

**STATE BOARD OF ALLIED MEDICAL SCIENCES
ODISHA**



**Bachelor of Science in
Operation Theatre Technology (BOTT)**

Introduction:

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

1. Able to help the anesthesiologist in administering anesthesia, assisting 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 centers.
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.

Plan of Classes & Examination Pattern for BOTT course

- Total duration of each course is 3 years (6 Semesters).
- Each semester is of 6 months duration.
- In each semester the classes will be of 5 months duration & internal assessment will be conducted in the last month of each semester except 3rd & 6th semester.
- University examination will be conducted at the end of 3rd & 6th Semester.
- In each semester, the classes will be of 500 hours including theory and practical/clinical.
- **Distribution of classes:** There will be 5 hours of classes / day for 5 days in a week, 25 hours / week, 100 hours / month and 500 hours in each semester.
- Of the 500 hours of classes, 200 hours will be dedicated for the theory classes; rest 300 hours will be practical / clinical.
- **Attendance in Class:** A Student will be eligible to appear in the semester and university examination if he/she has attended minimum 75% theory classes and 85% practical classes.

EXAMINATION PATTERN

- **Internal assessment:** Internal assessment will be conducted in the last month of each semester except 3rd & 6th semester (where there will be University examination.)
 - **Mark Distribution:** 50 marks per each subject (30 Theory and 20 practical/clinical). Minimum qualifying mark: 50 % in each theory and practical/clinical.
 - **Question Pattern for Theory (Semester Examination):**
 - i. Short questions of 2 marks each X 5 = 10
 - ii. Multiple choice question 1 mark each X 5 = 5
 - iii. Fill in the blanks 1 mark each X 5 = 5
 - iv. Match the following 1 mark each X 5 = 5
 - v. Long Question (Choice) 1 X 5 = 5
 - **University Examination:** Candidate has to pass two university examinations to be conducted at the end of 3rd Semester & 6th Semester, of 100 marks/ Paper to get the Bachelors degree.
4. **University Examination.** A student will be eligible to appear in the university examination if he/she has secured 50% in each internal assessment (both Theory and Practical) done at the end of 1st, 2nd, 4th & 5th semester
 5. Each Paper is of 100 marks (Theory -50, Practical-30, Internal Assessment-20). The duration of the examination is 2 hours.
 6. **Question Pattern for Theory (University Examination):**
 7. i. Short questions of 2 marks each X 5 = 10
 8. ii. Multiple choice question 1 mark each X 5 = 5
 9. iii. Fill in the blanks 1 mark each X 5 = 5
 10. iv. Match the following 1 mark each X 5 = 5
 11. v. Long Question (Choice) 1 X 5 = 5

Degree: On successful completion of three years programme, the candidate will be awarded with “Bachelor in Operation Theatre Technician ”

BACHELOR OF SCIENCE IN OPERATION THEATRE TECHNICIAN

FIRST SEMESTER			Total Teaching hrs (Theory & Practical/Clinical)
	1	Foundation Course	50
PAPER I	2	Anatomy & Physiology	120+60
	3	Biochemistry	60+40
SECOND SEMESTER			
PAPER II	4	Pathology	60+40
	5	Clinical Microbiology	60+40
	6	Clinical Pharmacology	60+40
THIRD SEMESTER			
PAPER III	6	Medicine	60+100
	7	Principles of Anesthesia	60+150
	8	OTT Directed Clinical Education–part I (studentship)	150
FOURTH SEMESTER			
PAPER IV	9	Basic Techniques of Anesthesia	60+40
	10	Basics of surgical procedures	60+40
	11	OTT Directed Clinical Education–part II (studentship)	150
FIFTH SEMESTER			
PAPER V	13	Basic Intensive care	60+100
	14	CSSD Procedures	60+100
	15	OTT Directed Clinical Education–part III (studentship)	150
SIXTH SEMESTER			
PAPER VI	16	Advance anesthetic techniques	60+100
	17	Specialized surgery and anesthesia	60+100
	18	Electronics and technology in surgery and anesthesia	40+20
	19	OTT Directed Clinical Education-part IV	150

Internship

Internship–minimum 1440 hours calculated based on 8 hours/per/day, if 180 working days in a year). This is the minimum requirement, however depending on the working days/hours, the total duration of engagement in internship may be more than 1440 hours.

FIRST SEMESTER

1.Foundation Courses

Introduction to National Healthcare System

Medical terminologies and record keeping

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include: origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests. Topics to be covered under the subject are as follows:

1. Derivation of medical terms.
2. Define word roots, prefixes, and suffix
3. Basic medical terms.
4. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
5. Interpret basic medical abbreviations/ symbols.
6. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
7. Interpret medical orders/reports.
8. Data entry and management on electronic health record system.

Basic computers and information science

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and Power Point presentation. 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. Process or 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, savingthedocument,spellchecking,printingthedocumentfile,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 Introduction of Operating System: introduction, operating system concepts, types of operating system.
9. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
10. 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.
11. Application of Computers in clinical settings. Practical on fundamentals of computers-
 1. Learning to use MSOffice: MSWord, MSPowerPoint, MSExcel.
 2. To install different software.
 3. Data entry efficiency

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 areas 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.

Communication and soft skills

Major topics to be covered under Communication and soft skills

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
4. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Types & process of communication
7. Barriers of communication & how to overcome

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. Biomedicalwastemanagementandenvironmentsafety-Theaimofthissectionwillbe 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.

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 health care environment

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

Principals of Management

The course is intended to provide a knowledge about the basic principles of Management.

1. Introduction to management
2. Strategic Management
3. Foundations of Planning
4. Planning Tools and Techniques
5. Decision Making, conflict and stress management
6. Managing Change and Innovation
7. Understanding Groups and Teams
8. Leadership
9. Time Management
10. Cost and efficiency

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 method should be used to ensure the attention of a student and make them more receptive such as group activities, interactive section, 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 frontline health workers.
3. Clinical visit to their respective professional department within the hospital.

2. Anatomy and Physiology of human body

Anatomy is a key component of all education programme 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 relationship with 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 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, Esophagus, Trachea, Lungs & Pleura, The Mediastinum including Thymus, Heart and Great Vessels and Diaphragm (Macroscopic and Surface Anatomy)
8. **Abdomen**: Structure of Abdomen & Peritoneum ,Retroperitoneal structures (including Kidney), Stomach, Small Intestine, Colon, Liver, Pancreas, Spleen (Macroscopic and Surface Anatomy)
9. **Pelvis 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

3.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–HasselBalch 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.

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

Second Semester

4. 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. Edema, 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.

5. 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, lifecycle, 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.

6. Clinical pharmacology

1. Antisialagogues: Atropine, Glycopyrrolate.
2. Sedatives I Anxiolytics: Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, and Triclofos.
3. Narcotics: Morphine, Pethidine, Fentanyl, Pentazocine, tramadol.
4. Antiemetics: Metoclopramide, Ondansetron, Dexamethasone
5. Induction Agent: Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate.
6. Muscle Relaxants: Depolarizing - Suxamethonium, Non depolarizing - Vecuronium, Atracurium, rocuranium
7. Inhalational Gases: Gases-O₂, N₂O, Air, Agents-Ether, Halothane, Isoflurane, 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 of 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

THIRD SEMESTER

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 haemopoiesis** - Anemia - iron deficiencies anemia.

8. OTT Directed Clinical Education-Part I

9.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**
 - e. Electrocardiography(ECG)
 - f. Pulse oximetry(SpO₂)
 - g. Temperature- central and peripheral
 - h. End tidal carbon dioxide(EtCO₂)
 - i. Anesthesia gas monitoring
 - j. Non-invasive blood pressure (NIPB)and Invasive blood pressure(IBP)
 - k. Central venous pressure(CVP)
 - l. PA Pressure, LA Pressure & cardiac output
 - m. Anesthesia depth monitor
 - n. 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 flowmeters, 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.

FOURTH SEMESTER

10. 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 take over and handover of the patient with vital signs recording before and after surgical procedure to the nursing staff.

Practical

1. Anesthesia workstation
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 deadspace of facemask.
 - d. Supra glottic airways.
 - e. Spinal and epidural blocks: equipment, types of spinal and epidural needles, their structure. Instruments used for spinal and epidural blocks. Laryngeal sprays: Types, structure and material used, mechanism, uses and their maintenance.

11. OTT Directed Clinical Education – part II (studentship)

Students will gain additional skills in clinical preparation, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior technical officer.

12. 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. Laparoscopic 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.

Fifth Semester

13. 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 hyperalimentation.
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 the 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 oscillo tonometer. 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.

4.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.)
8. Technique of sterilization of carbonized articles.
9. Methods of disinfection.
10. Boiling.
11. Chemical disinfection.
12. Hazards of sterilization.
13. Prevention of hazards of sterilization.
14. Precautions to be taken during sterilization.
15. Recent advances in the methods of sterilization.

15.OTT Directed Clinical Education – part III (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.

SIXTH SEMESTER

16.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, extrasystoles)
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.

17. 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 hypophysectomy.
 - 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 Laparoscopic surgery, genitourinary surgery including percutaneous nephrolithotomy, Endoscopic Surgery, TURP, TURBT, Lithotripsy, ESWL (Extracorporeal shock wave therapy)
9. Anaesthetic and surgical requirements 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 requirements 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.)

18. 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.

19.OTT Directed Clinical Education – part V (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 class room and clinical instruction.

Skill based Outcomes and monitor able 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 theatre 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

19.OTT Directed Clinical Education – part IV (studentship)

The course provides 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.

INTERNSHIP

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Sixth Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Internship

1. Case record
2. Lab management and ethics
3. Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

