MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Super Specialty Courses

SYLLABUS

DM –CARDIAC ANAESTHESIA

Notice

1. Amendment made by the Medical Council of India in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.

2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.

3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

Syllabus of DM/M.Ch. Courses

DM –CARDIAC ANAESTHESIA

Selection of Candidates:

There shall be a uniform entrance examination to all medical educational institutions at the Postgraduate level namely 'National Eligibility-cum-Entrance Test' for admission to postgraduate courses in each academic year and shall be conducted under the overall supervision of the Ministry of Health & Family Welfare, Government of India.

In order to be eligible for admission to Postgraduate Course for an academic year, it shall be necessary for a candidate to obtain minimum of marks at 50th percentile in the 'National Eligibility-Cum-Entrance Test for Postgraduate courses' held for the said academic year. However, in respect of candidates belonging to Scheduled Castes, Scheduled Tribes, and Other Backward Classes, the minimum marks shall be at 40th percentile. In respect of candidates with benchmark disabilities specified under the Rights of Persons with Disabilities Act, 2016, the minimum marks shall be at 45th percentile for General Category and 40th percentile for SC/ST/OBC.

The percentile shall be determined on the basis of highest marks secured in the All India Common merit list in National Eligibility-cum-Entrance Test for Postgraduate courses.

Provided when sufficient number of candidates in the respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test held for any academic year for admission to Postgraduate Courses, the Central Government in consultation with Medical council of India may at its discretion lower the minimum marks required for admission to Post Graduate Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the academic year only.

The reservation of seats in Medical Colleges/institutions for respective categories shall be as per applicable laws prevailing in States/Union Territories. An all India merit list as well as State-wise merit list of the eligible candidates shall be prepared on the basis of the marks obtained in National Eligibility-cum-Entrance Test and candidates shall be admitted to Postgraduate Courses from the said merit lists only.

There shall be no admission of students in respect of any academic session beyond 31st August under any circumstances or beyond the date announced by the National Medical Commission/Supreme Court of India. The Universities shall not register any student admitted beyond the said date.

Eligibility:

S. No.	Area of Specialisation	Prior Requirement
1	DM Cardiology	MD (Medicine / Paediatrics)
2	DM Medical Gastroenterology	
3	DM Nephrology	
4	DM Neurology	
5	M.Ch. Cardio vascular & Thoracic Surgery	MS (Surgery)
6	M.Ch. Urology	
7	M.Ch. Neuro-Surgery	
8	M.Ch. Plastic Reconstructive Surgery	
9	DM Cardiac Anaesthesiology	(MD/DND Anaesthesiology)

Common Counseling:

There shall be a common counseling for admission to all Postgraduate Super specialty Courses (DM/ M.Ch.) in all Medical Educational Institutions on the basis of merit list of the National Eligibility-cum-Entrance Test.

Period of Training:

The period of training for obtaining DM/M.Ch Degrees shall be three completed years including the examination period.

Migration:

Under no circumstance, Migration/transfer of student undergoing any Super Specialty course shall be permitted by any University/ Authority.

Staff - Faculty:

Only those teachers who possess 6 years teaching experience out of which at least 2 years teaching experience as Assistant Professor gained after obtaining the higher specialty degree shall be recognized post graduate teacher.

No teacher shall be considered as a postgraduate teacher in any other institution during the period till the postgraduate course at the institute which has been granted permission considering him as a postgraduate teacher is recognized u/s 11(2) of the Indian Medical Council Act, 1956.

Minimum staff required (Super-speciality):

1- Professor

1- Associate Professor

1- Assistant Professor

1- Senior Resident

2- Junior Resident

Training Programme:

All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year (Academic Term of 6 months) including assignments, assessed full time responsibilities and participation in all facets of the educational process.

No candidate shall be permitted to run a clinic/work in clinic/laboratory/nursing home while studying postgraduate super specialty course. No candidate shall join any other course or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration.

Every institution undertaking Post Graduate training programme shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training programme in each speciality in consultation with other department faculty staff and also coordinate and monitor the implementation of these training Programmes.

The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the training undergone

by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

Post Graduate students shall maintain a record (log) book of the work carried out by them and the training programme undergone during the period of training including details of surgical operations assisted or done independently by M.Ch. candidates.

The Record (Log) Books shall be checked and assessed periodically by the faculty members imparting the training.

During the training for award of Degree / Superspecialty in clinical disciplines, there shall be proper training in Basic medical sciences related to the disciplines concerned; so also in the applied aspects of the subject; and allied subjects related to the disciplines concerned. In the Post Graduate training programmes including both Clinical and Basic medical sciences, emphasis has to be laid on Preventive and Social aspects. Emergency care, facilities for Autopsies, Biopsies, Cytopsies, Endoscopy and Imaging etc. shall also be made available for training purposes.

The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to nonlinear mathematics shall be imparted to the Post Graduate students.

The teaching and training of the students shall include graded responsibility in the management and treatment of patients entrusted to their care; participation in Seminars, Journal Clubs, Group Discussions, Clinical Meetings, Grand Rounds, and Clinico-Pathological Conferences; practical training in Diagnosis and Medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialitites.

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; with practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization. Postgraduate Superspecialty Residents in Surgical Specialties shall participate in Surgical operations as well.

A postgraduate student of a postgraduate degree course in super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

Enrolment and Registration:

Every candidate who is admitted to DM/MCh. course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled and registered with the Mahatma Gandhi University of Medical Sciences & Technology upto November 30 of the year of admission without late fees upto December 31 of the year of admission with late fees after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application for the enrolment/eligibility along with the following original documents with the prescribed fees –

1. MD/MS pass Marks sheet/Degree certificate issued by the University.
2. Migration certificate issued by the concerned University (in case the University is other than the MGUMST).
3. Date of Birth Certificate

4. Certificate regarding registration with Rajasthan Medical Council / Medical Council of India / Other State Medical Council.

Eligibility to appear for University Examination :

1. **Work diary or Logbook**: Every candidate shall maintain a work diary for recording his/her participation in the training program conducted in the department. The work diary and logbook shall be verified and certified by the Department Head and Head of the Institution.
2. Every student would be required to present one poster presentation, to read one paper at a National/State Conference and to have one research paper which should be published/accepted for publication/ sent for publication to an indexed journal during the period of his/her post graduate studies so as to make him/her eligible to appear at the Post Graduate Degree Examination
3. **Attendance:** Every candidate shall have fulfilled the requirement of 80% attendance during each academic year of the postgraduate course (as per MCI rules).
4. Research projects to be completed and submitted before the end of one and half years.

Scheme of Examinations:

The examination shall be held at the end of three academic years (six academic terms). The academic term shall mean six months training period. The examination shall consist of: Theory and Clinical/Practical and Oral.

The examinations shall be organised on the basis of 'Marking system' to evaluate and to certify candidate's level of knowledge, skill and competence.

For passing DM/M.Ch. examination as a whole, a candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory (2) Clinical / Practical and Oral examination.

(1) **Theory:**

There shall be four theory papers of 3 hours duration and 100 marks each. Out of the four theory papers, one Paper-I shall be on 'Basic Sciences', and another Paper-IV on 'Recent Advances'. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

Paper I and II will be set by one external examiner from outside of the state and paper III and IV by another external examiner from outside of the state. The external examiner, who is paper setter for paper I & II shall evaluate the answer books of paper II. The external examiner, who is paper setter for paper III & IV shall evaluate the answer books of paper III. The answer books of paper I & IV shall be evaluated by internal examiners. The answer books of paper IV shall be evaluated by the Head of the Department and the answer books of paper I shall be evaluated by the second Internal Examiner.

Candidates will be required to attempt all the questions in every question paper. In Paper I, Paper II and Paper III there will be 10 questions. Each question shall carry 10 marks. In Paper IV there will be 5 questions of 20 marks each.

Obtaining a minimum of 40% marks in each theory paper and not less than 50% cumulatively in all the four papers shall be compulsory to pass the examination.

Theory Paper :

The theory examination shall consist of 4 papers of 100 marks each.

Paper-I, Paper-II and Paper-III shall consist of 10 questions each. Every question shall carry 10 marks.

Paper-IV shall consist of 5 questions of 20 marks each.

All questions shall be compulsory.

Each theory paper shall be for 3 hours.

Paper I: **Basic Sciences as applied to Cardiac Anaesthesia, Monitoring in cardiac anaesthesia**

Paper II: **Principles and practice of Adult Cardiac Anaesthesia**

Paper III: **Paediatric Cardiac Anaesthesia, Thoracic and Vascular anesthesia, Transesophageal echo cardiography**

Paper IV: **Intensive care medicine as applicable to cardiac anaesthesia, Recent advances in cardiac anaesthesia, and intensive care**

B) Clinical examination: Total=300 marks

(2) Clinical / Practical and Oral:

Clinical/Practical examination shall be conducted to test / aimed at assessing the knowledge and competence of the candidate for undertaking independent work as a specialist / teacher. Practical examination shall consist of carrying out special investigative techniques for Diagnosis and Therapy. M.Ch candidates shall also be examined in surgical procedures. Oral examination may be comprehensive enough to test the candidate's overall knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the super-specialty, which shall form a part of the examination.

There shall be one long case of 150 marks, two short cases of 75 marks each, Instruments/Radiology/Pathology/Bones & Splints / Operations (5 marks each) and Viva examination of 75 marks. Obtaining of 50% marks in Clinical / Practical and Oral

examination shall be mandatory for passing the Clinical / Practical and Oral examination.

Part I: **Clinical Cases (300 marks)**

- One long case : 100 marks
- Two short cases : 25 mark each (25x2=50 marks)
- Equipments : 25 marks
- Drugs : 25 marks
- CXR, ECG,CAG : 25 marks
- TEE : 25 marks
- Internal assessment : 50 marks

Clinical Practical and Viva Voce

Students will be taken into the operating rooms where live demonstration and evaluation of TOE views and their interpretation will be evaluated. The long case will be for 45 minutes and each short case about 20 minutes. Viva Voce for drugs and equipments will be for a period of 20 minutes each. The candidates are also given ECG, X-rays to be interpreted. Various equipment, used in OT, intensive care, drugs, fluids, catheter for invasive monitoring are also required to be interpreted and discussed.

Result:

For passing DM/M.Ch. Examination, a candidate will be required to obtain at least 40% marks in each theory paper, 50% marks in the aggregate of all the four theory papers and 50% marks in the aggregate of Clinical / Practical and Oral examination separately. A candidate failing in any theory paper or in the aggregate of all four theory papers or Clinical / Practical and Oral examination shall have to repeat the whole DM/M.Ch. examination.

Grace Marks

No grace marks will be provided in DM/M.Ch. examinations.

Revaluation / Scrutiny

No Revaluation shall be permitted in the DM/M.Ch. examinations. However, the student can apply for scrutiny of the answer books as per University Rules.

Examiners:

As per the Amendment Notification of the MCI dated June 5, 2017, no person shall be appointed as an internal examiner in any subject unless he/she has three years experience as recognized PG teacher in the concerned subject. For external examiners, he/she should have minimum six years of experience as recognized PG teacher in the concerned subject.

For all Post Graduate Super specialties examinations, the minimum number of Examiners shall be four, out of which at least two (50%) shall be External Examiners, who shall be invited from other recognised universities from outside the State.

Number of Candidates:

The maximum number of candidates to be examined in Clinical / practical and Oral on any day shall not exceed three for D.M./M.Ch examinations.

Number of Examinations:

The university shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

Curriculum for DM Cardiac-Anaesthesia

Preamble

DM (Cardiac Anesthesiology) course is designed to train candidates in the principles and practice of Cardiac Anesthesia to enable them to conduct anaesthesia and intensive care to cardiac patients and to function as faculty/consultant in Cardiac Anesthesia and Cardiac Thoracic, preoperative and postoperative intensive care.

Aiims and Objectives of the Course

The aim of the course is to impart thorough and comprehensive training to the candidate in the various aspects of this specialty to enable them:

- To function as a faculty/consultant in the specialty.
- To carry out and help in conducting applied research in the field of cardiac anesthesia.
- To plan and set-up independent cardiac anaesthesia unit catering to cardiothoracic vascular surgery and intensive cardiac care and cath lab.

Basic Curriculum

Basic sciences include Anatomy, Physiology, Pharmacology, Physics, Biochemistry, coagulation, CPB –Pharmacokinetics during CPB.

Monitoring, diagnostic techniques involves cardiology, diagnostic and therapeutic.

Special consideration

- Cardio pulmonary bypass, drugs related to anaesthesia on CPB
- Pulmonary life-Support
- advanced cardiac life support

Operative Observations

- Operative direct care (Conduct of anaesthesia).

- Post-operative care and pain relief.
- Research Projects / Exchange Program with other Centers:
- Examinations:
  - Basic Sciences (Theory and Practical)
  - Clinical Practice of Anaesthesia
  - Allied Sciences.
  - Recent advances.

General

- History of anaesthesia for thoracic & cardiovascular surgery.
- Natural History of Cardiac & Pulmonary diseases, Demography.
- Diagnosis, Pre-Op. evaluation & Preparation for surgery.

Detailed Syllabus

Basic Sciences

- ANATOMY: Cardiac embryology, development of heart, pulmonary and vascular anatomy, coronary artery anatomy.
- PHYSIOLOGY: Cardiac cellular Physiology, haemodynamics, Autonomic nervous system, Cardiac functions, Blood Physiology, Coagulation cascade, and action potential.
- Cardiac arrhythmia:
- Pulmonary: pulmonary physiology, pulmonary function tests, blood gas analysis, physiology of ventilation.
- Pulmonary airway mechanics, one lung ventilation, Thoracotomy and pulmonary physiology, Renal, Hepatic, CNS, endocrinal System, others System, metabolic effects of surgery, Endocrines response to anaesthesia and surgery.
- PATHOPHYSIOLOGY: Heart Failure, Congenital defects, COAD, Cardiopulmonary reserves, acquired cardiac & pulmonary diseases. Vascular pathology.
- Immunological response and metabolic response during CPB.
- PHARMACOLOGY: Total circulatory arrest, Pharmacokinetics & Pharmacodynamics of anaesthetic and vasoactive drugs, biochemical reactions, applied concepts. Drugs related to anaesthesia practice.
- Cardiovascular drugs, Bronchodilators.
- Current concepts in antibiotics usage, antiarrhythmic drugs, and nitric oxide.
- PHYSICS: Basic concepts, Analyzing, measuring & monitoring devices, electronics, computing of patient's data. Laser in cardiac surgery, robotic technique.
- EQUIPMENT: Computer application, Maintenance, monitoring techniques, equipment in OT, equipment for transport of patients.
- ICU equipment**.**

Clinical Science

- Anaesthesia for Cardio-thoracic & Vascular Surgery.
- Anaesthesia for diagnostic procedures in adults & Paediatric age groups.
- Anaesthesia for Cardiac Surgery: For closed & Open heart surgery.
- Anaesthesia for Vascular Surgery: Aortic surgery, cartoid artery surgery.

Paediatric:

- Basic haemodynamics, palliative procedures, Pre-op. preparations & special care in monitoring, Fluid balance & airway management.
- Anaesthesia for neonatal complex cardiac surgery.
- Anaesthesia management for re-surgery.
- Paediatric diagnostic procedures in Cath Lab & echocardiography.
- Invasive therapeutic techniques like ASD devices, stent in major vessels, coil embolization.

Adult:

- Anaesthesia for ischemic heart disease, valvular heart disease, vascular disease, adult and congenital heart surgery.
- Electrophysiological & Arrhythmia surgery.
- Heart transplant, heart lung transplant, ventilator assets devices.
- Anaesthetic techniques for pulmonary surgery (Diagnostic & elective).
- Emergency procedures for lung surgery. One - Lung anaesthesia / Ventilation, Physiotherapy (gas exchange & airway dynamics).
- Anaesthesia during emergency surgery and direct emerging from cath lab after cath lab complication.
- Anaesthesia in patients for diagnostic & palliative procedures in Cardiology, Radiology cath LAB (outside operative rooms), Invasive cardiology procedure.
- Anaesthesia management of re-surgery.
- Management of Post-Operative ventilatiory care, prolonged ventilation, weaning, Control of Pain - its techniques & agents used. Postoperative pain management.
- Intra op. monitoring, PAC, Cardiac output coagulation monitoring.

Cardiopulmonary Bypass

- Perfusion technology, principles, equipment, oxygenators, haemofiltration
- Hypothermia techniques & protocols.
- Myocardial Protection.
- Haemodilution.
- Anticoagulation, Pharmacology, monitoring methods.
- Side-effects, complications & management.
- Subsystem care - cerebral, renal, and Hepatic protection, cerebral protection, cerebral monitoring.
- Total circulatory arrest, left heart bypass.
- Anaesthesia management during CPB.
- Pharmacoakinetics & pharmacodynamics of drugs during CPB.

Intensive Care Management

- Protocols for sub-system care, cerebral, Renal, Hepatic & others.
- Ventilatory Care, weaning of Ventilatory support, Parenteral Nutrition, control of infection.
- End stage renal failure, bedside dialysis techniques.
- Postoperative management of single ventricular repair.
- Hepatic failure.
- ICU monitoring technique in postoperative pain management.
- ICU Management, especially after neonatal surgery – ventilatory support in neonates, ECMO program for neonates and children.
- Intensive coronary care.
- Cerebral monitoring.

Allied Sciences

- Cardiac Surgery: Surgical technique, curative surgery, Palliative procedures, Risk
- Evaluation, prognosis, and Robotic surgery.
- Cardiology and cardiac Radiology: Pre-op. evaluation, pathophysiology, Electrophysiology, Diagnostic Procedures-ECG, x-ray, Angiography, Cardiac Cath,
- Doppler's. Echocardiography, nuclear studies & their interpretations. Treatment of disease, Special procedures: Pacing, Cardio version, PTCA, etc.
- Automated cardioverters, invasive procedures for arrhythmia i.e. ablation of abnormal pathway.
- Biotechnology: Various mechanical & electronic equipments, Animal experiments, materials used for CPB techniques, VAD, IABP, Laser for TMR, and ECMO.
- Statistics: Statistical technique
- Hospital Administration: Sterilization/Gas supply, equipment maintenance

Monitoring in Anaesthesia

Invasive & Non-Invasive monitoring techniques for Pre-operative, peri-operative & Post-operative periods in cardiothoracic centre:

- Understanding of basic concepts of monitoring.
- Indications, cost effectiveness, complications.
- Equipment usage & knowledge of accessories.

Knowledge of the following monitoring —

- Cardiac functions: ECG, ABG, Vent. Pressures, Calculation of cardiac output, resistance, Flow, Echo, Doppler & (CAT, PET, NMR)
- Pulmonary functions: PFT, Blood gases, Acid-base, Pulmonary Airway mechanics.
- Coagulation Profile: Temperature, ACT, Heparin & Protomine regulation, thromboelastography.
- Neuromuscular blockade: And other recent advances in monitoring, BIS, cerebral oximetry, evoked potential monitoring, CNS monitoring during CPB.

Recent Advances

Knowledge of recent developments in field of Cardio thoracic & vascular surgery

- Cardiology - PTCA, Balloon embolectomy etc.
- Heart - lung transplant - physiology, pharmacology (Anaesthetic consideration), Donor – recipient selection.
- Immunosupression etc.
- Cardiac assisting devices - Artificial heart, IABP, LHAD
- Advances in Pulmonary support - ECMO, H.F. Ventilation
- Blood substitutes
- Current advances and concepts in drugs, equipments, and monitoring methods
- Virtual bronchoscopy

Teaching Methods

- During the period of training candidates follow in-service residency program. They work as senior resident and are given gradually increasing responsibility – for
- independently managing the sample cardiac operations and decision making in intensive care management, and Cath Lab investigative procedure and various intensive monitoring.
- The day to day work of the trainees will be supervised by the consultants of the department of cardiac anesthesiology. The posting is so designed that the trainee get posted in various areas of the department like operation theatre, postoperative ICU, Intensive coronary care unit, cath. Lab, echo room. He or she will be leaving invasive cardiology diagnostic procedure and therapeutic procedure done in cath lab, invasive monitoring, and emergency services. Beside this a program for demonstrations, seminars, workshops, and journal club will also be organized.

Teaching Programme

The following teaching program is prescribed for the course:

- Operation theatre 4 days/week
- Intensive care unit duties 2 days/week
- DM seminar Once week
- Journal Club Once a week
- Surgery/Cardiothoracic Once a week
- Cath Lab Once a week
- Bed side case discussion Once a week

Teaching of MD. Anesthesia, by the DM student if available is part of the training.

Intensive Coronary Care Unit

During their posting in CCU for one month; the candidate is required to be attending the CCU rounds and learn for himself, the coronary intensive care in addition to the ventilatory care.

Pediatric Cardiology Intensive Care

For their one month posting in pediatric intensive care unit, trainees will be participating in the teaching, ward rounds and in addition their teaching programs, in cardiology cath labs and echo room.

Cardiac Radiology

During their posting in Cardiology, trainees are required to participate in radiology meet and teaching program and also echo room training.

The trainee is made conversant with the technique of various invasive cardiac therapeutic and diagnostic procedures in adults, children and neonates, as well as in CT scan and MRI scan also under the guidance of cardiac radiologist for one month. Cardiac radiological investigations are conducted every day and a special posting will be done for getting conversant with these produces.

Cath Lab

A special posting for cath lab for handling the neonates and children undergoing investigative and therapeutic procedure and also for insertion of implants / pacemaker in adult patients. They will learn current advancing in imaging cardiology during their posting in cath lab.

Period of Posting in Various Units

- The trainee will be posted in different specialties and during this, posting will be as following:
- Cardiac Anaesthesia 2 years
- CTVS 3 months
- Cath Lab 2 months
- Echo room 1 month
- ICCU 1 month
- Paediatric ICU 1 month
- Research experience 1 month (optional)
- Elective posting 3 months

Assessment

Regular three internal assessment both in theory and clinical should be made for every candidate. Internal assessment will be made in day-to-day work of the trainee, which involves patient care, teaching, anaesthesia management in the operation room, emergency service, bed side presentation and research.

Research

The trainee shall be required to undertake research and write papers under the guidance of consultant. The candidate will have to submit a proposal/topic for the project work within three months of the joining of the course. The work period for the project will be 1½ year to 2 year. Papers from the project should be accepted for publication in an indexed journal. Another article as first author should also be submitted for publication in an indexed journal before the candidate appears in the final DM. Cardiac Anesthesiology examination.

Cardiac Anesthesia Curriculum

The Head of the Department will also coordinate and monitor the implementation of the program mentioned in this. The training program shall be updated as and when required. The trainer shall maintain a log book of the work assigned to them.

List of Procedures to be Performed

Procedure Under	Supervision	Independently
Femoral catheterization	10	100
Subclavian and Internal jugular Catheterization	10	100
TOE	50	100
PA Catheter insertion	5	50
Bronchoscopy	15	15
Percutaneous Tracheostomy	5	15
IABP Insertion	5	10

Orientation to Information

1. Library

The postgraduate students need to become familiar with the books, periodicals, and other publications pertaining to Cardiac Anaesthesia that are available in the Institution. A list of such books will be on record in the department. In addition to this, department will develop and maintain *Departmental Library*, which will contain highly specialized books and publications from which the postgraduate can benefit.

2. Research

The component of research shall be promoted by encouraging candidates to undertake projects during the first two years of their course.

This objective may be achieved either through intramural programs or by enrolling postgraduates in extramural programs providing the necessary training.

3. Monitoring of Teaching/ Learning Activities

Activity	Periodicity of Assessment	Method
Journal clubs	Monthly	Faculty and Peer review
Seminars	Monthly	Faculty and Peer review
Theory Knowledge	Six monthly	Written tests
Clinical performance	Six monthly	Clinical exam
Procedures	Monthly	Log book
Research & Presentation	Three monthly	Logbook & Faculty peer view

Text Books for Reference

The following textbooks are recommended for reference:

1	Cardiac anesthesia	Joel Kaplan,Reich,Konstadt
2	Pediatric cardiac intensive care	Chang, Hanley
3	Perioperative care in cardiac anesthesia and surgery	Cheng, Davy
4	A practical approach to cardiac anesthesia	Hansley, Martin
5	Pediatric cardiac anesthesia	Carol .l. Lake,Peter .D. Booker
6	Clinical recognition of Congenital Heart disease	Joseph .K.Perloff
7	Principle and practice of mechanical ventilation	Tobin
8	Anesthesia for cardiac surgery	James A. Dinardo
9	Principles of Crititcal Care	Hall,Jesse B
10	Blood gas analysis: A practical perspective	Shyam sunder T
11	Heart transplantation	Kirklin, james K
12	The ICU book	Marino, Paul L
13	Clinical Anesthesiology	Morgan, Edward G
14	Understanding Anesthesia Equipment (R)	Dorsch, Jerry A
15	Medicine for Anesthetists	Vickers, M D

16	Procedures and techniquies in intensive care Management	Irwin and Richard S
17	Essentials of Anaesthetic Equipment	Al-Shaikh, Baha
18	Anesthetic Physiology and Pharmacology	McCaughey, William
19	Paediatric Anesthesia (R)	Gregory, George A
20	Anesthesia and Co-existing Disease (R)	Stoelting, Robert K
21	Textbook of Regional Anesthesia ®	Raj, Prithvi P
22	Clinical application of mechanical ventilation	Chang, David W
23	Drugs and Equipment in Anaesthetic Practice	Paul, Arun Kumar
24	Pain Management	Main, Chris J
25	Procedures and Techniques in Intensive Care Medicine	Irwin, Richard S
26	Mechanical Ventilation	MacIntyre, Neil R
27	Essential Anatomy for Anesthesia	Black, Sue M
28	Miller's Anesthesia Vol.1(R)	Miller, Ronald D
29	Miller's Anesthesia Vol.2(R)	Miller, Ronald D
30	Mechanical Ventilation and Nutrition	Verma, P K
31	Pediatric Cardiac Anesthesia	Lake, Carol L
32	Laryngeal Mask Anesthesia	Brimacombe, Joseph R
33	Comprehensive Textbook of Intraoperatively Tran esophageal Echocardiography	Savage, Robert M
34	A practical approach to transesophageal echocardiography	Albert Perrino
35	Oh's Intensive Care Manual	Bernsten, Andrew
36	Cardiovascular Physiology for Anesthesiologists	Gordon
37	Nunn's Applied Respiratory Physiology	Lump
38	Principles of Critical Care	Hall,Jesse B
39	ECG Complete	Bowbrick,Steven
40	ECG in Emergency Decision Making	Wellens
41	Electrocardiography in Clinical Practice	Chou, Te-Chuan
42	Lung function tests	Hughes,J M B
43	Chou's Electrocardiography in Clinical Practice	Surawicz, Borys
44	Marriott's Practical Electrocardiography	Wagner, Galen S
45	Handbook of Clinical Electrocardiography	Koley, Kumar Tapas
46	Twelve-Lead Electrocardiography	Foster,Bruce D
47	An Introduction to Electrocardiography	Colin, Schamroth
48	Advanced Therapy in Cardiac Surgery	Franco, Kenneth L
49	Glenns Thoracic and cardiovascular surgery Vol 1&2	Baue, Arther E
50	Clinical cardiovascular and pulmonary physiology	Rosedorff, clive
51	Blood Conservation in Cardiac Surgery	Krieger, Karl H
52	Cardiac Surgery	Doty, Donald B
53	Nadas' Pediatric Cardiology	Fyler, Donald C
54	Pediatric Cardiology - Vol. 1 (R)	Anderson, Robert H
55	Pediatric Cardiac Surgery	Mavroudis, Constantine
56	Bronchoscopy	Udaya B S Prakash
57	Interventional bronchoscopy	Bolliger, C T

List of Recommended Journals

- Anesthesiology clinics
- British journal of anesthesia
- Anesthesia analgesia
- Critical care clinics
- Critical care medicine

- Current opinion in critical care
- Indian journal of anaesthesia
- Journal of cardio thoracic and vascular anaesthesia
- Advances in anaesthesia
- Annals of cardiac anaesthesia
- Canadian journal of anaesthesia

MODEL PAPER

DM Examination Month, Year

CARDIAC ANAESTHESIA

Paper-I Basic Sciences as applied to Cardiac Anaesthesia, Monitoring in cardiac anaesthesia

Time: Three Hours **Maximum Marks: 100**

Attempt all questions

Each question carries 10 marks

Draw diagrams wherever necessary

Q1. Write a note on history of cardiac anaesthesia, early cardiac surgery using cardio-pulmonary bypass

Q2. Discuss chambers of heart and its anatomical variation

Q3. Write note on Coronary auto regulation. Enumerate factors affecting myocardial oxygen balance.

Q4. Significance of pulmonary function tests in pre operative evaluation.

Q5. Importance of Medical record keeping in cardiac anesthesia.

Q6. preoperative optimization of coronary patient on anti-platelet agents.

Q7. Explain cardiac cycle. Why LVEDP value is important.

Q8. Indication, Classification and anesthesia management of permanent pacemakers.

Q9. Physiology of one lung ventilation. Write indication of OLV in CTV Surgery.

Q10. Write pharmacology of Anti heart failure drugs. Explain management of end stage patient waiting for heart transplant surgery.

MODEL PAPER

DM Examination Month, Year

CARDIAC ANAESTHESIA

Paper II: Principles and practice of Adult Cardiac Anaesthesia

Time: Three Hours **Maximum Marks: 100**

Attempt all questions

Each question carries 10 marks

Draw diagrams wherever necessary

Q1. Which are common rhythm disturbances you encounter during cardiac surgery . Write brief management of SVT.

Q2. Write anesthesia management of 64 yr, old male patient presented for CABG with diagnosis of ACS,TVD mod.MR. with EF of 40% ?

Q3. Describe important considerations and management of anesthesia in full term pregnant patients with mitral stenosis for elective LSCS

Q4. How will you manage low BP, high PAP, low CO in low EF patient?

Q5. Write essay on fluid therapy in cardiac surgery patients.

Q6. Discuss pathophysiology and management of post cardiopulmonary bypass pump systemic inflammatory syndrome.

Q7. How do you diagnose massive air embolism during cardiac surgery? What measure you will take to manage above condition?

Q8. Discuss Anaesthetic management of TAVI.

Q9. Cardiac pre-conditioning and its relevance to clinical practice.

Q10. Write advantages and indications of modified ultrafiltration.

MODEL PAPER

DM Examination Month, Year

CARDIAC ANAESTHESIA

Paper-III Paediatric Cardiac Anaesthesia, Thoracic and Vascular anaesthesia, Transesophageal echo cardiography

Time: Three Hours **Maximum Marks : 100**

Attempt all questions

Each question carries 10 marks

Draw diagrams wherever necessary

Q1. Discuss anaesthesia management of six-month child posted for PDA ligation.

Q2. Discuss anaesthesia management of sixty-year-old patient of atrial fibrillation for ablation surgery.

Q3. Write in brief about utility of intra-operative trans- thoracic echocardiography in pediatric cardiac surgery.

Q4. Management of postoperative bleeding after congenital heart surgery.

Q5. Write in short about Pain relief techniques in pediatric cardiac surgery

Q6. Discuss the shunt calculation in CHD and it's effect on anesthesia management.

Q7. Anaesthetic management of TAPVC.

Q8. Write an essay on fetal circulation

Q9. Management of cyanotic spell.

Q 10. Compare and contrast alpha stat v/s pH stat.

MODEL PAPER

DM Examination Month, Year

CARDIAC ANAESTHESIA

Paper-IV Intensive care medicine as applicable to cardiac anaesthesia, Recent advances in cardiac anaesthesia, and intensive care.

Time: Three Hours **Maximum Marks: 100**

Attempt all questions
Each question carries 20 marks
Draw diagrams wherever necessary

Q1. Discuss anaesthetic management in TAVI

Q2. Discuss role of 3D Transoesophageal Echocardiography in mitral valve repair.

Q3. Write about the concept Cerebral protection it's advantages and role of NIRS during aortic arch surgery.

Q4. Current trends and recent advances in Cardiac output monitoring.

Q5. Discuss ECMO management of patient with Celphos poisoning in detail.