HEMWATI NANDAN BAHUGUNA UTTARAKHANDMEDICAL EDUCATION UNIVERSITY, DEHRADUN

B. Sc. OPERATION THEATRE TECHNOLOGY (BOTT)

(w.e.f. Academic Session 2020-21)

(Based on model curriculum handbook of Operation Theatre technology by Ministry of Health and Family Welfare Allied Health Section 2015-16)

B. Sc. in Operation Theater Technology

Introduction:

Learning Objectives: At the completion of this course, the student should be -

1. Able to help the anesthesiologist in administering anesthesia, assist in various procedures and also help in continuous monitoring of patients during surgery.
2. Able to train and develop an individual to independently handle the latest technology and high end biomedical equipment in Operation Theatre
3. Able to assist anesthesiologists in developing and plummeting patient anesthesia care plans, including pre-operative, surgical theater, recovery room, and post-operative intensive care procedures.
4. Able to do- patient data collection, catheter insertion, airway management , assisting the administration and monitoring of regional and peripheral nerve blockades, support therapy, adjusting anesthetic levels during surgery, inter-operative monitoring, postoperative procedures, pain clinics and patient education, and administrative tasks.
5. Able to manage medical gases and pipeline system
6. Able to assist in Intensive care unit
7. Able to manage Central sterile supply department
8. Able to assist during Disaster and emergency situations.

Expectation from the future graduate in the providing patient care.

1. The Course prepares the operating theatre technologist to work as a competent, reliable member of the health care team under the guidance and supervision of doctors in their delivery of patient care, training also focuses on the knowledge and skills of monitoring infection control policy and procedures in the operating theatre.
2. Employment opportunities can be found in hospitals in both private and public sectors as well as in independent trauma centres.
3. OTT graduate is encouraged to pursue further qualification to attain senior position in the professional field, also to keep abreast with the advance and new technology, the professional should opt for continuous professional education credits offered by national and international institutes.

Duration of the course

Duration of the course: 3 years 6 months (970 hours of Theory & 2270 hours of Practical Classes) and 720 hours (minimum) of internship

Total hours – 3960 hours

Medium of instruction:

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

Attendance:

A candidate has to secure minimum-

1. 75% attendance in theoretical
2. 80% in Skills training (practical) for qualifying to appear for the final examination.

No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition etc.

Assessment:

Assessments should be completed by the academic staff, based on the compilation of the student's theoretical &clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated.

Curriculum Outline:

First year

SR. NO.CODE	SUBJECT	THEORY	THEORY INTERNAL	TOTAL	PRACTICAL	INTERNAL	TOTAL
1.	Anatomy	70	30	100	70	30	100
2	Physiology	70	30	100	70	30	100
3	Forensic medicine. Medical law and ethics. Professionalism and values	70	30	100	-	-	-
4.	Pathology/Microbiology /Biochemistry.	70	30	100	70	30	100
5.	Preventive Social Medicine	70	30	100	-	-	-
Non- University Examination							
1	ENGLISH	70	30	100	-	-	-
2	COMPUTER	70	30	100	-	-	-

Anatomy and Physiology of human body

Anatomy is a key component of all education programmes for OTTs and should have a strong focus on organ position, orientation and relationships. The topics provide the student with an understanding of the structure and relationships of the systems and organs of the body which is essential in patient positioning and accurate delivery of intervention.

Similarly Physiology provides the students with knowledge of the function of systems and organs and their relationships and underpins the understanding of how surgical intervention can modify the function and structure of outcomes. Physiology is important to all programmes with increased depth of content required where OTTs are being required to take a more active role in side effect recognition and management. This may be in departments where OTTs are increasingly taking some responsibility in this area or in resource constrained environments where nursing or medical staff are limited.

1. Structure and function of cell; cell division; tissue: definition and classification (Gross outline)
2. General Anatomical terms and topography of the body-planes regions, positions, movements.
3. Skeleton & joints- Long bones, vertebrae, pelvic and shoulder girdles, hands and feet, skull , face and teeth; parts of classical long bone; outline of different joints and type of movements.
4. Muscles; Classification, structure and function (Gross outline)
5. Brain & spinal cord with its coverings and cavities including cerebrospinal fluids and pituitary gland (Macroscopic anatomy and surface anatomy only)
6. Head & Neck; Oral cavity & lips, Pharynx, Larynx, Nasal Cavity and Para Nasal sinuses, Salivary Glands, Ear; Orbit & its content; Thyroid Gland and Nodal Areas (Macroscopic Anatomy only)
7. Thorax: Structure of Thoracic cage, Oesophagus, Trachea, Lungs & Pleura, The Mediastinum including Thymus, Heart and Great Vessels and Diaphragm (Macroscopic and Surface Anatomy)
8. Abdomen: Structure of Abdomen & Peritoneum, Retro Peritoneal structures (including Kidney), Stomach, Small Intestine, Colon, Liver, Pancreas, Spleen (Macroscopic and Surface Anatomy)
9. Pelvic and Perineum: Structure of Pelvis, Rectum & Anus, Bladder, Prostate, Female Genital Tract, Male Genital Tract and Inguinal Femoral Region (Macroscopic and surface Anatomy)

10. Lymphatic system and Reticulo-endothelial system (Gross outline only)- Position and function of Lymph Nodal regions (Including Neck, Axilla, Mediastinum, para-aortic, Inguinal) Extra nodal Lymphatic Tissues (Waldeyer's Ring, Spleen and Liver, Malt, Bone Marrow, Thymus) and Re System; Lymphatic Drainage.
11. Digestive System- Organs of digestion, histology of the digestive organs (stomach, small intestine, liver, pancreas), process of digestion, absorption and assimilation of food, Vitamins and minerals
12. Respiratory System- Organs of respiration and their histology (lungs and trachea), Respiration (Definition and Mechanism), gas exchange in the lungs, regulation of respiration, basal metabolic rate
13. The skin (Structure and functions)
14. The excretory system- Organs of excretion (kidneys, ureter, bladder), histology of kidney and its functions, formation of urine and its composition, structure of nephron
15. Circulatory System- Composition and functions of blood, the heart anatomy and physiology, the chambers of heart, various vessels and valves present in heart, Circulation of blood, the cardiac cycle and heart sounds, blood pressure, arteries and veins.
16. Nervous System- Central nervous system (Brain and Spinal cord), Peripheral nervous system (cranial and spinal nerves), The reflex action and reflex arc, The transmission of nerve impulse, sense organs (eye, ear, tongue and nose); structure and functions
17. Endocrine System- short description of various endocrine glands and their functions
18. Reproductive System- Male and female reproductive system, Histology of Gonads, ovarian cycle and ovulation, Fertilization, Fertility control

Medical law and ethics

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.
Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice".28 Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Professionalism and Values

The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant is professionalism in terms of healthcare system and how it affects the overall patient environment.

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behavior- professional behavior, treating people equally
4. Code of conduct , professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts
6. Cultural issues in the healthcare environment

Pathology:

1. Cellular adaptation and cell death
2. Inflammation and repair, infection, circulatory disorders, immune defense
3. Genetics of disease
4. Neoplasia
5. Cell injury and adaptation
6. Atrophy, hypertrophy, metaphase, hyperplasia
7. Classification of tumors, premalignant lesion
8. Types of inflammation & system manifestations of inflammation
9. Disorders of vascular flow & shock (brief introduction)
10. Oedema, hyperemia or congestion, thrombosis, embolism, infarction shock, ischemia, over hydration, dehydration
11. The response to infection
12. Categories of infectious agents, host barriers to infection
13. How disease is caused
14. Inflammatory response to infectious agents
15. Hematopoietic and lymphoid System
16. Hemorrhage, various types of anemia, leucopenia, leukocytosis, bleeding disorders coagulation mechanism.

Clinical Microbiology

1. Morphology
   a. Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

2. Growth and nutrition
   a. Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.
3. Culture media
   a. Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.
4. Sterilization and Disinfection
   a. Principles and use of equipment of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptic and disinfectants.
5. Immunology
   a. Immunity, vaccines, types of vaccine and immunization schedule, principles and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA.
   b. Rapid tests for HIV and HBsAg (excluding technical details).
6. Systematic Bacteriology
   a. Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure and pathogenicity),
   b. Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.
7. Parasitology

a. Morphology, life cycle, laboratory diagnosis of following parasites: E. histolytica, Plasmodium, tape worms, Intestinal nematodes.

8. Mycology

a. Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi

9. Virology

a. General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis

Biochemistry:

1. Carbohydrates - Glucose and Glycogen Metabolism
2. Proteins-Classification of proteins and functions
3. Lipids- Classification of lipids and functions
4. Enzymes- Definition, Nomenclature, Classification, Factors affecting enzyme activity, Active site. Coenzyme, Enzyme Inhibition, Units of enzymes, Isoenzymes and Enzyme pattern in diseases
5. Vitamins & Minerals- Fat soluble vitamins (A, D, E, K), water soluble vitamins, B-complex vitamins, principal elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and Sulphur), trace elements, calorific value of foods, Basal Metabolic Rate (BMR), Respiratory Quotient (RQ), Specific Dynamic Action (SDA), balanced diet, Marasmus and Kwashiorkor
6. Acids and bases-Definition, pH, Henderson – Hassel Balch equation, Buffers, Indicators, Normality, Molarity, Molality
7. Hormones
8. Applied Chemistry:

a. Nomenclature of compounds containing Halogen. Alcohols and Phenols. Ethane, Propane, Ether, Aldehydes, Ketones, Carboxylic acid, Cyanides, Isocyanides, Nitrogen compounds and amines.

b. Catalysis.

c. Hemoglobin, Blood and respiration.

Introduction to National Healthcare System

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
    a. Healthcare delivery system in India at primary, secondary and tertiary care
    b. Community participation in healthcare delivery system
    c. Health system in developed countries.
    d. Private Sector
    e. National Health Mission
    f. National Health Policy
    g. Issues in Health Care Delivery System in India
2. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.
3. Introduction to AYUSH system of medicine
    a. Introduction to Ayurveda.
    b. Yoga and Naturopathy
    c. Unani
    d. Siddha
    e. Homeopathy
    f. Need for integration of various system of medicine
4. Health scenario of India- past, present and future

5. Demography & Vital Statistics-
    a. Demography – its concept
    b. Vital events of life & its impact on demography
    c. Significance and recording of vital statistics
    d. Census & its impact on health policy
6. Epidemiology
    a. Principles of Epidemiology
    b. Natural History of disease
    c. Methods of Epidemiological studies
    d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Research Methodology and Biostatistics

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Basic Concepts of Biostatistics
6. Types of Data
7. Research tools and Data collection methods
8. Sampling methods
9. Developing a research proposal

Community orientation and clinical visit

The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge; this will lay a sound foundation for their learning across the under-graduate program and across their career. Innovative teaching methods should be used to ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

1. The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical college, private hospitals, dispensaries and clinics.
2. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front line health workers.
3. Clinical visit to their respective professional department within the hospital.

Syllabus for practical

1. Benedict's test
2. Heat coagulation tests

OTT Directed Clinical Education – part I (studentship)

Students will observe the basic operations of the operation theatre while interacting with the multidisciplinary team members involved in providing optimal care to the patients. The student will be introduced to terminologies, equipment, and techniques used for preparation and management of the OT.

BOTT – 2ND YEAR

SR. NO.CODE	SUBJECT	THEORY	THEORY INTERNAL	TOTAL	PRACTICAL	INTERNAL	TOTAL
1.	PRINCIPLES OF MANAGEMENT	70	30	100	-	-	-
2	QUALITY CONTROL AND PATIENT SAFETY	70	30	100	70	30	100
3	MEDICINE AND CLINICAL PHARMOCOLOGY	70	30	100	70	30	100
4.	PRINCIPLES OF ANESTHESIA	70	30	100	-	-	-
5.	BASIC TECHNIQUE OF ANESTHESIA	70	30	100	70	30	100

Principles of management

1. Principles of management:

a. Development of Management: Definitions of Management – Contributions of F.W. Taylor, Henry Fayol and others.
b. Functions of Management: Planning – Organizing – Directing – Controlling Planning: Types of planning – Short–term and long plans – Corporate or Strategic Planning – Planning premises – Polices – Characteristics and sources – principles of policy making – Strategies as different from policies – Procedures and methods– Limitations of planning.
c. Organizing: Importance of organization – Hierarchy – Scalar chain – Organization relationship – Line relationship – Staff relationship - Line staff relationship – Functional relationship - Committee organization – Management committees – Depart mentation.
d. Motivation: Motivation theories – McGregor's theory X and theory Y – Maslow's and Herzberg's theory – Porter and Lawler model of complex view of motivation– Other theories – Diagnostic signs of motivational problems – Motivational Techniques.
e. Communication: Types of communication – Barriers of effective communication– Techniques for improved communication.
f. Directing: Principles relating to Direction process – Principles and theories of leadership – Leadership Styles – Delegation of authority.
g. Controlling: Span of control – Factors limiting effective span of control – Supper management, General managers, Middles managers and supervisors – Planning and controlling relationships – Management control process – Corrective measures– Strategic control points – Budgetary control – Types of budgets.
h. Co-ordination: Co-ordination and co-operation – Principles of co-ordination – Techniques of co-ordination charts and records – Standard procedure instructions.

Objective of Personnel Management – Role of Personnel Manager in an organization – Staffing and work distribution techniques – Job analysis and description – Recruitment and selection processes – Orientation and training – Coaching and counselling – disciplining – Complaints and grievances – Termination of employees – Performance appraisal – Health and safety of employees - Consumer Protection Act as applicable to health care services.

3. Financial management:

Definition of financial Management – Profit maximization – Return maximization– wealth maximization – Short term Financing – Intermediate Financing – Long term Financing – leasing as a source of Finance – cash and Security Management – Inventory Management – Dividend policies – Valuations of Shares – Financial Management in a hospital – Third party payments on behalf of patients. Insurance – health schemes and policies.

Introduction to Quality and patient safety

1. Quality assurance and management - The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
   a. Concepts of Quality of Care
   b. Quality Improvement Approaches
   c. Standards and Norms
   d. Quality Improvement Tools
   e. Introduction to NABH guidelines

2. Basics of emergency care and life support skills - Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:
   a. Vital signs and primary assessment
   b. Basic emergency care – first aid and triage
   c. Ventilations including use of bag-valve-masks (BVMs)
   d. Choking, rescue breathing methods
   e. One- and Two-rescuer CPR
   f. Using an AED (Automated external defibrillator).
   g. Managing an emergency including moving a patient

   At the end of this topic, focus should be to teach the students to perform the maneuvers in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above mentioned modalities.
3. Bio medical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment and the general public. Topics to be covered under the subject are as follows:
   a. Definition of Biomedical Waste
   b. Waste minimization
   c. BMW – Segregation, collection, transportation, treatment and disposal (including color coding)
   d. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
   e. BMW Management & methods of disinfection
   f. Modern technology for handling BMW
   g. Use of Personal protective equipment (PPE)
   h. Monitoring & controlling of cross infection (Protective devices)

4. Infection prevention and control - The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –
   a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],

b. Prevention & control of common healthcare associated infections,

c. Components of an effective infection control program, and

d. Guidelines (NABH and JCI) for Hospital Infection Control

5. Antibiotic Resistance-

a. History of Antibiotics

b. How Resistance Happens and Spreads

c. Types of resistance- Intrinsic, Acquired, Passive

d. Trends in Drug Resistance

e. Actions to Fight Resistance

f. Bacterial persistence

g. Antibiotic sensitivity

h. Consequences of antibiotic resistance

i. Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals

6. Disaster preparedness and management- The objective of this section will be to provide knowledge on the principles of on-site disaster management. Concepts to be taught should include-

a. Fundamentals of emergency management,

b. Psychological impact management,

c. Resource management,

d. Preparedness and risk reduction,

e. Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

Medicine:

1. Common symptoms of diseases –

a. Pain: pathophysiology, clinical types, assessment and management

b. Fever: clinical assessment and management

c. Cough, chest pain, dyspnoea, hemoptysis

d. Edema, anasarca, ascites

e. Pallor, jaundice

f. Bleeding

g. Anorexia, nausea and vomiting

h. Constipation and diarrhea

i. Hematemesis, malena and hematochezia

j. Common urinary symptoms- dysuria, pyuria, anuria, oliguria, polyuria, nocturia, enuresis

k. Body pains and joint pains

l. Headache, seizures, fainting, syncope, dizziness, vertigo

m. Disturbances of consciousness and coma

n. Weight loss and weight gain

2. Immune Response and Infections

a. Approach to infectious diseases – diagnostic and therapeutic principles

b. Immune defense mechanisms

c. Laboratory diagnosis of infections

d. Principles of immunization and vaccine use

e. Immunodeficiency disorders - acquired

f. Immunodeficiency disorders – congenital

3. Systems

a. Cardiovascular system- Clinical examination of the cardiovascular system, major manifestations of cardiovascular disease

b. Respiratory system - Clinical examination of the respiratory system, major manifestations of respiratory disease

c. Renal and genito-urinary system- Major manifestations of renal and urinary tract disease

d. Liver and biliary tract disease - Viral hepatitis, alcoholism.

e. Endocrinology and metabolism - Diabetes mellitus, Hyper - and hypothyroidism.

f. Disorders of the Immune System, Connective Tissue and Joints

g. Disorder of haemopoesis - Anemia - iron deficiencies anemia.

Principles of anesthesia

1. Medical gas supply
    a. Compressed gas cylinders
    b. Color coding
    c. Cylinder valves; pin index.
    d. Gas piping system
    e. Recommendations for piping system
    f. Alarms & safety devices.
    g. Scavenging of waste anesthetic gases
2. Anesthesia machine
    a. Hanger and yoke system
    b. Cylinder pressure gauge
    c. Pressure regulator
    d. Flow meter assembly
    e. Vaporizers - types, hazards, maintenance, filling and draining, etc.
3. Breathing system
    a. General considerations: humidity & heat
    b. Common components - connectors, adaptors, reservoir bags.
    c. Capnography
    d. Pulse oximetry
    e. Methods of humidification.
    f. Classification of breathing system
    g. Mapleson system - a b c d e f
    h. Jackson Rees system, Bain circuit
    i. Non rebreathing valves - Ambu valves
    j. The circle system
4. Face masks & Airway laryngoscopes
    a. Types, sizes
    b. Endotracheal tubes - Types, sizes.
    c. Cuff system
    d. Fixing, removing and inflating cuff, checking tube position, complications.
5. Anesthesia ventilator and working principles
6. Monitoring
    a. Electrocardiography(ECG)
    b. Pulse oximetry(Sp02)
    c. Temperature- central and peripheral

d. End tidal carbon dioxide(EtCO2)
e. Anesthesia gas monitoring
f. Non-invasive blood pressure (NIPB) and Invasive blood pressure(IBP)
g. Central venous pressure(CVP)
h. PA Pressure, LA Pressure & cardiac output
i. Anesthesia depth monitor
j. Neuromuscular transmission monitor

Practical

1. Supply of compressed gases:
   a. Types of gases and their chemical and physical properties.
   b. Types of containers.
   c. Their checking and maintenance.
   d. Types of compressors.
   e. Structure and mechanism of various type of gauges, liquid oxygen storage and supply system.
2. Structure of reducing valves-
   a. Mechanism of pressure reducing valves.
   b. Their maintenance and safety checks
3. Structure and mechanism of flow meters, maintenance and safety checks
4. Volatile anaesthetic agents.
   a. Selection of material to be used for containers of the volatile anaesthetic agents.
   b. Structure of different types of vaporizers.
   c. Principles of various vaporizers, their maintenance and safety precautions.
5. Types of circuits:
   a. Open, Semi closed and closed circuits.
   b. Non-rebreathing valves.
   c. T-piece circuit and its modifications.
   d. To and fro system and circle absorber.
6. Types of valves used in the different circuits. Structure and working of Heidbrink's valve, Rubin valve nu-man valve etc.

CLINICAL PHARMACOLOGY

1. Antisialagogues: Atropine, Glycopyrrolate.
2. Sedatives I Anxiolytics: Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, and Triclofos.
3. Narcotics: Morphine, Pethidine, Fentanyl, Pentazozine, tramadol.
4. Antiemetic's: Metoclopramide, Ondanseteron, Dexamethasone
5. Induction Agent: Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate.
6. Muscle Relaxants: Depolarizing - Suxamethonium, Non depolarizing - Vecuronium, Atracurium, rocuranium
7. Inhalational Gases: Gases-02, N20, Air, Agents-Ether ,Halothane, Isofllurane, Saevoflurane, Desflurane
8. Reversal Agents: Neostigmine, Glycopyrrolate, Atropine, Naloxone, Flumazenil (Diazepam).
9. Local Anesthetics: Xylocaine, Bupivacaine - Topical, Prilocaine-jelly, Emla - Ointment, Etidocaine. Ropivacaine.
10. Emergency Drugs : Mode or administration, dilution, dosage and effects
    a. Adrenaline, Atropine
    b. Ephedrine, Mephentramine
    c. Bicarbonate, calcium, potassium.
    d. Inotropes: dopamine, dobutamine, amidarone
    e. Aminophylline, hydrocortisone, antihistaminic,
    f. Antihypertensive –Beta-blockers, Ca-channel blockers.

g. Antiarrhythmic- xylocard

h. Vasodilators- nitroglycerin & sodium nitroprusside

i. Respiratory system- Bronchodilators

j. Renal system- Diuretics, frusemide, mannitol

Basic techniques of anesthesia

1. Resuscitation techniques:
   a. Basic life support (Airway, breathing, circulation) and the equipment used for it.
   b. Drugs used in CPR.
   c. AED and Defibrillators.
2. Anesthesia drugs and techniques:
   a. Principles of anesthesia.
   b. Basics of general anesthesia depth, mechanism and intubation.
   c. Techniques of general anesthesia.
   d. Various intravenous and inhalational agents.
   e. Regional anesthesia, spinal and epidural, posture and drugs.
   f. Local Anaesthetic agents.
   g. Neuro muscular blocking agents.
   h. Principles of oxygen administration along with the apparatus.
   i. Care of patient in the recovery room.
   j. Post-operative pain: evaluation and management.
   k. Types of fluid and therapy.
   l. Blood and blood components transfusion.
   m. Preparation of anesthesia machine, intubation kit, suction machine, anesthesia drugs.
   n. 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 recording before and after surgical procedure to the nursing staff.

Practical

1. Anesthesia work station
2. Boyle's anesthesia apparatus and other Advanced Anesthesia machines.
3. Apparatus and technique of the intravenous injections:
   a. Selection of the material used for intravenous injection.
   b. Different types of intravenous needles and cannulas.
   c. Theoretical study for testing of the toxicity of the materials.
4. Resuscitation equipment and Resuscitation techniques:
   a. Endotracheal tubes :
      - Selection of the material used for the endotracheal tube
      - Study of the structure of various types of the endotracheal tubes. Cleaning and sterilization of ETT.
   b. Connectors: Various connectors, size and material used.
   c. Mask: Material, structure and importance of dead space of face mask.
   d. Supraglottic airways.
   e. Spinal and epidural blocks: equipment, types of spinal and epidural needles, their structure. Instruments used for spinal and epidural blocks.
   f. Laryngeal sprays: Types, structure and material used, mechanism, uses and their maintenance.

OTT Directed Clinical Education – part II (studentship)

Students will improve their skills in clinical procedures. Progressive interaction with patients and professional personnel are monitored as students practice in a supervised setting. Additional areas include problem solving, identifying machine components and basic side effect management. Students will demonstrate competence in beginning, intermediate, and advanced procedures.

BOTT – 3RD YEAR

SR. NO.CODE	SUBJECT	THEORY	THEORY INTERNAL	TOTAL	PRACTICAL	INTERNAL	TOTAL
1.	BASIC OF SURGICAL PROCEDURE/SPECILIZES SURGERY AND ANESTHESIA	70	30	100	70	30	100
2	CSSD PROCEDURES	70	30	100	70	30	100
3	ADVANCED ANESTHESIA TECHNIQUE	70	30	100	70	30	100
4.	BASIC INTENSIV CARE	70	30	100	-	-	-
5.	ELECTRONIC AND TECHNOLOGY IN SURGERY AND ANESTHESIA.	70	30	100	70	30	100

Basics of surgical procedures

1. Blood Transfusion
   a. History of discovery of blood groups and genetics of blood groups.
   b. Types of blood groups and Rh factor.
   c. Coombs test.
   d. Collection of blood, its preservation and standardization.
   e. Various types of blood and blood products(Packed cells, PRP, FFP)
   f. Pre-transfusion checks.
   g. Transfusion reactions.
   h. Fluids and electrolytes
   i. Body fluid compartments and the effect of fluid administration on them.
   j. Types of fluids (crystalloids and colloids) and their chemical composition.
   k. Indications of specific fluids and their complications.
2. General surgical procedure and para-surgical equipment
   a. Operating tables: structure, material used, maintenance, control, Hydraulic system and Electrical system.
   b. Different types of diathermy machine. Monopole, Bipolar, Ligasure, Harmonic Scalpel, CUSA- Principle, hazards, prevention, functioning and maintenance.
   c. Types of operation lights and light sources: Features, Care, cleaning, sterilization and maintenance.
   d. Operation Theatre sterilization- Different recent advances.
   e. LAR/APR--Positioning of patient, care-Prevention of hazards.
   f. Total thyroidectomy—with emphasis on proper positioning.
   g. Transthoracic esophagectomy—Different approaches.
   h. Venesection and Tracheostomy.
   i. Laproscopic Cholecystectomy – Pneumoperitonium - Creation and removing, principles.
   j. Nephrectomy.
   k. Breast surgery.
   l. Positioning of patient for different operations: Problems and hazards.
   m. Hypothermia and hyperthermia.

CSSD procedures

1. Principles of sterilization and disinfection.

2. Methods of sterilization
3. Dry Sterilization.
4. Wet sterilization.
5. Gaseous sterilization.
6. Chemical sterilization.
7. Sterilization by radiation (Gamma rays, ultraviolet rays)
8. Techniques of sterilization of rubber articles. (LMA, FOB, ETT, Laryngoscopes, Anesthesia machines and circuits.)
9. Technique of sterilization of carbonized articles.
10. Methods of disinfection.
11. Boiling.
12. Chemical disinfection.
13. Hazards of sterilization.
14. Prevention of hazards of sterilization.
15. Precautions to be taken during sterilization.
16. Recent advances in the methods of sterilization.

Advance anesthesia techniques

1. Heart as a pump.
2. Cardiac cycle.
3. Cardiac contractility and stroke volume.
4. Cardiac output and its measurement.
5. Various ECG Leads, their placement and Normal ECG.
6. Cardiac Arrhythmias (atrial fibrillation, ventricular tachycardia, extra systoles)
7. Circulatory shock and its physiology.
8. Cardiac failure.
9. Physics of blood flow and pressure.
10. Measurement of blood flow.
11. Electromagnetic flow meter, ultrasonic flow meter, plethysmography.
12. Regulation of arterial pressure and hypertension (Drugs used for treatment of hypertension)
13. Arterial circulation including cardiopulmonary bypass.
14. Artificial ventilation and related equipment:
    a. Physiology of IPPV (Intermittent positive pressure ventilation)
    b. Principles of mechanical ventilation.
    c. Various modes of IPPV.
    d. Automatic pressure and time cycled ventilators.
    e. Operating room ventilators.
    f. Other types of ventilators (HFJV, NIV)
    g. Complications in patients on ventilators.
    h. General care of a patient on ventilator.
    i. Disinfection and sterilization of ventilators.
    j. Humidification
    k. Principles of oxygen administration and methods used to deliver oxygen.
    l. Acid base balance.
    m. Electrolyte imbalance and its relevance to anesthesia.

Basic Intensive care

1. Care and maintenance of ventilators, suction machine, monitoring devices.
2. Sterilization and disinfection of ventilators.
3. Care, maintenance and operational capabilities of beds, lights and other apparatus.
4. Air conditioning and control of pollution in ICU.
5. Attachment and intraoperative utility of ventilators and monitoring devices.
6. Care of unconscious adult and pediatric patients.
7. Physiotherapy techniques, feeding, Ryle's tube insertion and hyper alimentation.
8. Suctioning and posturing of semiconscious and unconscious patients.
9. Oxygen therapy, maintenance of clear Airway.
10. Ventilation of patient in crisis:
11. Mouth to mouth.
12. Mouth to ET Tube.
13. Resuscitator/ bag valve mask assembly
14. Different types of Airways.
15. Short term ventilation/ Transport ventilators.
16. ICU Laboratory; Detection of blood gases of the patient, Principles of ABG machines.
17. Management of asepsis.
18. Management of tetanus patient.
19. Psychological aspects of the patient, relative and staff.
20. Hemofiltration and hemodialysis.
21. Ventilators: Principles of working of different ventilators:
    a. Volume cycled/Time cycled/Pressure cycled ventilators.
    b. High frequency ventilators and other types.
    c. Methods of measuring the expired gases from the patient; Types of spirometers, Principles of working of spirometers. Clinical application of above apparatus.
    d. Apparatus and techniques of measuring of blood pressure and temperature; Principle and working of direct/indirect blood pressure monitoring apparatus; structure, principle and working of the oscillotonometer. Principles and working of aneroid manometer type B.P. instrument.
    e. Laryngeal sprays; Types, material, principle and mechanism.
    f. Monitoring techniques and equipment; Cardiac monitors, Respiratory monitors, Spirometers, Temperature monitors.

Specialized anesthesia and surgery

1. Cardiovascular and Respiratory System- Techniques, equipment, procedures and instruments
    a. Diseases of cardiovascular and respiratory systems.
    b. Types of perfusion machines.
    c. Techniques of Perfusion and operational capabilities.
    d. Intra-aortic Balloon pump.
    e. Cell saver techniques.
    f. Care, maintenance and working of Heart lung Machine.
    g. Patient's record keeping preoperatively, during anesthesia and post-operatively.
    h. Principles and techniques of temperature monitoring.
    i. Positioning during cardiothoracic surgical procedures.
    j. Positioning and techniques for:
        - Radial artery cannulation.

- Central venous cannulation/pulmonary artery catheter.
- Femoral artery/venous cannulation.

2. Monitoring Techniques and Equipment:
   a. Cardiac monitors, blood pressure and ECG monitoring.
   b. Respiratory monitors, respiratory rate, Spirometers, SpO2, and EtCO2.
   c. Temperature monitors.
   d. TEE and echocardiography machine
   e. Non- invasive cardiac output machine
3. Positioning-
   a. During various neurosurgical procedures including sitting, prone, lateral and position for trans-sphenoidal hypo-physectomy.
   b. Fixation of head during various neurosurgical procedures.
   c. Prone and Knee chest position for spine surgery.
4. Requirements during intubation in a case of cervical spine fracture including fiber- optic laryngoscopy, awake intubation, LMA family especially ILMA.
5. Anaesthetic and surgical requirements during aneurysm surgery.
6. Surgical and Anaesthetic requirements during micro neurosurgery including types of microscopes, principle, structural features, microscopic photography and cameras used.
7. Anaesthetic and surgical requirements during thyroid surgery, adrenal surgery.
8. Anaesthetic and surgical requirements during abdominal surgery including Laproscopic surgery, genitourinary surgery including percutaneous nephrolithotomy, Endoscopic surgery, TURP, TURBT, Lithotripsy, ESWL (Extracorporeal shock wave therapy)
9. Anaesthetic and surgical requirement during renal transplant donor and recipient surgery including care and precautions during operative procedures of hepatitis B & hepatitis C positive patients.
10. Anaesthetic and surgical requirement during pediatric and Neonatal surgical procedures including emergency procedures like tracheo-esophageal fistula. Sub diaphragmatic hernia, major abdominal and thoracic procedures. Foreign body bronchus and esophagus.
11. Apparatus and techniques for measuring blood pressure and temperature.
12. Principle and working of direct/Indirect blood pressure monitoring apparatus.
13. Intraoperative and postoperative problems and complications of general surgery.
14. Management of emergency caesarean section.
15. Management of massive obstetrical hemorrhage.
16. Surgical management in major burns and craniofacial surgery.
17. Surgical management of joint replacement and arthroscopy.
18. Surgical management of endoscopies, laryngectomy with RND and cochlear implant.
19. Management of PPV and perforating eye injury.
20. Care and maintenance of Para-surgical equipment (Cautery, OT Lights, OT Table etc.)

Electronics and technology in surgery and anesthesia

1. Electronics and electro mechanical techniques-
   a. Electrical safety precautions in operation theatre. OT tables, OT lights, suction machines, electrodes, pressure transducers, electrical safety, application, handling operation.
   b. Basic electronics, basic principle, care and maintenance and uses of surgical diathermy machine, defibrillator, Boyle's apparatus, anesthesia machine, monitors, pace-makers and stimulators etc.
   c. Engineering aspects of operation theatre equipment, power supplies, CVT, servo-stabilizers, and ups etc.
2. Book keeping and Stock maintenance.
   a. Moral aspects and duties of OT technologist.
   b. Indenting, Book keeping and storage procedures of different articles.
   c. Co-ordination with all working personal in operation Theatre.

d. Psychological aspects of patient, staff and relatives of the patient.
e. Management of operation theatre in routine and emergency.

3. Computer data processing, software information and Data management
   a. Logging on and off, Security concepts, Sending and receiving Emails.
   b. Hospital information system.

OTT Directed Clinical Education – part III (studentship)

This course is the final in a series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction.

INTERNSHIP

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning, intermediate, and advanced procedures in both areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

Skills based outcomes and monitorable indicators for Operation Theatre Technologist

Competency statements

1. Demonstrate ability to prepare and maintain Operation Theater
2. Demonstrate ability to maintain equipment support in an acute care environment
3. Identify and move to maintain a sterile field
4. Follow infection control policies and procedures
5. Manage and maintain theater equipment
6. Demonstrate ability to prepare the patient for operative procedures
7. Provide intra-operative equipment and technical support
8. Demonstrate skills and knowledge to assist anesthetist in handling emergencies outside of OT Room
9. Manage hazardous waste and follow biomedical waste disposal protocols
10. Ensure availability of medical and diagnostic supplies
11. Monitor and assure quality
12. Act within the limits of one's competence and authority
13. Work effectively with others
14. Manage work to meet requirements
15. Maintain a safe, healthy, and secure working

S.No.	Learning outcomes	Knowledge / comprehension	Applications / synthesis/ evaluation	Hours
1	Prepare and maintain Operation Theatre	Be familiar with the Operation Theatre and all the equipment.	Prepare the OT for the operation along with all the necessary equipment.	**300**

		Know the protocols used in Operation Theatre	Interpret and understand all planning techniques to keep an OT functional.	
2	Maintain equipment support in an acute care environment	Use basic knowledge of surgical procedures to assist and identify the needs of equipment of Operating teams.	Clean and store equipment safely	**300**
			Position equipment in accordance with set up procedures	
3	Assist anaesthetist in handling emergencies outside of OT Room.	Knowledge of assisting anaesthetist outside OT Room.	Prepare emergency kit to handle areas outside OT Room.	**300**
			Ensure any signs or symptoms of a clinical emergency is identified correctly and reported to the appropriate clinician.	
4	Follow infection control policies and procedures	Knowledge of effective infection control strategy that ensures the safety of the patient.	Preform the standard precautions to prevent the spread of infection in accordance with organization requirements	**220**
5	Ensure availability of medical and diagnostic supplies	Anticipating demand and ensuring availability of adequate medical and diagnostic supplies.	Maintain adequate supplies of medical and diagnostic supplies. Arrive at actual demand as accurately as possible	**100**
6	Prepare patient for operative procedures	Knowledge of preparing patients as required before the operation.	Safely position patient to meet the requirements of the anaesthetist and Surgeon.	**200**
`7	Provide intra-operative equipment and technical support	Knowledge to assist the anaesthetist and provide technical support during surgical procedure.	Monitoring the performance of equipment used and adjusting surgical equipment.	**200**
8	Work effectively with others	Working with other people to meet requirements	Identify any problems with team members and other people and take the initiative to solve these problems.	**100**
		Communicating with other team members and people internal or external to the organisation	Communicate with other people clearly and effectively	
9	Be able to demonstrate professional behavior	Explain the legal and ethical guidelines related to the profession	Promote collaborative practice	**100**
		Be aware of your own competency levels		
10	Be able to complete accurate treatment documentation	Recognize the importance of accurate documentation	Complete the treatment documentation accurately	**50**
11	Manage hazardous waste		Coordinate the hazardous waste management program.	**100**

		Knowledge of Handle, collect and dispose of the hazardous waste.	Properly identify, segregate, handle, label, and store waste.	
12	Maintain a safe, healthy and secure working environment.	Complying the health, safety and security requirements and procedures for Workplace.	Identify individual responsibilities in relation to maintaining workplace health safety and security requirements.	**100**
			Follow the organization's emergency procedures promptly, calmly, and Efficiently.	
13	Monitor and assure quality	Monitor treatment process/outcomes process/outcomes	Evaluate potential faults in treatment procedures.	**200**
		Identify problems in treatment	Identify breaches in health, safety and security procedures.	
		Solve treatment process/outcome problems	Follow the organization's emergency procedures promptly, calmly and efficiently.	
	Total			**2270**