advanced Cardiac Life Support (ACLS) when required.
7. Assist Intensivists in managing critically ill patients in Intensive Care Units.

2.3. Medium of instruction

Medium of instruction shall be English

2.4. Course outline

The course enhances student’s knowledge and skills in several major categorical areas of Anaesthesia Technology. The degree in anaesthesia technology provides advanced skills to practicing technicians in health administration, leadership, quality assurance and health informatics. It is a four-year professional degree course. Total course duration is 6060 hours. There will be two internal examinations conducted by the institute/college per year and one university examination at the end of each academic year.

2.5. Duration

The total duration of the course shall be four years.

2.6. Subjects

First year:

Paper	Subjects	Theory Hours	Practical Hours	Total Hours
Paper I	Anatomy	300	40	340
Paper II	Physiology	300	40	340
Paper III	Biochemistry	200	40	240
Paper IV	Pathology	300	40	340
Paper V	English	80		80
Paper VI	Information Technology	20	20	40
	Total	1200	180	1380

Second year:

Paper	Subjects	Theory Hours	Practical Hours	Clinical posting Hours	Total Hours
Paper VII	Medicine relevant to Anaesthesia Technology	160	--	--	160
Paper VIII	Microbiology	80	40	--	120
Paper IX	Pharmacology	100	20	--	120
Paper X	Introduction to Anaesthesia Technology	160	----	1000	1160
Total		500	60	1000	1560

Third year:

Paper	Subjects	Theory Hours	Practical Hours	Clinical Posting Hours	Total Hours
Paper XI	Anaesthesia Technology– Clinical	80	50	275	405
Paper XII	Anaesthesia for Basic specialities	80	50	275	405
Paper XIII	Anaesthesia for Super specialities	80	50	250	380
Paper XIV	Trauma, resuscitation & critical care	80	50	200	330
Total		320	200	1000	1520

Fourth year:

In fourth year, the students will be posted to train under the guidance qualified Anaesthesia Technologists/Anaesthesiologists/Critical Care specialists/ Casualty doctors in attached hospital of the institution and to carry out project work simultaneously. Hospital posting as well as project work must be substantiated with bonafide records duly signed by the designated senior staff members concerned. Submission of a Project work is a compulsory requirement. Each student can choose a topic for the project, in any one of the subjects related to Anaesthesia technology. The supervising teacher should have minimum 3 years full time teaching experience in the concerned subject. The student under the guidance of the supervising staff should carry out the work on the topic selected and prepare a project report including results and references. The minimum total duration of work in fourth year is 1600 hours. The project will be evaluated by a set of qualified examiners during the practical examination at the end of fourth year. There is no theory examination at the end of fourth year.

2.7. Total number of hours

As given in clause 2.6

2.8. Branches if any with definition

The course shall comprise of both theory and practical studies in different branches of Anaesthesia Technology and its related subjects such as:

1. Anatomy
2. Physiology
3. Biochemistry
4. Pathology
5. Medicine relevant to Anaesthesia Technology
6. Microbiology
7. Pharmacology-General and Applied
8. Introduction to anaesthesia technology
9. Anaesthesia Technology - Clinical
10. Anaesthesia Technology - Basic specialities
11. Anaesthesia Technology - Super specialities
12. Anaesthesia Technology - trauma, resuscitation and critical care
13. General topics – English, Introduction to computer application

2.9. Teaching learning methods

See clause 1.4.3

Classroom lectures, practical classes, clinical postings, power point presentations

a) Qualification of teacher:

- Anatomy, Physiology, Biochemistry, Pathology, Microbiology, Pharmacology, shall be taught core faculties and visiting qualified nursing faculties.
- English and information technology shall be taught by respective qualified visiting faculty
- Rest of the subjects shall be taught by core faculties and visiting faculties from anaesthesia department.

2.10. Content of each subject in each year

B.Sc. Anaesthesia Technology - FIRST YEAR

Paper I ANATOMY

1) Introduction to anatomical terms and organization of the human body

- a. Microscopic structure of human cell
- b. Classification, functions and microscopic structures of primary tissue, epithelial tissue, connective tissue, muscular tissue, nervous tissue (with histology).
- c. Histology of cartilage – hyaline, elastic, fibro cartilage

2) The skeletal system

- a. Classification of bones, constituents of bone and bone tissue, functions of skeleton, microscopic structure of compact bones
- b. Histology: Bone - cross section and longitudinal section.
- c. Organization of skeleton, structure of typical vertebrae.
- d. Brief study on individual bones: axial skeleton, appendicular skeleton, cartilages and its classification.
- e. Scapula, humerus, radius & ulna, sacrum, clavicle, hip bones, pelvic bones, femur, tibia, fibula.
- f. Carpel and tarsal bones.
- g. Classification of joints, ligaments (with examples)
- h. Skull bones - Importance of sutures: coronal, sagittal and lambdoid, cranial fossa, foramen magnum (elementary knowledge only). Bones of cranium, auditory meatus, mandible.
- i. Differences between foetal and adult skull.

3) Muscular System

- a. General functions and actions, nerve supply and blood supply of muscles. Classification of muscles. Diaphragm.
- b. Nerve supply and blood supply of extremities.
- c. Histology: Muscles- voluntary or striated, cardiac muscle, smooth muscle

4) Thorax

- a. Thoracic cavity, mediastinum, pleura.

5) Respiratory System

- a. Trachea and lungs – Position, relations, structure and blood supply. Broncho-pulmonary segments. Bronchiole, alveoli and muscles of respiration.
- b. Histology of trachea and lungs.

6) Heart

- a. Position, shape, size, structure, borders, chambers of heart, valves, pericardium, blood supply and nerve supply of heart
- b. Conduction system of heart.

7) Vascular system

- a. Blood vessels, classification and its structure
- b. Differences in the structure of artery and vein. Portal venous system.
- c. Histology: Large artery – Aorta, medium sized artery, large veins – Inferior vena cava, medium sized veins.

8) Lymphatic System

- a. Lymph node, spleen, thymus, tonsil, lymphatic duct.

9) Digestive System

- a. Oral cavity, salivary glands, teeth, tongue, pharynx, oesophagus, stomach.
- b. Glands in digestive system, small intestine - duodenum, jejunum, ileum.
- c. Pancreas, liver, gall bladder, biliary tract, large intestine, appendix, rectum, recto-vesical and recto-uterine pouch.

10) Urinary System

- a. Kidney, nephron, ureter, urinary bladder and its relations in males and females, urethra, blood supply, venous drainage.

11) Reproductive system

- a. Male reproductive system– testis, seminiferous tubules, epididymis, seminal vesicles, external genitalia.
- b. Female reproductive system – vagina, cervix, uterus, fallopian tubes, ovary.

12) Nervous System

- a. Classification and structure of neurons, brain - parts, ventricles, cranial nerves, spinal cord, spinal nerves.
- b. Histology of neuron, spinal ganglion, sympathetic ganglion, peripheral nerves

13) Integumentary system.

- a. Skin - parts, function.

14) Endocrine system.

- a. Pituitary glands, thyroid, parathyroid, suprarenal gland, pancreas.

15) Special senses

- a. Olfactory epithelium, taste buds of tongue.
- b. Structure of ear, eye and their functions.

Practical

Demonstration of gross anatomy – organs

Demonstration of structures including veins, arteries and nerves in the upper & lower limbs. Identification of normal tissues

Human skeleton-demonstration.

Microscopic demonstration of histology slides as per theory.

Textbooks

1. Gross Anatomy - Chaurasia vol 1,2,3
2. Histology - I. B. Singh's textbook
3. General Anatomy - Chaurasia.
4. Ross and Wilson-Anatomy and physiology in health and illness.
5. Manipal Manual of Anatomy-Samapth Madhyastha

Paper II

PHYSIOLOGY

1) Introduction to physiology

- a. Homeostasis

2) Blood physiology

- a. Composition and functions of blood
- b. Plasma proteins – types, functions
- c. RBCs – morphology, functions, erythropoiesis
- d. WBCs – classification, morphology, functions, WBC count, leucopoiesis
- e. Platelets – normal count, thrombopoiesis
- f. PCV, ESR, osmotic fragility, RBC count, blood indices – MCH, MCV, MCHC
- g. Haemostasis – mechanism
 - a. Coagulation of blood – extrinsic and intrinsic pathway
 - h. Bleeding time, clotting time
 - i. Blood groups – ABO system, determination, importance, mismatch blood transfusion, Rh system

3) Respiratory system

- a. Functional anatomy – phases of respiration – inspiration and expiration – mechanism
- b. Lung volumes and capacities – normal values

- c. Spirometry
 - d. Pulmonary gas exchange – diffusion of gases, transport of respiratory gases in blood – O₂ and CO₂
 - e. Oxyhaemoglobin dissociation curve
 - f. Regulation of respiration – chemical and neural mechanisms
- 4) Cardiovascular system**
- a. Functional anatomy, conduction system and spread of cardiac impulse, cardiac cycle – definition, duration of phases.
 - b. Heart sounds, pulse – definition, heart rate, systemic circulation
 - c. ECG – Basic principle of recording, types of leads, normal ECG
 - d. Cardiac output – definition
 - e. Determination of blood pressure and normal values, regulation of BP.
- 5) Endocrine system**
- a. General introduction, hormones – definition
 - b. Endocrine glands – secretions, major functions, (hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal glands, ovary and testis).
- 6) Muscle and nerve**
- a. Transport across cell membrane, resting membrane potential and its basis.
 - a. Action potential – its basis, refractory period, latent period.
 - b. Neuron – Morphology, properties.
 - c. Muscle – Types, differences between them, properties.
 - d. Neuromuscular junction, structure, neuromuscular transmission.
- 7) Nervous system**
- a. Introduction, organization of brain and spinal cord, functions.
 - b. Synapse – definition, types, synaptic transmission and synaptic inhibition.
 - c. Reflex action – definition, components, important properties, clinical importance.
 - d. Cerebral cortex – Physiological importance, EEG, functions of cerebellum, hypothalamus, thalamus, medulla.
 - e. Autonomic nervous system
 - f. CSF –Production, circulation, composition, functions
 - g. Lumbar puncture.
- 8) Special senses**
- a. Vision – Basic optics, refractory errors, visual receptors, visual pathway
 - b. Audition –Physiology of hearing
 - c. Olfaction, gustatory -Basic physiology.
- 9) Digestive system**
- a. Innervations, salivary secretion.
 - b. Gastric secretion – phases, control, functions; Pancreatic secretion – functions, regulation, Bile – functions and composition.
 - c. Small intestine – secretions, GI motility-deglutition, peristalsis; functions of stomach, small intestine and colon.
- 10) Excretory system**
- a. Renal system
 - Kidney -Functions of kidney
 - Urine formation – glomerular ultrafiltration, tubular reabsorption, tubular secretion.
 - Glomerular Filtration Rate (GFR) – definition, measurement, factors affecting GFR.

- Tubular functions – re-absorption of sodium, water, glucose, tubular secretion of H⁺ (acidification of urine).
 - Diuresis and diuretics, micturition
 - Dialysis
- b. Skin-Mechanism of temperature regulation.

11) Reproductive system

- a. Male reproductive system – functions of testis, prostate, seminal vesicles.
- b. Female reproductive system-Function of ovaries, menstrual cycle – ovarian cycle and uterine cycle, fertilization, pregnancy, functions of placenta, parturition, and pregnancy test principle.

Practical

- Haemoglobin estimation
- ESR determination
- RBC count
- WBC count
- Differential count
- PCV, Red cell indices.
- Osmotic fragility test
- Bleeding time, Clotting time
- Blood grouping
- Measurement of blood pressure

Textbooks

1. Essentials of Medical Physiology - K. Sembulingam & Prema Sembulingam
2. Textbook of physiology for BDS students - Prof. Jain A.R.
3. Basics of medical physiology-Dr. Venketesha H Sudhakar
4. Textbook of physiology - Ganong
5. Textbook of physiology - G.K. Pal
6. Guyton (Arthur) Textbook of Physiology.
7. Chatterjee (CC) Human Physiology Vol-1, Medical Allied Agency
8. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book
9. Manipal Manual of Physiology- C N Chandra Shekar.

Paper III

BIOCHEMISTRY

1) Introduction to the chemistry of the living things and the cell.

Cell structure, cell organelles and bio membrane –structure and function, cell fraction
Units of measurements

2) Laboratory equipments and procedures:

- Grades of chemicals, storage and handling of chemicals and reagents. Laboratory safety - General principles, laboratory hazards and safety measures, universal safety precautions.
- First aid in the laboratory
- Expressing concentrations of solutions in physical units and in chemical units
- Water, the universal solvent, Ionization of water, weak acids and weak bases,

dissociation constants, buffer systems, Henderson Hasselbach equation, pH and pH meter.

- Dilution of solution. Inter conversion of concentration - normal, molar, molal and percentage solution.
- Chemical indicators and theory of indicators.
- Collection, preservation and processing of biological specimens for biochemical analysis, preparation and use of anticoagulants and urine preservatives.
- General laboratory equipment- Principle, use and maintenance of the following instruments / apparatus - centrifuge, cold centrifuge, homogenizer.
- Viscosity, surface tension, properties of colloids, emulsions, adsorption, partition coefficient and its application to biological systems.
- Osmosis, dialysis and Donnan membrane equilibrium.

3) CARBOHYDRATES

a. **Chemistry of biological molecule:** Classification, chemistry and properties of monosaccharides, disaccharides and polysaccharides. Digestion and absorption of carbohydrates. Mucopolysaccharides and glycoproteins.

b. Proteins

- Classification, properties and biological function
- Amino acids- Structure & properties- peptide bond, primary, secondary, tertiary and quaternary structures
- Digestion and absorption of proteins
- Lipoproteins and nucleoproteins, structural proteins
- Colour reactions of amino acids and proteins

c. Lipids

- Classification of lipids, chemistry and properties of fatty acids – saturated & unsaturated fatty acids, triglycerides, phospholipids and steroids
- Saponification number, iodine number and rancidity. Digestion and absorption of lipids
- Cell membrane: Structure and function – fluid mosaic model and transport mechanisms.

d. Nucleic acids

- Chemistry of purines, pyrimidines, nucleosides, nucleotides, nucleic acids, nucleosomes. Structure of DNA and RNA.

e. PRACTICALS

- Measurements of liquids, weighing solids
- Preparation of standard solutions, % solutions (V/V. W/V normal and molar solutions.
- Preparation of distilled and deionised water
- Preparation of anticoagulants and preservatives for specimen collection
- Measurement of pH, preparation of buffers
- Reactions of carbohydrates, reactions of glucose, fructose, lactose, sucrose, dextrin, starch and glycogen
- Reactions of amino acids, colour reactions of albumin, globulin, casein, gelatin and peptone
- Reactions of fatty acids and cholesterol
- Reactions of NPN substances (urea, uric acid, creatinine)

RECOMMENDED TEXTBOOKS

1. Fundamentals of Biochemistry - Ambika Shanmugam
2. Harper's Biochemistry - Robert K. Murray
3. Textbook of Biochemistry - Vasudevan and Sreekumari

Paper IV PATHOLOGY

1) Histopathology - Theory

- Introduction to histopathology
- Use & care of Microscope
- Bio-Medical waste management
- Staining of tissues - H& E Staining

2) Clinical Pathology – Theory

- Basics of clinical pathology
- Examination of body fluids

3) Haematology – Theory

- Introduction to haematology
- Normal constituents of blood, their structure and function
- Collection of blood samples
- Various anticoagulants used in haematology
- Laboratory safety guidelines
- Normal Haemostasis
Hb, PCV, ESR, bleeding time, clotting time, Prothrombin time, Activated partial thromboplastin time.

4) Blood Bank

- Introduction
- Blood grouping and Rh types
- Cross matching

PRACTICALS

- Blood grouping Rh typing
- Hb Estimation, Packed Cell Volume [PCV], Erythrocyte Sedimentation rate [ESR]
- Bleeding time, Clotting time, ACT.

RECOMMENDED TEXTBOOKS

1. Dacie & Lewis – Practical Haematology
2. Robbins and Cotran - Textbook of Pathology
3. Sachdev K.N. Clinical Pathology and Bacteriology, J.P. Bros, New Delhi-1991.
4. Krishna - Text book of Pathology, Orient Longman Pvt. Ltd.

Paper V ENGLISH

Students of professional courses have a tendency to neglect the language content. The paper “English for Special Purposes” is introduced with a view to developing the communication skills of the participants in written and spoken English. The emphasis will be fully on the practical aspects of language use, and not on literature. The course content may also help the students to take up overseas examinations in English proficiency like the IELTS or TOEFL.

Writing skills Composition:

- Writing effective paragraphs, ability to describe objects, people, process and ideas and narrating incidents- note taking/ making summaries. Writing telegrams, advertisements, preparing laboratory reports.
- Letter writing:
- Business letters-applying for a job, for higher studies- preparing curriculum vitae-subscribing to a journal- requesting for information- ordering equipment- Letters to the editor.

Foundation English

- Revision of basic grammar: common errors in English, Language functions in medical writing- use of passive voice particularly in scientific and official writing, expressing obligation- use of must, should, ought: expressions of possibility, likelihood, certainty, degrees of comparison, expression of necessity: must, have to, need to, expression of generalizations and emphasis.

Vocabulary

The language of doctor and patient. Medical terminology- roots, prefixes and suffixes, medical abbreviations.

Spoken English

- A course in speech and conversation with focus not on phonetics and grammar, but on developing their ability to talk about objects and expressions around them.
- Fixing appointments- Getting information- Managing medical representatives- Telephoning in a hospital: The objective is to provide practice in fluent conversation. Focus is on specific expressions typical of familiar situations in a medical practice. Techniques of discussion at medical meetings, making presentation at workshop or conference.

RECOMMENDED READING

1. John Christopher Maher, International Medical communication in English (London, Edinburg, University press) 1990
2. Jones L. Functions of English (Cambridge University Press) Tickoo Subramaniam

Paper VI

INFORMATION TECHNOLOGY

Basic computers and information technology: The students will be able to appreciate the role of information technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation. This includes classes to practice how to collect, store, manage and transmit a patient's electronic medical record. Topics to be covered under the subject are as follows:

1. **Introduction to computer:** Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

2. **Input output devices:** Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
 3. **Processor and memory:** The Central Processing Unit (CPU), main memory.
 4. **Storage Devices:** Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
 5. **Introduction of windows:** History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing, and maximizing, etc.).
 6. **Introduction to MS-Word:** introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
 7. **Introduction to Excel:** introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
 8. **Introduction to power-point:** introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
 9. **Introduction of Operating System:** introduction, operating system concepts, types of operating system.
 10. **Computer networks:** introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
 11. **Internet and its Applications: definition,** brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW), www browsers, use of the internet. Sending and receiving Emails
 12. **Introduction to Data Base Management system.**
Various DBMS an introduction,
Computer data processing –software
Information and data management.
 13. **Application of Computers in clinical settings**
Hospital information system, PACS, EMR
Health care system in cloud
 14. **Cyber security**
 - a. Logging on and off
 - b. Security concepts
 - c. Firewall
 - d. VIRUS & ANTI VIRUS software
- Practical on fundamentals of computers –**
1. Learning to use MS office - MS word, MS PowerPoint, MS Excel
 2. Concepts of different software.
 3. Data entry efficiency
 4. Awareness to HIS & EMR

REFERENCE BOOKS

1. Fundamentals of Computing, J. B. Dixit, Laxmi Publications
2. Database System Concepts, Korth, Silberschatz, and Sudarsan - Tata McGraw Hill
3. Computer Networks-Andrew S. Tannenbaum-PH
4. Internet for Everyone - Alexis Leon and Mathews Leon -- Vikas Publishing House Pvt. Ltd., New Delhi

5. Operating System Concepts, Silber Schatz, Galvin, Gange (6th Edition)
6. Open Office Basic: An Introduction, Prof. James Steinberg, Gold Turtle Publishing, December 2012, ISBN 978-1481270939
7. Information Systems for Healthcare Management, C.J. Austin, S.B. Boxerman, 6th Edn, ISBN 81-8014-093-8, Standard Publishers distributors, New Delhi
8. Health Informatics in the Cloud, Mark L. Braunstein, Springer-Verlag New York Inc. (2012)

B.Sc. Anaesthesiology Technology - SECOND YEAR

Paper VII MEDICINE RELEVANT TO ANAESTHESIA TECHNOLOGY

1. Cardiovascular System (CVS)

IHD-Angina pectoris, Acute Coronary Syndrome, complications of acute MI, perioperative MI

Valvular heart diseases- MS, MR, MVP, AS, AR, TR, PR, congenital heart disease

Cardiac arrhythmias – Normal ECG, brady and tachyarrhythmias, cardiac conduction disturbances

Systemic and pulmonary artery hypertension

Acute and chronic heart failure

Peripheral occlusive vascular disease

2. Respiratory system

Infections, Asthma, COPD, Interstitial lung disease, pulmonary embolism.

3. CNS

Cerebral blood flow, cerebral metabolism, ICP and factors affecting ICP, cerebrovascular disease, traumatic brain injury –EDH, SDH, SAH, seizure disorder, degenerative diseases of the brain, spinal cord disorders- intervertebral disc disorders, traumatic spine injury, autonomic hyperreflexia.

4. Disease of liver and biliary tract

Acute and chronic hepatitis, chronic liver disease and liver cirrhosis, cholecystitis, acute liver failure.

5. Diseases of GIT

Peptic ulcer, Gastroesophageal Reflux Disease (GERD), hiatus hernia, acute and chronic pancreatitis, GI bleeding, appendicitis, peritonitis.

6. Renal system

Clinical assessment of renal function, acid base disturbances, acute renal failure, chronic renal failure, nephrotic syndrome, glomerulonephritis, urolithiasis, hepatorenal syndrome, benign prostatic hyperplasia, end stage renal disease.

7. Endocrine system

Diabetes mellitus- management, thyroid disease –hyperthyroidism and hypothyroidism, adrenal gland dysfunction- hypercortisolism, adrenal insufficiency, primary hyperaldosteronism, pheochromocytoma, pituitary gland dysfunction- acromegaly, SIADH, diabetes insipidus.

8. Haematological disorders

Disorders of haemostasis, coagulation, hypercoagulable disorders, disseminated intravascular coagulation

9. Disorders of ENT

Acute and chronic tonsillitis, sinusitis, acute epiglottitis, croup, deviated nasal septum, adenoids, choanal atresia, retropharyngeal abscess, otitis media.

10. Skin and musculoskeletal diseases

SLE, muscular dystrophy, myasthenia gravis, rheumatoid arthritis, osteoarthritis, kyphoscoliosis, systemic sclerosis, ankylosing spondylitis

11. Infectious diseases

Bloodstream infections, sepsis, encephalitis, meningitis, tuberculosis, HIV, tetanus, gas gangrene, surgical site infection, classification of antibiotics and antibiotic resistance.

12. Paediatric diseases

Diseases of the neonate- respiratory distress syndrome, hypoglycaemia, hydrocephalus, neonatal surgical disease-CDH, TOF, abdominal wall defects, intussusception, congenital hypertrophic pyloric stenosis, necrotising enterocolitis, anorectal malformation, bowel atresia, Hirschsprung's disease, Down's syndrome, upper airway disorders- acute epiglottitis, croup, foreign body aspiration, malignant hyperthermia, cerebral palsy, hydrocephalus, meningomyelocele, cleft lip and palate, febrile seizures.

Paper VIII

MICROBIOLOGY

Theory

Objective: - This course introduces the principles of microbiology with emphasis on applied aspects of microbiology of infectious diseases particularly in the following areas:

- Principles & practice of sterilization methods
- Collection and dispatch of specimens for routine microbiological investigations
- Interpretation of commonly done bacteriological and serological investigations
- Control of hospital infections, biomedical waste management and immunization.

▶ Morphology

Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of micro-organisms

▶ Growth and nutrition

Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology

▶ Sterilisation and disinfection

Principles and use of equipment for sterilization namely hot air oven, Autoclave, serum inspissator, ETO, plasma steriliser. Pasteurization, antiseptic and disinfectants. Antimicrobial sensitivity test.

▶ Immunology

Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg (To avoid technical details)

▶ Systematic Bacteriology

Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (the classification, antigenic structure and pathogenicity are not included) Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. Diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes

▶ Parasitology

Brief description and morphology of common parasites

▶ Mycology

Morphology, diseases caused and lab diagnosis of following fungi-Candida, Cryptococcus, Dermatophytes, Opportunistic fungi.

▶ Virology

General properties of viruses, diseases caused, lab diagnosis and prevention of following viral infections- Herpes, Hepatitis, HIV, Rabies, Poliomyelitis, Varicella

- ▶ **Hospital acquired infection** - Causative agents, transmission methods, investigations, prevention and control.
- ▶ **Principles and practice of biomedical waste management**

Practical

Compound microscope.

Demonstration and sterilization of equipment– hot air oven, autoclave, bacterial filters.

Demonstration of commonly used culture media-Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac Conkey medium, LJ media, Robertson cooked meat media, Potassium tellurite media, antibiotic susceptibility test.

Gram staining, Acid Fast staining.

Visit to hospital for demonstration of biomedical waste management.

Visit to hospital CSSD (Central Sterile Services Department).

Packing of equipment for sterilisation, loading, holding time and unloading.

Anaerobic culture methods.

Collection of specimens from ICU and operation theatre for sterility testing

The various methods employed for sterility testing.

Interpretation of results of sterility testing.

Disinfection of OT.

RECOMMENDED TEXTBOOKS

1. Ananthanarayanan & Paniker's Textbook of Medical Microbiology
2. Chatterjee – Parasitology – Interpretation to Clinical medicine
3. Medical Parasitology – Ajit Damle
4. Methods of sterilisation and disinfection in hospitals- Divya Sidhalingappa and Lakshmi Prasad. Lambert Academic publishing

Paper IX

PHARMACOLOGY

General concepts of pharmacodynamic and pharmacokinetic principles.

1. Autonomic nervous system

- a. Anatomy & functional organisation.
- b. List of drugs acting on ANS including dose, route of administration, indications, contraindications and adverse effects.

2. Cardiovascular drugs

Mode of action, side effects and therapeutic uses of the following drugs.

- a. Antihypertensives
- b. Beta adrenergic blockers
- c. Alpha adrenergic blockers
- d. Peripheral vasodilators
- e. Calcium channel blockers
- f. ACE inhibitors and ARBs
- g. Diuretics
- h. Antiarrhythmic drugs
- i. Cardiac glycosides
- j. Inotropes and vasopressors
- k. Coronary vasodilators
- l. Antianginal drugs

- m. Lipid lowering & anti atherosclerotic drugs
 - n. Drugs used in haemostasis – anticoagulants, thrombolytics and antithrombolytics, antiplatelets
 - o. Cardioplegic drugs
- 3. Anaesthetic agents**
 - a. General and local anaesthetics
 - b. Classification of general anaesthetics
 - c. Inhaled anaesthetic agents
 - d. Intravenous anaesthetic agents
 - e. Local anaesthetics – classification, mechanism of action, duration of action and methods to prolong the duration of action. Preparation, dose and routes of administration.
 - 4. Analgesics**
 - a. Definition and classification
 - b. Non opioid and opioid analgesics
 - c. Routes of administration, dose, frequency of administration, side effects and its management.
 - 5. Antihistamines and antiemetics**
Classification, mechanism of action, adverse effects, preparations, dose and routes of administration.
 - 6. CNS stimulants and depressants**
 - a. Alcohol
 - b. Sedatives, hypnotics and narcotics
 - c. CNS stimulants
 - 7. Neuromuscular blockers and reversal agents**
 - a. Classification
 - b. Mechanism of action
 - 8. Pharmacotherapy of respiratory disorders**
 - a. Modulators of bronchial smooth muscle and pulmonary vascular smooth muscle tone
 - b. Pharmacotherapy of bronchial asthma
 - c. Pharmacotherapy of cough
 - d. Mucokinetic and mucolytic agents
 - e. Use of bland aerosols in respiratory care
 - 9. Corticosteroids** – Classification, mechanism of action, adverse effects and complications. Preparation, dose and routes of administration.
 - 10. Diuretics**
 - a. Classification, site of action of diuretics, adverse effects, preparations, dose and routes of administration.
 - 11. Antimicrobial agents**
 - a. Definition, classification and mechanism of action of antimicrobial agents
 - b. Chemoprophylaxis
 - c. Test dosing of antibiotics
 - d. Classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, antitubercular drugs.
 - 12. Miscellaneous**
 - a. IV fluids-crystalloids and colloids. Various preparations and their usage
 - b. Electrolyte supplements
 - c. Emergency drugs, anticholinergic drugs
 - d. Drugs used in metabolic and electrolyte imbalance.

Practical

Pharmacology directed to show the effects of commonly used drugs and interpretation of charts.

RECOMMENDED TEXTBOOKS

1. Pharmacology and Pharmacotherapeutics. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure
2. Essentials of Medical Pharmacology, K.D. Tripathi
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition

Paper X

INTRODUCTION TO ANAESTHESIA TECHNOLOGY

1. Gas physics

- States of matter
- Temperature conversion
- Humidity
- Pressure measurement
- Gas flows and diffusion
- Gas laws
- Miscellaneous concepts- density, viscosity, specific gravity

2. Medical Gas Supply

- Compressed gas cylinders
- Colour coding
- Cylinders and cylinder valves
- Manifold room for cylinders
- Diameter Index Safety System (DISS)
- Medical gas pipeline system and station outlets
- Air compressors
- Oxygen concentrators
- Alarms and safety devices

3. Gas Administration Devices

- Simple oxygen administration devices
- Methods of controlling gas flow
- Reducing valves
- Flow meters
- Regulators
- Flow restrictors

4. Oxygen Delivery Devices

- Definition
- Low and high flow systems
- Limitations

5. Anaesthesia machine and workstation

- Hanger and yoke system
- Cylinder pressure gauge, pin index
- Pressure regulator
- Flow meter assembly
- Vaporizers – Types, hazards, maintenance, filling and draining.
- Suction apparatus

6. Breathing System

- General considerations
- Classification of breathing system
- Mapleson system
- Circle system
- Non rebreathing valves – Ambu valves

7. Perioperative monitors

- ECG
- NIBP
- Pulse oximeter
- Capnograph
- Invasive BP
- CVP monitoring
- Temperature monitoring
- Neuromuscular monitoring
- BIS monitor

8. Manual Resuscitators

- Types of resuscitator bags
- Indications
- Hazards
- Methods of increasing oxygen delivery capabilities while using resuscitator bags.

9. Artificial airway

- Face masks – Types, sizes and its usage.
- Parts of airway and features
- Oral and nasal airways- types, sizes and methods of insertion
- Supraglottic airway devices- I-gel, LMA
- Endotracheal tubes including special tubes.
- Care of long-term airways and complications
- Tracheostomy tubes.

10. Laryngoscopes

- Parts of laryngoscope
- Types of blades
- Video laryngoscopes
- Fiberoptic bronchoscope

11. Methods of cleaning and sterilization of anaesthetic equipment

12. History of Anaesthesia

- Prehistoric era
- Inhalational anaesthetic era
- Regional anaesthetic era
- Intravenous anaesthetic era
- Modern anaesthetic era

13. Minimum standards for anaesthesia

- Who should give anaesthesia?
- Ten golden rules of anaesthesia
- Patient assessment and preparation
- Checking the drugs and equipment
- Maintaining airway
- Monitoring pulse and BP

RECOMMENDED TEXTBOOKS

1. Understanding Anaesthesia Equipment, Dorsch and Dorsch
2. Understanding Anaesthetic Equipment and procedures, Dwarakadas
3. Manual of Anaesthesia for Operation Theatre Technicians, S.Ahanantha Pillai

B.Sc. Anaesthesia Technology THIRD YEAR

Paper XI

ANAESTHESIA TECHNOLOGY-CLINICAL

1. Preoperative preparation--Pre anaesthetic assessment and optimisation prior to surgery.
2. Informed consent, importance of preoperative fasting
3. Premedication: aims, agents used
 - a. Narcotics
 - b. Antihistamines
 - c. Antacids
 - d. Anxiolytics
 - e. Anticholinergics
 - f. Agents for premedication in paediatrics.
4. Investigations
 - a. Biochemistry – Blood glucose, Urea, Creatinine, LFT, electrolytes.
 - b. Haematology – Hemogram, Prothrombin time, Partial thromboplastin time, BT, CT
 - c. Urine- Complete urine analysis
 - d. ECG- Normal, common ECG changes in ischemia and arrhythmias
 - e. Chest X-ray
 - f. ABG
5. American Society of Anaesthesiologists classification used for perioperative risk stratification
6. Equipment:
Checking anaesthesia workstation, oxygen cylinder, laryngoscopes, endotracheal tubes, airways, suction apparatus, anaesthetic drugs and emergency drugs.
7. Preparation:
 - a. Patient identification
 - b. Consent and NPO status
 - c. Prosthesis identification.
 - d. Lab results
 - e. Consultation
 - f. Blood and blood products
 - g. Antibiotic prophylaxis
8. Emergency Drugs
 - a. Atropine
 - b. Epinephrine
 - c. Isoprenaline
 - d. Ephedrine
 - e. Aminophylline
 - f. Hydrocortisone
 - g. Sodium bicarbonate
 - h. Dopamine
 - i. Nor epinephrine
 - j. Dobutamine

- k. Phenylephrine
- 9. I.V access.
 - a. Site of cannulation
 - b. Finding a vein
 - c. Technique of venepuncture.
 - d. Special difficulties.
- 10. Induction of anaesthesia.
 - a. Inhalational/intravenous induction
 - b. Endotracheal intubation, confirming the tube position and securing the tube.
- 11. Intubation
 - a. Choice of ETT
 - b. Choice of laryngoscope
 - c. Techniques of intubation.
 - d. Complications
 - e. Difficult intubation
 - f. Positioning in anaesthesia.
- 12. Protection of the patient
 - a. Padding pressure points.
 - b. Protection of eyes
- 13. Maintenance of anaesthesia.
- 14. Fluid / Blood and electrolyte balance
- 15. Emergence, termination and recovery.
 - a. Reversal of neuromuscular blockade and steps of extubation.
 - b. Oropharyngeal toilet, throat pack removal
 - c. Endotracheal tube suction.
 - d. Deflation of the cuff.
 - e. Removal of the tube.
 - f. Transfer of the patient
- 16. In the recovery room
 - a. Patient identification
 - b. Diagnosis & surgery
 - c. Type of anaesthesia
 - d. Fluid balance
 - e. Vitals
 - f. Complications
 - g. Instructions about ventilation, vital signs.
- 17. Problems in recovery room
 - a. Hypo/hypertension
 - b. Tachy/bradycardia
 - c. Pallor, cyanosis, dyspnoea
 - d. Restlessness, nausea, vomiting.
 - e. Seizures, conscious level.
 - f. Sweating, shivering.

RECOMMENDED TEXTBOOKS

1. The Anesthesia Technologist's Manual. Emily S. Guimaraes, Matthew Davis
2. Clinical Anaesthesiology. Morgan and Mikhail
3. Millers Anaesthesia

- Methods of anaesthesia
- Inhalational anaesthesia
- Minimum alveolar anaesthetic concentration
- Stages of ether anaesthesia
- Halothane, Isoflurane, Sevoflurane, Nitrous Oxide
- Opioids analgesics -Morphine, Pethidine, Fentanyl, Buprenorphine, Tramadol
- Intravenous anaesthetic agents- Thiopentone, Propofol, Ketamine.
- Neuromuscular blockers- Suxamethonium, Pancuronium, Vecuronium
- Atracurium, Rocuronium, Cis-atracurium
- Monitoring during anaesthesia and surgery
- Reversal agents- Neostigmine, Glycopyrrolate
- Recovery room – Setup, things needed, expected problems
- Postoperative complications and management
- CPR
- Regional anaesthesia
- Spinal anaesthesia
- Epidural anaesthesia
- Patient positioning during various surgeries.
- Nerve blocks
- Nerve stimulators
- Drugs acting on sympathetic nervous system
- Adrenaline, Noradrenaline, Dopamine, Dobutamine, Isoprenaline
- Local anaesthetic agents-Lignocaine, Bupivacaine, Ropivacaine
- Complications and accidents during anaesthesia
- Complications:
 1. Related to equipment.
 - a. Hypoxemia
 - b. Hypercapnia
 - c. Changes in airway pressures
 - d. Thermal & electrical injuries, including fire in operation theatre.
 - e. Monitoring instrument related malfunction.
 - f. Anaesthesia equipment malfunction.
 2. Related to airway
 - a. Difficult intubation
 - b. Airway trauma
 3. Cardiovascular complications
 - a. Hypotension
 - b. Hypertension
 - c. Tachycardia
 - d. Bradycardia
 - e. Arrhythmias
 - f. Myocardial ischemia & infarction
- Anaesthesia for emergency surgeries.
- Anaesthesia for OBG, including labour analgesia.
- Anaesthesia for ENT surgeries
- Anaesthesia for ophthalmic surgeries.
- Anaesthesia for general surgeries, both open and laparoscopy

- Anaesthesia for orthopaedic surgeries including peripheral nerve blocks

RECOMMENDED TEXTBOOKS

1. Clinical Anaesthesiology. Moran and Mikhail.
2. Millers Anaesthesia.

Paper XIII ANAESTHESIA FOR SUPER SPECIALITIES

1. Anaesthesia & co- existing diseases
 - a. Ischemic heart disease
 - b. Hypertension
 - c. Congestive cardiac failure
 - d. Arrhythmias & heart blocks
 - e. COPD
 - f. Bronchial asthma
 - g. Paediatric anaesthesia
 - h. Liver disease and anaesthesia
 - i. Renal disease and anaesthesia
 - j. Obesity and anaesthesia
 - k. Diabetes mellitus and anaesthesia
 - l. Thyroid disease and anaesthesia
2. Anaesthesia for head and neck surgery including maxillofacial surgeries and major oncological resections.
3. Anaesthesia for special situations
Shock, low cardiac output, non-operating room anaesthesia including anaesthesia for endoscopy, ERCP, MRI.
4. Anaesthesia for paediatric surgery.
 - a. Resuscitation of the new-born
 - b. APGAR scoring system
 - c. Use of drugs
 - d. Temperature control
 - e. Caudal epidural analgesia
 - f. Spinal anaesthesia in paediatrics.
5. Anaesthesia for thoracic surgery
 - a. Use of double lumen tubes
 - b. Anaesthesia for bronchoscopy.
 - c. Anaesthesia for lobectomy/pneumonectomy
6. Anaesthesia for cardiac surgery
 - a. Preparations & monitoring
 - b. Heparin & Protamine
 - c. Care & use of arterial & venous lines
 - d. Maintenance of body temperature
 - e. Anaesthesia for open heart surgery
 - f. Transport to ICU
 - g. Special equipment in cardiac surgeries.
7. Anaesthesia for plastic surgery.
8. Anaesthesia for urology including renal transplant.
9. Anaesthesia for neurosurgery.
10. Anaesthesia for major vascular surgeries.

RECOMMENDED TEXTBOOKS

1. The Anesthesia Technologist's Manual. Emily S. Guimaraes, Matthew Davis
2. Clinical Anaesthesiology. Morgan and Mikhail
3. Steeling's Anaesthesia and Co existing Disease-Paul, Hines, Marschall
4. Millers Anaesthesia

Paper XIV TRAUMA, RESUSCITATION AND CRITICAL CARE

1. Trauma

- Triaging in trauma
- Manual in line stabilisation for cervical injuries.
- Blunt injury, penetrating injury, crush injury
- Specific injuries -Head injury with initial assessment, GCS scoring, clinical features.
- Facial injury, neck injury, thoracic injuries including haemothorax/pneumothorax, cardiac tamponade
- Blunt trauma abdomen- liver and splenic injuries
- Long bone fractures.

- Burns - surface area calculation, management of burns including fluid calculation, inhalational injury
- Other injuries -Poisoning, Drowning

2. Resuscitation

- Volume resuscitation using crystalloids, colloids, blood in hypovolemic shock
- Recent CPR recommendations-BLS, ACLS guidelines.
- Post resuscitation care.

3. Critical Care

- Sepsis and septic shock, cardiogenic shock, anaphylactic shock.
- Respiratory failure and types, initial ventilator set up
- ARDS
- Acute exacerbation of COPD.
- Pulmonary embolism
- Weaning from mechanical ventilation
- Congestive cardiac failure and management
- Acid base disorders, electrolyte abnormalities and correction.
- Diabetic ketoacidosis
- Community acquired pneumonia
- Prevention of infection in ICU
- Acute kidney injury, Renal Replacement Therapy, End Stage Renal Disease
- Upper GI bleed and management
- Status epilepticus
- Blood transfusion- Indications and complications
- Sedation in ICU
- Inotropes and vasopressors in ICU
- Nutrition in ICU – Enteral, TPN
- ICU Procedures- Arterial line insertion, central venous cannulation, endotracheal intubation, percutaneous tracheostomy, chest tube insertion.

RECOMMENDED TEXTBOOKS

1. The Anesthesia Technologist's Manual. Emily S. Guimaraes, Matthew Davis
2. The ICU Manual. Paul Marino

B.Sc. Anaesthesia Technology – FOURTH YEAR

Activity for the internship year

Not applicable

2.11 No: of hours per subject

As given in clause 2.6

2.12 Practical training

As given under clause 2.6

2.13 Records

Records should be maintained for all practical work in all the 3 years. It shall also be considered for calculating the internal assessment marks. A maximum of 5 marks shall be given for the record.

2.14 Dissertation

All students are required to complete a dissertation before the end of final year, without which the students shall not be eligible to appear for the final year university examination.

2.15 Specialty training if any

Students have to complete a full year of training during which there will be rotational posting in operation theatres, casualty and ICUs.

2.16 Project work to be done if any

Synopsis/protocol

A project work synopsis/protocol on a current topic of relevance in anaesthesia. It has to be approved by the HOD. The general/specific guidelines of the University (KUHS) are to be followed for the format and style of the project/thesis/dissertation synopsis/protocol submission. The project work should be done in about 30 pages (Times New Roman, Font size 14, line space 1.5), bound.

Submission

The project should be certified by the supervising staff and submitted to the Head of the Department and a soft copy of the certified project should be submitted to the

controller of examinations of KUHS one month prior to the fourth-year university practical examination.

Valuation of Project

The project report evaluation will be conducted by the internal and external examiners together in the concerned subject of Fourth year B.Sc. Anaesthesia Technology University practical examination. Soft copy of the project should be sent to the examiners at least one week before the date of practical examination by KUHS.

Candidate who has secured a minimum of 50% marks in the University examination (theory and practical separately) and 50% marks in Total for theory block (University theory examination and internal assessment) and 50% in practical block (University Practical, Viva & Internal assessment) separately in any subject or subjects shall be declared to have passed in that subject / subjects. There will be no minimum marks for viva examination. A candidate who fails in any subject or subjects in the examination may need to appear for the theory, practical and viva for that subject only. Five marks may be given as grace mark (or as per KUHS regulations) either in a subject alone or distribute it among subjects so as to make the candidate eligible for a pass.

Examples for topics

1. Thrombophlebitis associated with IV cannulation
2. Patient awareness during general anaesthesia
3. Outcome of labour analgesia
4. Awareness about anaesthesia among general population
5. Headache associated with spinal anaesthesia
6. Hypotension after spinal for caesarean section
7. Sore throat after endotracheal intubation
8. Post-operative analgesia with caudal block in paediatric
9. Complications of subclavian vein cannulation
10. Intra-arterial line cannulation

2.17 Any other requirements

Students may be encouraged in these aspects as per requirement of the course

2.18 Prescribed/recommended textbooks for each subject

See clause 2.10 and as supported and decided by the concerned faculties/HOD

2.19 Reference books

See clause 2.10 and as supported and decided by the concerned faculties/HOD

2.20 Journals

As decided by the concerned faculties/HOD

2.21 Logbook - To be maintained during the training which is mandatory

3. EXAMINATIONS

3.1 Eligibility to appear for exams

See clause 1.8, 1.9

a) Attendance and condonation option

- Minimum of 80% attendance is required for appearing in the examination with the provision for one-time condonation up to 10% on medical grounds (condonable limit 70%). Condonation for shortage of attendance shall be vested with a committee constituted by the Principal/Head of Institution as the Chairman and five members (senior teachers) in the committee and remittance of required fee to the university.
- If a candidate who has not attained 80% attendance and the shortage is beyond the condonable limit, then he shall not be eligible to continue the course with the same batch of students. He may obtain special sanction from the institution and the university to appear for supplementary examination after 6 months.

b) Internal assessment marks (see clause 1.14)

- The internal assessment marks shall be restricted to a maximum of 25% of the university examinations. The internal assessment marks shall be on the basis of the assessment made by the teachers from the candidate's performance in the: two sessional examinations (evenly placed) conducted by the department and from the marks for the record books during the period study.
- The average of two sessional examinations shall be taken as the internal assessment marks for theory.
- The marks secured by the candidates in each paper/subject shall be forwarded to the university as the internal assessment marks for university examinations.
- The minimum requirement of internal assessment marks for appearing in the university examination shall be **50%**. If a candidate fails to secure minimum internal assessment marks, he should appear for next university examination (supplementary or regular) after securing the minimum internal assessment. A regular record of theory and practical sessional marks shall be maintained for each student in the institution. A separate internal assessment examination shall be conducted for theory and practical for the failed candidates who appear for the supplementary university examination.
- There shall be university examination at the end of each academic year. In case of failed/not appeared candidates, a supplementary examination will be conducted within six months of the previous university examination.
- Candidates who fail in one or more papers in an examination need to appear for only those papers for securing complete pass in the supplementary examination. Those who fail either in theory or practical of a subject shall have to appear for both theory and practical in that subject.
- There will be no university examination for English & Information Technology however 50% marks in internal assessment is compulsory for a pass.
- There will be no university practical and viva examination for any of the first-year subjects. There will be no practical internal assessment, but practical classes should be conducted for these papers as per the hour distribution table.

c) Practical record book

- A certified practical record book is compulsory for each subject and that will be evaluated at the time of concerned practical examination. A maximum of 5 marks shall be given for the record book.

3.2 Schedule of Regular/Supplementary exams

There will be one regular and one supplementary examination. Supplementary examination shall be conducted within 6 months of regular examination. A minimum of 50% marks in each subject separately for theory and practical is required to pass.

3.3 Scheme of examination:

a) Scheme of examination showing maximum marks and minimum marks

(Max- Maximum and Min- Minimum for a pass, NA- not applicable)

FIRST YEAR - B.Sc. Anaesthesia Technology										
Paper & subjects	Theory						Practical		Grand Total	
	University		Internal		Total		Max	Min	Max	Min
	Max	Min	Max	Min	Max	Min				
Paper I Anatomy	100	50	20	10	120	60	-	-	120	60
Paper II Physiology	100	50	20	10	120	60	-	-	120	60
Paper III Biochemistry	100	50	20	10	120	60	-	-	120	60
Paper IV Pathology	100	50	20	10	120	60	-	-	120	60
Paper V English	-	-	50	25	50	25	-	-	50	25
Paper VI Information Technology	-	-	50	25	50	25	-	-	50	25
TOTAL	400	200	180	90	580	290	-	-	580	290

SECOND YEAR- B.Sc. Anaesthesia Technology										
Paper & subjects	Theory						Practical		Grand Total	
	University		Internal		Total		Max	Min	Max	Min
	Max	Min	Max	Min	Max	Min				
Paper VII Medicine relevant to Anaesthesia Technology	100	50	20	10	120	60	120	60	600	300
Paper VIII Microbiology	100	50	20	10	120	60				
Paper IX Applied Pharmacology	100	50	20	10	120	60				
Paper X Introduction to Anaesthesia Technology	100	50	20	10	120	60				
TOTAL	400	200	80	40	480	240	120	60		

THIRD YEAR- B.Sc. Anaesthesia Technology										
Paper & subjects	Theory						Practical		Grand Total	
	University		Internal		Total		Max	Min	Max	Min
	Max	Min	Max	Min	Max	Min				
Paper XI Anaesthesia Technology– Clinical	100	50	20	10	120	60	120	60	600	300
Paper XII Anaesthesia for Basic specialities	100	50	20	10	120	60				
Paper XIII Anaesthesia for Super specialities	100	50	20	10	120	60				
Paper XIV Trauma, resuscitation & critical care	100	50	20	10	120	60				
TOTAL	400	200	80	40	480	240	120	60		

FOURTH YEAR- B.Sc. Anaesthesia Technology		
Paper & subjects	Marks	
	Max	Min
Rotatory posting (Internal assessment)	20	10
University Practical Examination	100	50
Project work	30	15
Total	150	75

3.4 Papers in each year:

See clause 2.6 and clause 3.3

3.5 Details of theory examinations

All the question paper should be of standard type. Each theory paper will be of 3 hours duration. The question paper pattern would be similar for all the subjects in every year

Question paper pattern

Type of Questions	No. of Questions	Marks	Sub-total
Essays	2	10	20
Short notes	10	5	50
Answer briefly	10	3	30
Total			100

3.6 Model question paper for each subject with question paper pattern

QP CODE: 101011

Reg. No.....

First Year B.Sc. Anaesthesia Technology Examination, June 20---

PAPER I - ANATOMY

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay (2x10=20)

1. Describe the blood supply to brain
2. Anatomy of larynx

Short notes (10x5=50)

1. Coronary circulation
2. Brachial plexus
3. Anatomy of largest gland in human body
4. Draw a labelled diagram of nephron
5. Draw and label the gastrointestinal
6. Coverings of spinal cord
7. Pituitary gland
8. Diaphragm
9. Draw and label parts of a cell
10. Conduction system of heart.

Answer Briefly (10x3=30)

1. Pancreas
2. Neuron
3. Mitral valve
4. Knee joint
5. Pituitary gland
6. Hepatocyte
7. Parathyroid gland
8. Superior venacava

9. Alveolus
 10. Production and circulation of CSF
-

QP CODE: 101012

Reg. No.....

First Year B.Sc. Anaesthesia Technology Examination, June 20---

PAPER II - PHYSIOLOGY

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay **(2x10=20)**

1. Cardiac cycle
2. Composition and functions of blood

Short notes **(10x5=50)**

1. Reflex arc
2. Describe the conduction system of heart
3. Visual pathway
4. Briefly outline normal ECG wave form
5. Circulation and functions of CSF
6. Gas exchange during respiration
7. Describe the formation of urine
8. Mention the different types of muscles
9. What is feedback mechanism in case of hormone secretion?
10. Classification and functions of WBCs.

Answer Briefly **(10x3=30)**

1. Jaundice
 2. Acetylcholine
 3. Adrenaline
 4. Insulin
 5. Define tidal volume
 6. Action potential
 7. Functional Residual capacity
 8. Functions of skin
 9. Salivary amylase
 10. Protein synthesis within the cell
-

First Year B.Sc. Anaesthesia Technology Examination, June 20----

PAPER III - BIOCHEMISTRY

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay **(2x10=20)**

1. What in the normal pH of blood explain the role of blood buffers and lungs in acid base balance?
2. Fluid mosaic model of cell membrane and its transport mechanisms

Short notes **(10x5=50)**

1. Urine analysis.
2. Plasma proteins.
3. Principles of photoelectric colorimeter.
4. Classification of amino acids
5. Causes of metabolic acidosis.
6. Structure of insulin.
7. Donnan membrane equilibrium
8. Various anticoagulants used in haematology
9. Principle of centrifuge
10. Write short note on digestion and absorption of lipids.

Answer Briefly **(10x3=30)**

1. Plasma proteins
 2. Serum bilirubin
 3. Define basal metabolic rate
 4. Use of incubators
 5. Types of solution
 6. Define ketonuria.
 7. Gluconeogenesis.
 8. Glucose tolerance test
 9. Rancidity
 10. Basic structure of amino acids.
-

First Year B.Sc. Anaesthesia Technology Examination, June 20---

PAPER IV - PATHOLOGY

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay

(2x10=20)

1. What are the different types of blood groups in humans? Briefly describe how the blood group identification is done.
2. Describe how biomedical wastes are classified and managed after segregation.

Short notes

(10x5=50)

1. Heparin and its uses.
2. H and E stain
3. Normal constituents of urine.
4. Definition, classification and aetiology of anaemia.
5. Structure and functions of WBC.
6. Mention briefly about the safety guidelines followed in laboratory.
7. What is haemostasis? How is it achieved normally?
8. Fibrinolytic system
9. Describe the method for the collection and examination of sputum for AFB.
10. Clotting pathway.
11. What is normal ESR? What are the various diseases causing a raised ESR?

Answer Briefly

(10x3=30)

1. Describe the procedure of collecting a blood sample
2. Adverse effects of blood transfusion.
3. Osmotic fragility test
4. Sickling test
5. Examination of CSF. How do you document a normal CSF report?
6. What is cross matching? Mention the importance of cross matching.
7. Peripheral blood smear examination and reporting of a normal smear.
8. Functions of platelets
9. Fibrinolytic system
10. What are the various components of blood used for transfusion? Mention some of its indications

Second Year B.Sc. Anaesthesia Technology Examination, June 20----

PAPER VII - MEDICINE RELEVANT TO ANAESTHESIA TECHNOLOGY

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay

(2x10=20)

1. Draw circle of Willis. What is normal ICP? What are the factors affecting ICP?
2. What is Diabetic Ketoacidosis? Briefly describe about the management of DKA.

Short notes

(10x5=50)

1. Pulmonary embolism
2. Management of acute epiglottitis
3. Myasthenia gravis
4. Clinical features of Down Syndrome
5. DIC
6. Acute hepatitis
7. Mention the components of COPD. What are the clinical features?
8. Write a brief note on sepsis and its management.
9. What are the types of Traumatic Brain Injury?
10. Briefly classify antibiotics with examples.

Answer Briefly

(10x3=30)

1. GERD
 2. Malignant hyperthermia
 3. Clinical features of hyperthyroidism.
 4. POVD
 5. What are the clinical features of acute pancreatitis?
 6. Hormones secreted by adrenal gland.
 7. Diagnosis of Rheumatoid Arthritis.
 8. Briefly describe about the types of Valvular Heart Disease
 9. Nephrotic syndrome
 10. Clinical assessment of renal function
-

Second Year B.Sc. Anaesthesia Technology Examination, June 20----

PAPER VIII - MICROBIOLOGY

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay **(2x10=20)**

1. Describe in detail about the classification and management of biomedical waste.
2. With a neatly labelled diagram, describe in detail about the mechanism of action of a hot air oven.

Short notes **(10x5=50)**

1. Define sterilisation
2. Procedure for collection of urine for culture from a non-catheterised patient
3. Pasteurisation.
4. Mycobacterium Tuberculosis
5. ASO test.
6. Primary atypical pneumonia
7. Staphylococcus
8. Universal precautions
9. Post exposure prophylaxis
10. Disinfection in OT

Answer Briefly **(10x3=30)**

1. ELISA test
 2. Opportunistic infections
 3. Clinical features of meningitis
 4. Weil Felix test
 5. General properties of viruses.
 6. Candidiasis
 7. Widal test
 8. Parts of a compound microscope
 9. Leptospirosis
 10. MRSA
-

Second Year B.Sc. Anaesthesia Technology Examination, June 20----**PAPER IX - PHARMACOLOGY**

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay**(2x10=20)**

1. Routes of drug administration.
2. How are local anaesthetics classified? Briefly describe the mechanism of action of LA.

Short notes**(10x5=50)**

1. List of drugs acting on ANS.
2. Advantages of adding adrenaline to lignocaine
3. Use of MgSO₄
4. Metoprolol
5. Compare the analgesic potencies of different opioids.
6. Draw a neatly labelled diagram of nephron showing the different sites of action of diuretics.
7. Routes of drug administration
8. Classification and mechanism of action of penicillin.
9. Mechanism of neuro muscular blockers.
10. Clopidogrel.
11. Analgesic ladder for acute pain management.

Answer Briefly**(10x3=30)**

1. Tranexamic acid.
 2. List commonly used inotropes and vasopressors and their doses.
 3. Classification of opioid analgesics
 4. Pharmacotherapy for bronchial asthma.
 5. Midazolam
 6. Test dosing of drugs
 7. Neostigmine
 8. Uses of atropine
 9. Uses of corticosteroids
 10. Classify general anaesthetics
-

Second Year B. Sc Anaesthesia Technology Examination, June 20-----

PAPER X - INTRODUCTION TO ANAESTHESIA TECHNOLOGY

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay **(2x10=20)**

1. Safety features in anaesthesia workstation.
2. What are the various types of supraglottic airways available today? What are their advantages over endotracheal tubes?

Short notes **(10x5=50)**

1. PIN index system
2. Types of laryngoscope blades
3. BIS monitor
4. Flow meter
5. AMBU bag
6. Guedel airway
7. W.T.G Morton
8. Tracheostomy tube
9. Capnography
10. Neostigmine- Mechanism of action

Answer Briefly **(10x3=30)**

1. Oxygen concentrator
 2. Bain circuit
 3. Intraoperative monitors
 4. Total intravenous anaesthesia
 5. Ten golden rules of anaesthesia
 6. Videolaryngoscope - Advantages and disadvantages over normal laryngoscopes
 7. Sterilization of anaesthetic equipment
 8. Oral and nasal airways
 9. Importance of intraoperative temperature monitoring.
 10. Oxygen delivery devices
-

QP CODE: 103011

Reg. No:

Third Year B.Sc. Anaesthesia Technology Examination, June 20-----

PAPER XI – ANAESTHESIA TECHNOLOGY– CLINICAL

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay (2x10=20)

1. Describe various steps involved in checking anaesthesia workstation prior to surgery.
2. Describe the procedure for elective intubation in a normal patient. Mention the complications that may occur during the procedure and its management.

Short notes (10x5=50)

1. Technique of venepuncture.
2. Throat pack
3. Routine investigations in anaesthesia
4. Blood and blood products
5. Anticholinergics
6. Sedatives in anaesthesia
7. Post-operative nausea and vomiting
8. Problems during extubation
9. Causes of intraoperative tachycardia
10. Atropine

Answer Briefly (10x3=30)

1. Perioperative fasting
 2. Inhalational vs Intravenous induction
 3. Methods to confirm endotracheal tube position
 4. Preparation of anaesthesia workstation before elective surgery
 5. Antibiotic prophylaxis
 6. Choice of endotracheal tube in anaesthesia
 7. Common ECG changes in ischemia
 8. ASA risk stratification in anaesthesia
 9. Informed consent
 10. Premedication in anaesthesia
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QP CODE: 103012

Reg. No:

Third Year B.Sc. Anaesthesia Technology Examination, June 20-----

PAPER XII - ANAESTHESIA FOR BASIC SPECIALITIES

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay

(2x10=20)

1. What is supine hypotension syndrome? Describe the advantages and disadvantages of general anaesthesia and regional anaesthesia in caesarean section.
2. 65-year-old man with chronic intestinal obstruction comes for emergency laparotomy. Blood pressure is 80/60. Heart rate is 120/min. He looks dehydrated. How do you get the theatre ready for the case?

Short notes

(10x5=50)

1. Cis-atracurium
2. Minimum Alveolar Concentration
3. Propofol
4. Epidural anaesthesia
5. Monitoring during anaesthesia
6. Types of peripheral nerve blocks and its uses
7. Dopamine.
8. Airway trauma
9. Morphine
10. Local anaesthesia

Answer Briefly

(10x3=30)

1. Complications and accidents during anaesthesia
 2. Causes and management of intra op bradycardia
 3. Preparing OT for emergency surgeries
 4. Reversal in anaesthesia
 5. Procedure for neuromuscular monitoring
 6. Anaesthetic concerns in ophthalmological surgeries
 7. Post-operative complications and its management
 8. Anaesthesia equipment malfunction
 9. Anaesthesia concerns in laparoscopic surgeries
 10. Management of intraoperative hypotension
-

Third Year B.Sc. Anaesthesia Technology Examinations, June 20-----**PAPER XIII - ANAESTHESIA FOR SUPER SPECIALITIES**

Time: 3 Hours

Total Marks: 100

Answer all Questions.

Draw Diagrams wherever necessary.

Essay**(2x10=20)**

1. Mention the common positions during surgical procedures. Describe the concerns and effect of prone position.
2. What are the various methods of labour analgesia? Describe continuous lumbar epidural for labour analgesia

Short notes**(10x5=50)**

1. Mention the methods to lower intracranial pressure. How will you assist the anaesthesiologist for an emergency craniotomy?
2. APGAR scoring system.
3. Enlist the various complications during TURP surgery. Describe TURP syndrome.
4. Describe in detail about the fluid management and anaesthesia for burns patient.
5. What are the concerns in providing anaesthesia outside the operating room. How will you assist anaesthesiologist for giving anaesthesia in a 2-year-old child for taking MRI scan?
6. How will you get the theatre ready for anaesthesia in a 1-year-old boy for herniotomy surgery? Describe caudal anaesthesia.
7. What are the indications for providing one lung ventilation? Describe double lumen tube.
8. Venous air embolism
9. Double lumen tubes
10. Spinal anaesthesia in paediatrics.

Answer Briefly**(10x3=30)**

1. Respiratory changes in burns patient
2. Kidney rest position
3. Why is oropharyngeal packing done during oral surgery? What are the advantages and disadvantages?
4. Temperature monitoring and methods to prevent hypothermia in paediatric patient
5. Monitoring during cardiopulmonary bypass
6. Anaesthetic considerations in renal transplantation
7. Anaesthesia for electroconvulsive therapy (ECT)
8. Anaesthesia for Extracorporeal Shock Wave Lithotripsy (ESWL)
9. Lithotomy position
10. 'Rule of nine' in burns

Third Year B.Sc. Anaesthesia Technology Examination, June 20-----

PAPER XIV - TRAUMA, RESUSCITATION & CRITICAL CARE

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay

(2x10=20)

1. Complications of mechanical ventilation
2. Describe the procedure of chest compression in adult CPR. What are the possible complications associated with it?

Short notes

(10x5=50)

1. Name the 'H's and T's as causes of cardiac arrest.
2. 'Triple manoeuvre' (Head tilt, chin lift, jaw thrust) in an unconscious patient
3. Bag mask ventilation
4. What are the ECG rhythms seen in cardiac arrest? Describe briefly.
5. Initial fluid resuscitation in trauma. What is the choice of fluid? How does one rapidly infuse fluid?
6. Describe 'in line immobilisation'.
7. What are the indications for ventilating a trauma patient?
8. Describe triaging in trauma.
9. Nasopharyngeal airway introduction.
10. Procedure of Endotracheal suction.

Answer Briefly

(10x3=30)

1. ARDS
2. Sedation in ICU
3. Indications of blood transfusion.
4. Pulmonary embolism
5. GCS scoring
6. Blunt trauma abdomen.
7. Status epilepticus.
8. Pneumothorax
9. Central venous cannulation
10. Tracheostomy

3.7 Internal assessment component

The internal assessment marks shall be on the basis of the assessment made by the teachers from the candidate's performance in the: two sessional examinations (evenly placed) conducted.

The maximum marks of internal assessment in each paper will be 20. Those who obtain 50% of aggregate in each subject only, will be eligible for appearing the university examinations. The class average shouldn't exceed 75%. The internal assessment marks should be intimated to the University along with the attendance and application.

3.8 Details of practical/clinical exams

See clause 3.3

3.9 Number of examiners needed (Internal & External) and their qualifications

See clause 2.16 and 1.4

One set of examiners will be sufficient (one external and one internal) to conduct the practical and viva examination in all the subjects.

There shall be two examiners for practical and viva –one internal and one external. The external examiner shall be drawn from other institutions where a similar course is being conducted. Both internal and external examiners should have MD in the concerned subject and those who are full time consultants of Anaesthesia with at least two years of full-time teaching experience in anaesthesia technology after the acquisition of MD in the concerned subject. The theory papers should also be evaluated by teachers with the above qualifications.

3.10 Details of viva: division of marks

See clause 3.3

4. INTERNSHIP

Compulsory Rotatory Internship for one year

5. ANNEXURES

5.1 Check lists of monitoring: Seminar, assessment etc.to be formulated by the curriculum committee of the concerned institution

5.2 Institutional requirements: See MSR

ABBREVIATIONS

A		ETO	: Ethylene Oxide
ABG	: Arterial Blood Gas	ETT	: Endotracheal Tube
ACE	: Angiotensin-Converting Enzyme	G	
ACLS	: Advanced Cardiac Life Support	GCS	: Glasgow Coma Scale
ACT	: Activated Clotting Time	H	
AR	: Aortic Regurgitation	HIV	: Human Immune deficiency Virus
ARB	: Angiotensin II Receptor Blocker	HOD	: Head of Department
ARDS	: Adult Respiratory Distress Syndrome	I	
AS	: Aortic Stenosis	ICU	: Intensive Care Unit
ASO	: Anti-Streptolysin O	IHD	: Ischemic Heart Disease
B		MCH	: Mean Corpuscular Haemoglobin
BP	: Blood Pressure	MCHC	: Mean Corpuscular Haemoglobin Concentration
BSL	: Basic Life Support	MCQ	: Multiple Choice Questions
BT	: Bleeding Time	MCV	: Mean Corpuscular Volume
C		MI	: Myocardial Infarction
CDH	: Congenital Diaphragmatic Hernia	MR	: Mitral Regurgitation
COPD	: Chronic Obstructive Pulmonary Disease	MRI	: Magnetic Resonance Imaging
CPCR	: Cardiopulmonary-Cerebral Resuscitation	MS	: Mitral Stenosis
CSF	: Cerebro Spinal Fluid	MVP	: Mitral Valve Prolapse
CT	: Clotting Time	NIBP	: Non -Invasive Blood Pressure
		NPO	: Nil Per Oral
		OBG	: Obstetrics & Gynaecology
		PCV	: Packed Cell Volume
		PR	: Pulmonary Regurgitation
		RBC	: Red Blood Cell
		RF	: Rheumatoid Factor
		:	
E		SAH	: Sub Arachnoid Haemorrhage
ECG	: Electrocardiogram		
EEG	: Electro Encephalo Gram	SIADH	: Syndrome of Inappropriate Anti-Diuretic Hormone
:		:	
EDH	: Extra Dural Hematoma	SDH	: Sub Dural Hematoma
ELISA	: Enzyme Linked Immuno Sorbent Assay	TOF	: Tetralogy of Fallot
ENT	: Ear Nose & Throat	TR	: Tricuspid Regurgitation
ERCP	: Endoscopic Retrograde Cholangio Pancreatography	VDRL	: Venereal Disease Research Laboratory
		WBC	: White Blood Cell