

CURRICULUM & SYLLABUS
DIPLOMA IN OPERATION THEATER AND ANAESTHESIA TECHNOLOGY
(DOTAT)

Department of Anaesthesiology

Sree Chitra Tirunal Institute for Medical Sciences and Technology

Thiruvananthapuram.

**(An institute of National importance under Department of Science and
Technology, Govt of India)**

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AIMS AND OBJECTIVES

The science of anaesthesia has advanced immensely ever since first anaesthesia was administered in the year 1846. Presently the anesthesiologists provide perioperative services from basic to advanced surgical procedures in broad specialties which are very challenging. Moreover, in the modern day practice the services are extended to various diagnostic, cardiological/radiological investigational & interventions and critical care management. It is necessary to have trained personnel capable to aid in the management of perioperative care by the anesthesiologists in the operating and non-operating room environments.

The Diploma in Operation Theater and Anaesthesia Technology (DOTAT) course aims at training persons with background knowledge in the field of biomedical engineering to the technical aspects of operation theater management and understand the basics of the specialty of anaesthesia, impart knowledge on various anesthetic procedures in relation to surgery and monitoring, use of various equipments, drugs and gadgets used in the operating room, maintain sterility and maintenance of the equipments. At the end of the 2-year course the candidate is expected to have a working knowledge about various technical aspects of anaesthesia including anesthetic medications, anesthetic procedures, sterilization procedures, patient and operation theater safety, monitoring and equipments usage by the anesthesiologist. They are expected to independently assist the anesthesiologist in preparation of operation theaters / ICUs / cath labs / imaging suits like MRI & CT scans for anaesthesia, and conduct of anaesthesia for various procedures.

ELIGIBILITY

Diploma in Electronics/Biomedical Engineering/Instrumentation from a recognized institution with a good academic record. Admission to the course is based on the rank secured via an entrance examination and viva conducted yearly by the institute.

COMPETENCE AT THE END OF TRAINING

At the end of two years, the candidate after obtaining DOTAT is expected to;

- To assist anesthesiologists in various settings in safe and effective conduct of anaesthesia to patients.
- To prepare appropriate anaesthesia machines/ventilators, monitoring equipment, gadgets like airway, specific advanced cardiac and neuromonitoring equipments like echocardiography, ultrasound, transcranial doppler, drugs, catheters for invasive lines, cylinder gases and supplies for required for various anesthetic procedures.
- Apply sterile techniques in preparing equipment and supplies.
- Clean, sterilize, disinfect, stock, order and maintain routine anaesthesia equipments and supplies.
- Demonstrate an understanding of basics working knowledge on the human anatomy, physiology and pharmacology, local, regional and general anaesthesia.
- Demonstrate patient care skills, including transferring, positioning, monitoring and transporting patients.
- Identify patient & occupational hazards such as electrical, radiation, chemical and biological.
- Demonstrate ability to use medical terminology, acronyms, symbols and abbreviations.
- Skilled in computerized data maintenance.
- Service and maintenance of costly equipments, oxygen pipelines

Theoretical knowledge to be acquired (First year)

Anatomy

Basic knowledge about heart, vascular systems, lungs and airways, brain, spinal cord, liver, kidneys, bones, joints and muscles.

Physiology

Circulatory physiology, renal physiology, respiratory physiology, hepatic, endocrine, brain and spinal cord functions, coagulation system, temperature and homeostasis.

Pharmacology

Different routes of administration, storing of drugs, dosage and preparation of drugs in OT suite, Pharmacology of anesthetic drugs (inhalational, intravenous, local anesthetics), muscle relaxants, adjuvant drugs used in anaesthesia (opioids, analgesics, steroids, bronchodilators, insulin, antiepileptics, inotropes, vasodilators, heparin, protamine, intravenous fluids etc), blood and blood products.

Microbiology

Infections, infection control practices, Sterilization, common pathogens, hospital acquired infections, microbial safety, biohazards.

Monitoring

X-ray chest basics, ECG basics, Pulse oximetry, capnograph, invasive pressure monitoring, bispectral index, neuromuscular monitoring, basic and advanced life support.

Theoretical knowledge to be acquired (Second year)

Pathology

Coronary artery disease, valvular heart disease, acyanotic and cyanotic heart disease, thoracic pathologies needing surgery, cath lab organization, endovascular and interventional cardiology basics.

Intracranial pressure, Brain tumors, intracranial aneurysms, epilepsy and movement disorders.

Spinal cord diseases.

Anaesthesia

Medical gas cylinders, Gas Manifold, anaesthesia machine, vaporizers, endotracheal tubes, airways, laryngoscopes, difficult intubations gadgets, resuscitation bags, airways, ventilators, etc.

Basics of anesthetic management of cardiac, thoracic and vascular diseases.

Anesthetic management of neurosurgical patients for various procedures.

Management of patients for anaesthesia outside operating room.

Arterial blood gases, echo machine, Thromboelastography (TEG), Neuromonitoring

Safety and Hazards

Patient safety, Electrical safety, occupational safety

Fire safety, Biohazard

Medical records

Basics of record keeping, Cost management

Practical / Clinical / Laboratory experience

1. Setting up of anaesthesia machine
2. Preparation of drugs, labeling for anaesthesia.
3. Setting up equipments, airway, etc. prior to anaesthesia.
4. Assist anesthesiologist to administer anaesthesia.
5. Sampling for investigations, blood gas analysis,
6. Sterilization and disinfection of various equipments, biohazard materials
7. Blood and blood products ordering, storing and handling.
- 8 Setting of various monitoring devices relevant to the case.
9. Medical gas cylinders handling, manifold room handling.
10. Transport of sick patients for various investigations.
11. Respiratory therapy: suctioning, FOB use, basic physiotherapy
12. Pulmonary function tests: how to do, equipment and basic interpretation
13. Patient positioning during surgery: techniques, safety, preparation and complications
14. Basic aspects of arterial blood gas analysis & electrolytes.
15. Record keeping of data, equipments, drugs and cost accounting, computers use.

TEXTBOOKS

1. Lee Synopsis of Anaesthesiology
2. Dorsch and Dorsch-A practical approach to anaesthesia equipment
3. Berry & Kohn's Operating Room Techniques
4. Paul Barash Clinical Anaesthesia; Chapters in cardiac anaesthesia, vascular and Thoracic anaesthesia, Neuroanaesthesia, Anaesthesia outside operating rooms.

STUDENT POSTINGS

Place	No. of Months	
	1 st year	2 nd year
CSOT	3 months	3 months
NSOT	3 months	3 months
PSOT	2 months	2 months
Cath labs/MRI/CT scan	1.5 months	1.5 months
DCE/CSSD/Gas Manifold	2.5months	2.5 months

MONTHLY ACADEMIC PROGRAMS

The students will be taught by didactic lectures and group discussions regarding the theoretical aspect of training. Lectures will be taken by the anaesthesia faculty, senior residents, anaesthesia technicians and biomedical engineers.

[Academic schedule:](#)

Tuesdays: 3-4 pm (Neuroanaesthesia division)

Thursdays 3-4 pm (Cardiac anaesthesia division)

Saturdays 11-12 (anaesthesia technicians, computer, medical records and DCE)

Practical Training

DOTT students will be given practical training in the operation rooms and other anaesthesia sites in the form of discussions, practical demonstration, hands on training related to basics, handling, identifying problems and remedial measures of anaesthesia techniques, various equipments, sterilization procedures etc.

MONITORING MECHANISMS

The academic activities and training of the students will be monitored by the following persons each assigned to specific areas.

HOD & Scientific Assistant in charge of Division: Head of the department along with scientific assistant in charge has overall responsibility of the training program. PIC and Program Coordinator monitor the functioning time to time.

Program In charge (PIC): Program In charge is an anaesthesia consultant who defines the academic program for the year. He/She takes care of smooth functioning of the academic classes including the practical aspects of training. The PIC will report to the Head of the department regarding any difficulties.

Program Coordinators (PC): Program coordinators from each division of anaesthesia and clinical engineering and anaesthesia technicians assess the academic progress of the students including working condition, duty hours. They will ensure that academic lectures are taken properly. They will report have regular meetings with PIC to improve the academic activity. They will also help student to undertake a project. They will be responsible for the logbook, projects.

Student Representative: A representative from the student will monitor the difficulties students face in day to day activities and report to PIC

LOGBOOK & INTERNAL EVALUATION

The students should maintain a logbook regarding the practical work done by them during their different posting. An internal evaluation based on the following criteria will be used to assess the progress of the candidates and grades will be given at the end of the course.

Criteria for internal evaluation (marks 100)

1. Anticipation of anaesthesia techniques and preparation
2. Sterility precautions
3. Quality of assistance given to anesthesiologist
4. Proficiency and skills in performing procedures
5. Attitude towards patients
6. Good manners
7. Inter personnel relationship
8. Ability to carry out duties independently

Grading (For Internal Evaluation)

A (exceptional) > 80%	B (very good) 60 - <80%
C (good) 50 to < 60%	D (below average) <50%

EXIT EXAMINATION

Theory examination: One question paper for 100 marks (10 questions of 10 marks each)

Viva voce: 100 marks

Components of viva:

1. Drugs-20 marks
2. Anaesthesia Equipments (machines, endotracheal tubes, laryngoscopes etc)- 20 marks

3. Case based problem solving -20 marks
4. Sterilization methods and safety issues-20 marks
5. BME-20marks

Candidate has to score 50% in theory and viva for a pass

SYLLABUS-ANAESTHESIA

1) Anatomy

- Cell and its organelles
- Basic tissues: Muscular system - smooth muscles cardiac muscles - neuro muscular junction
- Cardiovascular, Thoracic system
- Gastrointestinal, renal and reproductive system
- Brain and spinal cord, peripheral nerves
- Autonomous nervous system, Anatomy for vascular access

2) Physiology

- Cardiac and respiratory physiology
- Cerebral physiology
- Homeostasis, Coagulation, Temperature
- Blood groups, basic biochemistry

C) Pathology and Microbiology

- Basic pathology related to cardiac, respiratory and nervous system relevant to anesthesiologists
- Infectious diseases -Bacterial, Viral, Fungal
- Catheter related blood stream infections, Sepsis
- Ventilator associated pneumonia
- Bio medical waste management
- Immunization schedule
- Safety measures for infected case.

D) Sterilization and Asepsis

- Aseptic Techniques - Cleaning, Disinfection and Sterilization
- Classifying equipment for sterilization
- Methods and techniques - Advantages and disadvantages
- Sterilization of operation theater
- Personal protective equipment

E) Pharmacology

Part 1

- Antihypertensives - Beta Adrenergic antagonists - Alpha Adrenergic antagonists - Peripheral and pulmonary Vasodilators - Calcium channel blockers, prostaglandins, Nitric oxide
- Antiarrhythmic drugs
- Coronary vasodilators
- Antianginal and anti-failure agents
- Lipid lowering & anti atherosclerotic drugs
- Drugs used in Haemostasis, anticoagulants
- Thrombolytics and antithrombolytics
- Cardioplegic drugs
- Calcium, Potassium, Magnesium, sodium bicarbonate
- Inotropes and Vasopressors
- Respiratory medications

Part 2

- Antiepileptic agents
- Osmotic diuretics
- Intravenous fluids (crystalloids and colloids)
- Steroids
- Antiemetics
- Opioids and analgesics
- Intravenous anesthetic agents

- Inhalational anesthetic agents
- Muscle relaxants
- Local anesthetics and adjuvants.
- Medical gases
- Hormones; Vasopressin, Insulin, Glucagon, Thyroxine

F) Anaesthesia

a) Assessment

- Pre Anaesthetic Checkup, Investigations
- Biochemistry - Blood glucose, Urine analysis, Urea, Creatinine
- Haematology - Haemogram, Prothrombin Time, Partial thromboplastin time, Bleeding time, Clotting time
- ECG, X ray - ABG - Sample collection
- PFT (Lung volumes)
- Difficulty predicting factors - Grades and scores (ASA, Malampatti, GCS etc)
- CT scan, MRI, DSA

b) Preparation

- Accepting Criteria for surgery (ID, Diagnosis & Surgery, type of anaesthesia, consent, NPO, Prosthesis, Lab results, consultation, Blood, any other complications)
- Premedication: aims, drugs
- Checking the machine, laryngoscopes, endotracheal tubes, airways, suction apparatus, oxygen, flow meters, O₂ bypass, valves, vaporizers, gas supply, cylinders, anaesthetic drugs and emergency drugs, preparation of carts.
- Soda lime, malignant hyperpyrexia and management

c) Monitoring

- ECG, NIBP, ABP, Pulse oximetry, Capnography, Anesthetic agent monitoring
- Respiratory monitoring: ventilator display and loops.
- CVS: CVP, Pulmonary artery pressures, basics of echo, cardiac output
- Coagulation monitoring, ACT, Arterial and venous blood gas
- Neuromonitoring: EEG, depth of anaesthesia, evoked potentials, intracranial pressure, SjVO₂

monitoring

- Ultrasound basics

d) Anaesthesia management

Types of anaesthesia

- General - regional - epidural - spinal - nerve blocks - Needles
- Day care anaesthesia
- Anaesthesia outside OT - methods, gadgets and drugs for each
- Cardiac anaesthesia
- Thoracic anaesthesia
- Neuroanaesthesia
- Positioning

Endotracheal intubation

- Types of endotracheal tubes
- Types of laryngoscopes
- Techniques of intubation
- Complications of intubation
- Airway guidelines
- Emergency airway management
- Aids for difficult intubation
- Confirmation of tube position
- Securing the tube

Anaesthesia workstations and Ventilators

- Safety systems
- Parts and functions
- Accessories: Cylinders, Pipeline system, Vaporizers, Open and Closed system, scavenging

Intravenous drug Delivery systems

- Syringe pumps
- TCA, PCA pumps
- Volumetric pumps
- Intravenous and intra arterial catheters

Termination and recovery

- Nerve stimulators
- Reversal of neuromuscular blockage

- Extubation
- Problems on recovery
- Transfer of the patient
- Transport of critically ill patients

G) Therapy

1. Oxygen therapy: Oxygen administering devices, Causes and responses to hypoxemia, Clinical signs of hypoxemia, Goals of oxygen therapy, Evaluation of patients receiving oxygen therapy

2. Cardiac and respiratory arrest: CPR - Cardiac assist devices (Defibrillator, Pace maker, IABP)

3. Nebulization

H) Miscellaneous

- Patient and work place safety
- Hazards and prevention
- Documentation and data entry
- Anaesthesia and economy

SYLLABUS-DIVISION OF CLINICAL ENGINEERING (DCE)

First year- Duration: 2.5 months

	Theory	Practical	Self study
1. General awareness of the DCE workflow	05hrs	25hrs	15hrs
2. Electrical system	10hrs	20hrs	20hrs
3. Electronic equipments	05hrs	20hrs	20hrs
4. Understanding hospital equipments	05hrs	25hrs	25hrs
5. Tools and Instruments	05hrs	20hrs	20hrs
6. Understanding principle, operation and routine maintenance of following machines.			
a. Gas Manifold	05hrs	20hrs	20hrs

b. Anaesthesia Machine	05hrs	20hrs	20hrs
c. Ventilators	05hrs	20hrs	20hrs
d. Hemodynamic monitors	05hrs	20hrs	20hrs
e. Operation theatre equipments	05hrs	20hrs	20hrs
f. Supporting Equipments for Anaesthesiology	05hrs	20hrs	20hrs
7. Seminar	02hrs	10hrs	08hrs

Second year Duration: 2.5 months

1. Electrical Safety and standards	10hrs	30hrs	30hrs
2. Imaging equipments	10hrs	30hrs	30hrs
3. Maintenance management	10hrs	30hrs	30hrs
4. Understanding principle, operation and routine maintenance of following machines			
a. Resuscitation Equipments	10hrs	30hrs	30hrs
b. Test and Calibration equipments	10hrs	30hrs	30hrs
5. Seminar	02hrs	10hrs	08hrs
6. Project	10hrs	60hrs	60hrs