

SYLLABUS FOR BSC. MEDICAL TECHNOLOGY (ANESTHESIA & OPERATION THEATRE TECHNIQUES)



Atal Medical & Research University

A state University established by the Govt of H.P

SYLLABUS FOR B.Sc. MEDICAL TECHNOLOGY IN ANAESTHESIA AND OT TECHNIQUES

By rotation the trainee will be posed in the department of anaesthesia in OTs of various specialties, pre-operative and post-operative rooms for practical exposure and hands on training under supervision of the Anaesthesiologists, nursing and technical personnel posted in respective places. Lectures & practical training will be held as per the following syllabus:

Syllabus for BSc-I Medical Technology (Anaesthesia and OT Techniques)

BSc 1st Year

Paper- I

Title: Basic Sciences

A. Applied Physics:

Energy: Potential energy and Kinetic energy. Mechanical efficiency energy and Mass. Gases Densities: Molecular weight. Grams Molecular weight, Avogadro number, Molecular agitation, Density, waller's chloroform Balance and importance to the anaesthesia,

Heat: Thermometry, thermistor, thermocouple. Heat capacity of gases, Newton law of cooling, convection, conduction. Thermal conductivity and specific heat capacity.

Pressure: Dalton's law of partial Pressure. Pressure Gauges. Vapour pressure, gases law, Charles law, Gay-Lussac's law. Filling of compressed gases and filling ratio. Principle of pressure regulators, ambient pressure, type of pressure regulators, flow of fluids: viscosity, law of laminar flow rate, turbulent flow rate. Turbulent flow, critical Reynold's number. Resistance for laminar and turbulent flow. Pressure loss due to abrupt change in bore of tube Principle of flow meters and its types. Bernoulli's Principle and clinical applications of Bernoulli's theorem.

Diffusion and Osmosis: Laws of diffusion, isotonic, hypotonic and hypertonic solutions.

Oxidation, combustion, flames, deflagrations, detonations, and explosions, prevention of explosions.

B. Applied chemistry

Organic chemistry: Nomenclature of compounds containing Halogen, Alcohols and Phenols, Ethane, Propane, Ether, Aldehydes, Ketones, Carboxylic acid, cyanides, Isocyanides, Nitrogen compound and amines Isomerism nature radiation from radioactive substances, catalysis, Homogeneous and Heterogeneous amino-acid, peptides, proteins and enzymes, carbohydrates and their metabolism vitamins and Hormones.

C. Anatomy and Physiology of Human Body:

General Anatomical terms, regions of the body, cell structure and physiology

Gross

Anatomy and functions of: – Skeleton system, Respiratory system, Circulatory system, Nervous

system, Urinary system. Alimentary system, Reproductive system, Lymphatic system, Special sensory organs. Ductless glands, Reticulo-endothelial system, Spleen, Liver, Bone marrow etc.

D. Nursing Procedures and Techniques.

- a) Pre-operative preparation of patient
- b) Management of patients in post-operative room
- c) Transportation Techniques of patient in conscious, semiconscious and unconscious state, to and from operation theatre.
- d) Basic Life Support and related equipments
- e) Common resuscitation drugs.

Syllabus for BSc-I Medical Technology (Anaesthesia and OT Techniques)

BSc 1st Year

Paper- II

Title: Operation Theatre Equipment and Techniques

A. Essential Operation Theatre equipment:

Operating Tables and their attachments

Checking, disinfection and maintenance of OT tables

General features of OT Lights

Ceiling OT lights and their Attachments

Pedestal OT Lights and maintenance of OT Lights

Electrical Diathermy Machines, their use, hazards and care

Components and working of Central Vacuum Suction Trolleys and various types of Vacuum suction Machines

Care and maintenance of various types of suction machines.

Design and components of Crash carts and their uses

B. Operation theatre Techniques: Ethics and Discipline

Moral aspects and duties of medical Technologist.

Co-ordination with all working personal in operation theatre.

Psychological aspects of patient staff and relatives of the patient.

Drug addiction and substance abuse among health professionals.

C. Management Techniques of special Equipment :

Handling, cleaning and carbonization of operation tables, operation theatre lights suction machines, diathermy and other O.T. equipments.

Maintenance of special surgical equipment their care and preservation.

Techniques of handling of laser based equipment their care preservation and maintenance.

Bio-medical waste segregation, collection and disposal from OTs and ICU

D. Components and common uses of computers:

Hardware Components of a computer and networking

Portable memory devices

Common uses of computers and mobile devices in anaesthesia and hospitals

Syllabus for BSc-I Medical Technology (Anaesthesia and OT Techniques)

BSc 1st Year

Paper- III

Title: Basic Anaesthesia Drugs and Techniques

A. Anaesthesia Drugs And Techniques

intra-venous Anaesthetic agents

Inhalational anaesthetic agents.

Neuromuscular blockers

Opioid and Non Opioid analgesic agents

Drugs for reversal of neuromuscular block and other drugs.

Local anaesthetic agents.

Basics of general Anaesthesia depth. Mechanism & intubation.

Patient positioning for Regional analgesia, spinal and epidural

Techniques of general Anaesthesia.

B. Anaesthesia Equipment

Introduction to anaesthetic machines, their handling disinfection

Various types of single lumen Endotracheal tubes Endotracheal tube connectors

Cleaning and sterilization of endotracheal tubes.

Connection; a) selection of the material of the Endotracheal connections.

Various types of anaesthetic Face Masks; Material, structure and importance of dead space of face mask.

Oropharyngeal and naso pharyngeal airways

Magill's forceps, stylets, catheter mounts and other aids for tracheal intubation

Laryngeal sprays; Types structure and material used, mechanism uses and its maintenance.

Laryngeal sprays; Types, material, principle and mechanism.

Spinal and epidural blocks; equipment, types of spinal and epidural needles their structure.

Instruments used for spinal and epidural blocks.

Monitoring techniques and equipment; SpO₂, NIBP, Monitoring of ECG and Respiration, Temperature monitoring of patient.

Syllabus for BSc-I Medical Technology (Anaesthesia and OT Techniques)

BSc 1st Year

Paper- IV

Title: General Surgical Procedures and Para-surgical Equipment

A. General Surgical Procedures

Handling of sterilized articles in the operation theatre.

Introduction to the techniques of sterilization of surgical instruments and special equipment used in the operation theatre.

Management of surgical equipment and techniques.

Scrubbing techniques.

Injection techniques: Intramuscular and Intravenous and insertion of I.V. cannulas, handling of sterilized syringes and needles.

Types of suturing materials, techniques of stitching and removal of stitches.

Common surgical instruments, their uses, cleaning, disinfection and storage.

Importance of positioning of patient for different operations.

Preparation for Anaesthesia for surgical operations in General Surgery.

Preparation for Anaesthesia for surgical operations in Orthopedics.

Preparation for Anaesthesia for surgical operations in Obstetrics & Gynaecology.

Preparation for Anaesthesia for surgical operations in Eye and ENT.

Preparation for Anaesthesia for surgical operations in Emergency OT.

Preparation for Anaesthesia for emergency and elective cesarean section.

B. Para- Surgical Equipment

Operation tables;

Their types, structure and materials used in fabrication

Attachments of OT Tables for various operations

Care, uses, disinfection and maintenance of OT tables

Principles of Mechanical, Electromechanical and Hydraulic

Diathermy/ Cautery Machines;

Different types of diathermy and cautery machines: monopolar, bi-polar and underwater working.

Structural features of diathermy and cautery machines.

Types of active and passive electrodes.

Care, maintenance and uses.

Prevention of hazards.

Operation Lights:

Types of Operation lights and other light sources.

Structural features care cleaning, carbolisation, maintenance and uses.

Dry Heat Sterilization; Flaming, heating, hot air ovens and autoclaves

Uses, advantages and disadvantages of dry heat disinfection

Wet Heat Sterilization: Boiling, steaming, Steam autoclaving

Designs of instrument boilers and steam autoclaves

Uses, advantages and disadvantages of wet heat sterilization

Pasteurization

Chemical disinfection: Alcohols, Phenols, Aldehydes, Quaternary Ammonium compounds and peroxides

Syllabus for BSc-II Medical Technology (Anaesthesia and OT Techniques)

Bsc 2nd Year

Paper-III

Title: Anaesthesia Equipment and Resuscitation

A. Anaesthesia Equipment

Anaesthesia machine: Types, components and part of anaesthesia machine, physical principals and functions of various parts, safety mechanisms.

Disinfection and maintenance of anaesthesia machines

Method of vaporizing volatile anesthetic agents; volatile anaesthetic agents. Chemical and physical properties of volatile chemical agents. Selection of material to be used for containers of the volatile anaesthetic agents.

Structure of different types of vaporizers. Principle of various vaporizers, their maintenance and safety precautions.

Types and functioning of Anaesthesia ventilators. Checking and maintenance of anesthesia ventilators

Methods of delivering the gases to the patient.

Introduction of anaesthesia breathing circuits.

Supply of compressed gasses; Types of gases and their chemical and physical properties.

Types of containers, their checking and maintenance.

Types of compressors and Vacuum Pumps.

Liquid oxygen storage and supply system.

Structure and mechanism of various types of pressure gauges and Pressure regulators and pressure reducing valves. Their maintenance and checking.

Safety mechanisms in gas pipeline system.

Method of releasing and monitoring the gases; selection of supply pipes.

B. Principles of cardio-pulmonary resuscitation.

Basic and Advanced Cardiac life support in adults and pediatric patients

Resuscitation in operation theatre recovery room and intensive.

Physical principles and types of defibrillator and pace makers, their use and care

Manual resuscitators for adults and pediatric patients

Role of technician in resuscitation

C. Fundamentals of Electronics and Data Processing:

Electronic and Electromechanical Techniques in anaesthesia and Surgery

Recording system for physiological signals.

- i. Signal receiving methods.
- ii. Types of electrodes.
- iii. Types of apparatus.

Pressure transducers, Types, mechanism and structure.

Measurement of gas flow by means of electronic methods.

Electromagnetic blood flow meters.

Gas and vapour analysis.

Electrical safety precautions in the operating room.

Syllabus for BSc-II Medical Technology (Anaesthesia and OT Techniques)

Bsc 2nd Year

Paper-IV

Title: Clinical and Operative Surgery

Patient identification, marking, shifting to OT before surgery and out of OT to recovery room after surgery complete takeover and handover of the patient with vital signs recordings before and after surgical procedure to the nursing staff.

Basic precautions and principles of positioning the patient for surgery and anaesthesia.

Common surgical positions: Supine position, Lithotomy position, Lateral Position, Prone position and Trendelenberg position

Indications, advantages and disadvantages of above positions

Common surgical operations, instruments, their uses, cleaning, disinfection and storage

Importance of positioning of the patients for different surgical operations.

Names of common surgical operations in General Surgery and names of surgical instruments for operations on Hemorrhoids, Hernia, Appendix, Gall bladder, Common bile duct, Incision and drainage, exploratory laprotomy, thyroid surgery etc

Names of common surgical operations in Orthopedics and names of surgical instruments for open reduction of fractures, nailing, plating, bone grafting and arthroscopy

Names of common surgical operations in Obstetrics & Gynaecology and names of surgical instruments for dilatation & curettage (D&C), Suction evacuation, laproscopic sterilization, cesarean section, vaginal hysterectomy, total abdominal hysterectomy

Names of common surgical operations in Ophthalmology and names of surgical instruments and machines for cataract surgery, squint surgery, perforating eye injury etc

Syllabus for BSc-II Medical Technology (Anaesthesia and OT Techniques)

BSc 2nd Year

Paper-I

Title: Applied Basic Sciences

A. Microbiology;

Introduction and brief history of microbiology,

General characteristics and classification of bacteria, fungi and viruses.

Growth and nutrition of microbes.

Uses and mode of action of antiseptics and disinfectants.

Bacteriological fungal examination of air and water, testing of air and water, testing of antiseptic, antibiotics etc.

Sterilization tests (Detailed study of the subject).

Sample collection and preservation.

B. Biochemistry;

Carbohydrate metabolism, disturbances of carbohydrates metabolism glucose tolerance test, diabetic ketosis. Insulin tolerance, abnormal sugar in urine.

Protein metabolism, disturbances of protein and nitrogen metabolism, plasma,

Fat metabolism disorders of fat metabolism.

Liver function tests, plasma bilirubin, bilirubin metabolism, high plasma cholesterol disorder of the liver and biliary tract.

Calcium, phosphorous, Sodium and Potassium in the body their significance and general precautions.

Disturbances of water and sodium metabolism, acid-base equilibrium.

Effects of anaesthesia and surgery on the body biochemistry.

C. Pathology;

Care and preservation of surgical specimens for histopathology examination

Preservatives and their advantages and disadvantages

Preservation of paraffin blocks of tissue.

Cryostat and preservation of Biopsy samples for frozen section.

Museum techniques technique for preservation of tissue

D. Pharmacology:

Pharmacology of Adrenalin, nor adrenalin, mephentermine, ephedrine, dopamine, phenyl ephedrine and vasopressin

Pharmacology of atropine, glycopyrrolate

Pharmacology of drugs used for nebulization of asthma patients

Pharmacology of hypotensive drugs like sodium nitroprusside, nitroglycerin, esmolol and metoprolol

Pharmacology of drugs used with local anaesthetics eg clonidine, demedetomedine, fentanyl and dexamethasone

E. Biophysics (cardiac);

Heart as a pump and cardiac cycle.

Cardiac contractility and stroke volume, cardiac output and its measurements

Rhythmic excitation of heart and various methods of recording E.C.G.

Statistical Methods and forecasting techniques

Indenting, book keeping and storage procedures of different articles.

Syllabus for BSc-II Medical Technology (Anaesthesia and OT Techniques)

BSc 2nd Year

Paper-II

Title: Haematology and Blood Transfusion

A. Hematology:

Remanowsky stains and other stains used in hematology.

Hematocrit (macro and micro)

Absolute values of various blood cells; their formation, function and fate.

Haemo-globionometry; general principle, methods and standardization.

Classification of the anaemias- cause and diagnostic investigations.

Anti-coagulation and antiplatelet drugs and their importance in anaesthesia and ICU

B. Blood Trasfusion Techniques and Types of I.V. Fluids and Electrolyte:

History of the discovery of blood groups.

Genetics and classification of blood groups.

Blood grouping and cross matching. Coomb's test, compatibility test.

Different types of blood components and blood products.

Storage, handling of blood products and their use in OTs and ICUs.

Warming and checking of blood components before transfusion and preparation for transfusion

Blood substitutes.

Transfusion reactions, their detection and treatment.

Regulation of Acid base Balance and maintenance of milleu interior.

Fluid and electrolyte balance

Different types of I.V. fluids, their chemical composition

Specific I.V. fluids and their use

C. Principles of disinfection and Sterilization:

Different levels of disinfection:Steps of cleaning and disinfection of anaesthesia and surgical equipment and materials

Types of sterilization

Names of common surgical operations in ENT and names of surgical instruments for correction of DNS, FESS, mastoid surgery, tympanoplasty, direct laryngoscopy, tonsillectomy, tracheostomy and microlaryngeal surgery

Names of common surgical operations in Emergency OT and names of surgical instruments for such operations.

Different types of surgical sutures

Uses of surgical sutures in various operations

Advantages and disadvantages of various suture materials

Cleaning disinfection and storage of General Surgical equipment and surgical materials



Syllabus for BSc-III Medical Technology (Anaesthesia and OT Techniques)

BSc 3rd Year

Paper-I

Title: Clinical Anaesthesia

A. Clinical Anaesthesia

Mechanisms of action of anaesthetic agents and theories of anaesthesia

Stages of anaesthesia and monitoring of depth of anaesthesia

Control of breathing during general anaesthesia

Classification and types of anaesthesia circuits:

- Open semi closed and closed breathing circuits
- Mappleson system of breathing circuits: A, B, C, D, E, F etc
- Functional analysis, uses and care of Mappleson breathing circuits
- Circle absorber breathing system
- To and fro breathing system system
- Rebreathing valves like APL valves and Heidbrink valve, their uses, advantages and disadvantages
- Various Non-rebreathing valves, their uses, advantages and disadvantages
- T-pieces for oxygen therapy

Tracheal intubation and difficult tracheal intubation cart

Regional anaesthesia

Positioning for spinal, epidural and caudal anaesthesia

Equipment and drugs for regional anaesthesia

Cervical plexus, Brachial Plexus and lumbar plexus and lumbar sympathetic blocks

Role of anaesthesia technician in regional anaesthesia

Principles and uses of nerve stimulator in nerve blocks, its advantages and disadvantages

Principles of Ultrasound and its use in regional anaesthesia and nerve blocks, its advantages and disadvantages.

Physical principles of EtCO₂, Temperature and neuromuscular monitoring

Equipment and preparation for monitoring of various clinical parameters

Advantages and disadvantages of patient monitoring

B. Pain Management:

Methods, drugs and equipments for post-operative pain management

Techniques, drugs and equipment for chronic pain management

Radiofrequency machines for nerve ablation

C. Environment Control in Operation theatres

Control of pollution in operation theatre

Air-conditioning and air flow in OT.

Syllabus for BSc-III Medical Technology (Anaesthesia and OT Techniques)

BSc 3rd Year

Paper-II

Title: Advanced Surgical Procedures and Care of OT Equipment

Introduction and general considerations for subspeciality Operation theatres and their equipment

Preparation Operation theatres for anaesthesia and surgery in various subspecialities

Names of common surgical operations and equipment used in Cardio thoracic surgery

Double lumen endotracheal tubes and related equipment

Physical Principles and importance of defibrillators and cardiac pacemakers

Names of common surgical operations and equipment used in Neurosurgery

Sitting position; its advantage and disadvantages

Names of common surgical operations and equipment used in Urology surgery

Lateral kidney surgery position; its advantages and disadvantages

Names of common surgical operations and equipment used in Plastic surgery

RAE and other Endotracheal tubes for cleft lip and palate surgery

Names of common surgical operations and equipment used in Pediatric surgery

Masks, Airways, tracheal tubes and microcuff ETTs and suction catheters for neonates and infants

Names of common surgical operations and equipment used in Transplant surgery

Preservation and transportation of human organs for transplantation

Uses, Care and disinfection of special surgical and anaesthesia equipment:

Optical Equipment: Video-laryngoscopes, fibroptic and rigid Bronchoscopes, Laproscopes and Endoscopes.

Operating Microscopies

Radio-Imaging Machines: Features and uses of portable x-ray machines and C-arm image intensifiers

Monitoring of irradiation and commonly used safety methods to prevent radiation

Cardiopulmonary Equipment: Types of perfusion machines (CPB Machine) and their major components

Intra Aortic Balloon pump.

ECMO- Extra corporal Membrane oxygenator.

Techniques of ETO and Plasma sterilization, their uses and hazards

Ionizing radiation: Its uses for disinfection and sterilization and hazards

Methods for checking of effectiveness of sterilization

Surgical diathermy apparatus its safe use and hazards.

Surgical staplers and stapler materials

Types of surgical staplers, their advantages and disadvantages

Syllabus for BSc-III Medical Technology (Anaesthesia and OT Techniques)

BSc 3rd Year

Paper-III

Title: Critical Care in ICU

A. Internal Medicine

Diseases of the cardio. Vascular system and conditions requiring critical care.

Diseases of the reparatory system and conditions requiring critical care.

Diseases of the nervous system and conditions requiring critical care.

Diseases of the gastro-intestinal tract and conditions requiring critical care.

Diseases of the genitourinary system and conditions requiring critical care.

Diseases of the endocrine glands and conditions requiring critical care.

B. Lung ventilators

Various types of lung ventilators and their working principles.

Volume cycles ventilators.

Time cycles ventilators.

Pressure cycles ventilators.

High frequency jet ventilators and high frequency positive pressure ventilators.

Methods of measuring the volumes of inspired and expired gases, airway pressures and diagnostic function in ventilators

C. Modes of ventilation:

Controlled, Assisted Control, PRVC, APRV, IRV, ASV, AMV, NAVA

PEEP, CPAP, PSV, Spontaneous

HFJV, HFPPV,

Setting up of a ventilator

Breathing circuits of lung ventilators

Cleaning, Disinfection, sterilization and maintenance of ventilators .

Types of respirometers, their working principles and clinical applications of respirometers

D. Monitoring in ICU:

Physical principle and preparation for Invasive blood pressure monitoring

Different type of arterial caunlae and common sites for arterial canulation

Physical principles and preparation for Central venous pressure monitoring

Different type of CVP lines and common sites for CVP canulation

Importance and methods of monitoring of vital signs of patients during transportation

Measurement of blood gases of the patient and its importance

Principles of ABG electrodes, operation of ABG machines and their care

Airway Management in ICU: Different types of endotracheal tubes used in ICU

Preparation of patient and equipment for tracheal intubation in ICU

Different types of trachestomy tubes and Percutaneous tracheostomy equipment

Preparation of a patient and equipment for bedside percutaneous tracheostomy
 Role and uses of Anaesthesia Machine in ICU
 Drug delivery methods used in ICU
 Physical principles, design and uses of syringe infusion pumps in ICU
 Essential features of ICU beds and different types of ICU Beds
 Central vacuum suction machine, monitoring devices.
 Appropriate use of vacuum suction in ICU patients and care of suction devices
 Air conditioning and control of pollution in I.C.U.
 Scientific basis of Oxygen therapy in critically sick patients
 Classification and types of oxygen therapy devices
 Description and uses of nasal canulae, nasal prongs, simple oxygen mask, ventury mask, rebreathing and non rebreathing oxygen mask, oxygen tents and hood
 Use of anaesthesia breathing circuits for oxygenation of patients
 High flow oxygen therapy devices
 Advantages and disadvantages of above oxygen therapy devices
 Haemofiltration and haemodialysis.
 Psychological aspects of patient, relatives and staff.
 Prevention and control of infection in ICU and management of asepsis.
 Disinfection and sterilization of ICU equipment and beds
 General care of critically sick patients
 Care of unconscious adult and pediatric patients.
 Enteral nutrition of patients in ICU its advantages and disadvantages
 Parenteral nutrition of patients in ICU its advantages and disadvantages
 Input – Output charting of patients in ICU and its importance
 Handling and Management of patients with organophosphate poisoning
 Handling and management of snake bite patients
 Handling and management of a patient with scrub typhus in ICU
 Handling and management of Neurosurgical patients in ICU

Syllabus for BSc-III Medical Technology (Anaesthesia and OT Techniques)

BSc 3rd Year

Paper-III

Title: Role of Techniques Outside the OT and Computer Science

A. Use of Anaesthesia Techniques outside the OT:

Transportation of a patient from OT to ICU for overnight monitoring and ventilation
 Transportation of patients from OT or ICU to CT scan/ MRI or Dialysis unit
 Anaesthesia set up for CT Scan and DSA
 Anaesthesia in MRI suite

Setting up an OT for a family planning camp in a primary health Centre in a remote area.

Preparation of an intubation and resuscitation kit in casualty

Setting up of an ambulance for a critically sick patient

B. Computer Science

Operating systems and applications for computers and mobile devices

Office suites for computers and mobile devices

Basics of MS word and its uses

MS Powerpoint and its uses

MS Excel and its uses

E-mail and e-governance

Introduction to Hospital Information Management Systems (HIMS), Electronic Health Record and National Digital Health Mission

Electronics in Anaesthesia and surgery

C. Book Keeping

Book Keeping and maintenance of stock inventories

Issuing, disposal and 'Writing off' of various consumable and dead stock items

Department of Community Medicine, IGMC Shimla

BSc 3rd Year

Paper-V

Title: Environment Science

Syllabus for Environment Education of BSC Paramedical Courses	
Section 1	1. Water Purification at household level
	2. Water Pollution – causes & its health impacts
	3. Swachh Bharat Abhiyan
	4. Air Pollution- causes & its health impacts
	5. Prevention & control of measure for air pollution
	6. Noise pollution- its effects & control measures
Section 2	
	1. Biomedical Waste management
	2. Radiation Exposure- its health effects & reduction measures
	3. E- waste Management
	4. Universal Precautions in Hospitals
Section 3	1. Biodiversity- its types & conservation
	2. Ecosystem – its structural & functional aspects
	3. Green House Effect
	4. Environment Health Education – Aims, objectives & its importance 5. Methods of Environment Awareness in Community
Section 4	
	1. Natural resources- overexploitation & methods for its replenishment
	2. Population explosion – its impact & control measures
	3. Entomology & Pest Control
	4. Water Harvesting
	5. Climate Change & its impact
Text Books:	
	1. Environmental studies: Deepa Sharma, Bhupendra Singh Chabra
	2. Text book of Community Medicine: K Park

