SRI GURU RAM DAS UNIVERSITY OF HEALTH SCIENCES

BACHELOR OF SCIENCE IN PERFUSION TECHNOLOGY (BPrT)

NCAHP-ALIGNED CURRICULUM TEMPLATE | SESSION 2026–2027

Four-Year Programme: Six Academic Semesters + One-Year Compulsory Internship (Semesters VII–VIII)

Prepared with reference to the uploaded NCAHP Draft Competency-Based Curriculum for Perfusion Technology (NCAHP Act, 2021)

Status note: The uploaded NCAHP document is marked as a draft public-notice curriculum dated 23 October 2026. This university template is therefore described as NCAHP-aligned and should be placed before the competent University/Board of Studies for review and approval. Institutional course codes, academic regulations and implementation details should be finalized by the University.

Applicable from Academic Session 2026

1. Programme Overview

Parameter	NCAHP-aligned programme provision
Programme	Bachelor of Science in Perfusion Technology (B.Sc. PrT)
Duration	Four years, comprising six academic semesters and one year of compulsory internship (Semesters VII and VIII)
Programme structure	Semester-based competency-based curriculum
Total credit points	174
Total contact hours	4,635
Internship	12 months / 2,340 hours / 54 credits across Semesters VII and VIII
Semester duration	18 weeks for Semesters I–VI; internship as prescribed in Semesters VII–VIII
Instructional components	Lectures (L), Tutorials (T), Practical/Clinical learning (P)
Assessment terminology	CIE: Continuous Internal Examination/Assessment; ESE: End-Semester Examination; NUES: Non-University Examination/assessment-based course

2. Semester-wise Course Structure and Assessment Scheme

The following tables reproduce the course codes, titles, teaching scheme, credit points, contact hours and assessment distribution from the uploaded NCAHP draft curriculum. L=Lecture; T=Tutorial; P=Practical/Clinical; CP=Credit Point.

SEMESTER I

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 101	Basics Human Anatomy	3+1+1	5	90	Theory: 30+70; Practical: 30+70
2	BPrT 102	Basic Human Physiology	3+1+1	5	90	Theory: 30+70; Practical: 30+70
3	BPrT 103	Biochemistry & Molecular Biology	2+0+1	3	60	Theory: 30+70
4	BPrT 104	Introduction to Healthcare System & Perfusion Profession	1+0+0	1	15	Theory: 15+35
5	BPrT 105	Communication Skills & Functional English	1+0+0	1	15	Theory: 15+35
6	BPrT 106	Medical Ethics, Medical Terminology & Documentation	1+0+0	1	15	Theory: 15+35
7	BPrT 107	Hospital Orientation & Infection Control	1+0+0	1	15	Theory: 15+35
8	BPrT 108	Basic Emergency Care, First Aid & BLS	1+1+1	3	60	Theory: 15+35
SEMESTER TOTAL			**13+3+4**	**20**	**360**	**750**

SEMESTER II

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 201	Cardiovascular Anatomy	3+1+0	4	60	Theory: 30+70
2	BPrT 202	Cardiovascular Physiology	3+0+0	3	45	Theory: 30+70
3	BPrT 203	Pathology & Pathophysiology	2+1+1	4	75	Theory: 30+70; Practical: 30+70
4	BPrT 204	Microbiology, Immunology & Infection Prevention	2+1+0	3	45	Theory: 30+70
5	BPrT 205	Basic Pharmacology	1+0+0	1	15	Theory: 15+35
6	BPrT 206	Public Health & Epidemiology and Healthcare Delivery System	1+0+0	1	15	Theory: 15+35
7	BPrT 207	Computer Applications & Medical Informatics	1+0+1	2	45	Theory: 15+35
8	BPrT 208	Introduction to Perfusion Technology	1+0+1	2	45	Theory: 30+70; Practical:30+70
		SEMESTER TOTAL	**14+3+3**	**20**	**345**	**850**

SEMESTER III

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 301	Perfusion Technology–Applied I	3+2+5	10	225	Theory: 30+70; Practical: 30+70
2	BPrT 302	Cardiovascular Pharmacology	2+1+1	4	75	Theory: 30+70; Practical: 30+70
3	BPrT 303	Transfusion Medicine & Blood Component Therapy	1+1+1	3	60	Theory: 30+70; Practical: 30+70
4	BPrT 304	Professionalism and Values	2+1+0	3	45	Theory: 15+35
		SEMESTER TOTAL	**8+5+7**	**20**	**405**	**650**

SEMESTER IV

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 401	Perfusion Technology Clinical I	5+1+4	10	210	Theory: 30+70; Practical: 30+70
2	BPrT 402	Core Principles of Anesthesia for Extracorporeal Circulation Technologies	3+2+2	7	135	Theory: 30+70; Practical: 30+70
3	BPrT 403	Research Methodology & Biostatistics	2+1+0	3	45	Theory: 30+70
		SEMESTER TOTAL	**10+4+6**	**20**	**390**	500

SEMESTER V

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 501	Perfusion Technology– Advanced I	4+2+4	10	210	Theory: 30+70; Practical: 30+70
2	BPrT 502	Cardiovascular Pathology & Pathophysiology	3+2+3	8	165	Theory: 30+70; Practical: 30+70
3	BPrT 503	Healthcare Management & Leadership	2+0+0	2	30	Theory: 15+35
SEMESTER TOTAL			**9+0+4**	**20**	**405**	**450**

SEMESTER VI

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 601	Perfusion Technology-Applied II	3+2+2	7	135	Theory: 30+70; Practical: 30+70
2	BPrT 602	Perfusion Technology-Clinical II	3+2+2	7	135	Theory: 30+70; Practical: 30+70
3	BPrT 603	Perfusion Technology-Advanced II	3+1+2	6	120	Theory: 30+70; Practical: 30+70
SEMESTER TOTAL			**9+5+6**	**20**	**390**	**600**

SEMESTER VII

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 701	Compulsory Rotational Internship	0+0+24	24	1080	100
SEMESTER TOTAL			**0+0+24**	**24**	**1080**	**100**

SEMESTER VIII

S. No.	Course Code	Course Title	L+T+P	CP	Contact Hours	Assessment (CIE+ESE)
1	BPrT 801	Compulsory Rotational Internship	0+0+24	24	1080	100
2	BPrT 802	Dissertation / Minor Research Project	0+0+6	6	180	Theory: 30; Practical: 70
SEMESTER TOTAL			**0+0+30**	**30**	**1260**	**200**

3. Programme Credit and Contact-Hour Summary

Semester	Maximum Marks	Credits	Contact Hours
Semester I	750	20	360
Semester II	850	20	345
Semester III	650	20	405
Semester IV	500	20	390
Semester V	450	20	405
Semester VI	600	20	390
Semester VII	100	24	1080
Semester VIII	200	30	1260
GRAND TOTAL	**4,100**	**174**	**4,635**

Credit conversion as stated in the NCAHP draft: Lecture/Tutorial–1 credit = 15 hours; Practical – 1 credit = 30 hours; Clinical laboratory postings –1 credit = 45 hours.

Internship contact hours: Semester VII –1,080 hours; Semester VIII – 1,080 hours; Dissertation/Project – 180 hours. Total internship-related contact hours = 2,340 hours.

5.1 *Course Syllabus -Bachelor of Science in Perfusion Technology (B.Sc. (PrT))*

Course Name: Basics Human Anatomy-I			
Course Code	**Course Title**	**Credit**	**Contact Hours**
BPrT 101	Basics Human Anatomy	5	90
Course Rationale: Students will understand the structure and function of organs and organ systems in the human body.			
Learning Objective: At the end of the course, students should be able to ● Comprehend the gross, functional and applied anatomy of various structures in the human body. ● Identify the microscopic structures of various tissues and organs in the human body and correlate the structure with the functions. ● Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyze the integrative and regulative functions of the organs and systems.			

Unit	Topic	Hours
I.	**Basic Anatomy:** Introduction to Anatomy, terms and terminology. Regions of Body, Cavitiesand Systems. Surface anatomy – Musculoskeletal, vascular, cardio-pulmonary system. General Embryology.	**8**
II	**Tissues**- Classification and description of the basictissues of the body. Histology: Epithelium, compact bone, muscles, connective tissue, nervous tissue, artery, vein and lymphatic tissue. Connective tissue & its modification, tendons, membranes, and special connective tissue.	**8**
III	**Musculoskeletal system:** Bone structure, blood supply, ossification, and classification. Muscle classification, structure, types and functional aspects. Joints–classification, structures of joints, movements, range, blood supply, nerve supply, dislocations	**8**

IV	**Respiratory system:** Structure of the upper and lower respiratory tract. Thorax: Pleural cavities& pleura, Lungs and respiratory tree, Heart and great vessels, Diaphragm	**10**
V	**Digestive system -** Parts/Structure of digestive system, Abdominal cavity - divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, Intestine (small & large), and accessory organs of digestion	**6**
VI	**Excretory System:** Anatomy of the Kidney. Structure of the kidney, ureter, urinary bladder, male and female urethra. General description of pelvic organs. **Lymphatic system-** Lymphatic vessels and lymph, lymph nodes, Spleen. Mediastinum – division and contents	**10**
VII	**Cardiovascular system:** Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal & external features, Blood supply to heart, Conductive system of heart	**10**
VIII	**Nervous system:** Classification of the nervous system. Nerve – structure, classification, microscopy with examples. Spinal cord-anatomy, structure and features of Meninges, Ventricles of the brain, CSF circulation	**8**
IX	**Sensory system:** Structure of the Visual system, Auditory system, Gustatory system, Olfactory system, Somatosensory system, Skin	**8**
X	**Reproductive system:** Structure of male and female reproductive organs. **Endocrine system:** Pituitary gland, Thyroid, Parathyroid	**8**
	Total	**60**

Course Name: Basic Human Anatomy (Practical) **Credit =1 (30 hours)**

Course Rationale: Students will be able to identify and demonstrate anatomical structures of various organ systems.

1. Study of anatomical plans and positions
2. Histological study of tissues
3. Study of Skeletal system
4. Study of respiratory system
5. Study of digestive system
6. Study of urinary system
7. Study of Cardiovascular system
8. Study of Nervous system
9. Study of sensory organs: eye, ear, nose, tongue and skin
10. Study of reproductive system

*Clinical laboratory rotation/observation can be incorporated wherever possible

Suggested Readings:

- Ross and Wilson – Anatomy and Physiology in Health and Illness, 11th Ed., Elsevier
- Chaurasia B.D. – Human Anatomy, 7th Ed., CBS Publishers
- Gerard J. Tortora & Bryan H. Derrickson – Principles of Anatomy and Physiology, 14th Ed., Wiley
- Frank H. Netter – Atlas of Human Anatomy, 7th Ed., Elsevier
- Frederic H. Martini et al. – Fundamentals of Anatomy and Physiology, 9th Ed., Pearson
- Gray's Atlas of Anatomy – Richard Drake, Elsevier
- Manju Chugani & Preysi Chauhan – Simplified Anatomy and Physiology for Paramedical Students, Jaypee

COURSE NAME: HUMAN PHYSIOLOGY

Course Code	Course Title	Credit	Contact Hours

BPrT 102	Basic Human Physiology	5	90
Course Rationale: Students will gain knowledge of theorganization of human body cells, tissues, blood and physiological functions of various organ systems of the human body			
Learning Objective: At the end of the course, students should be able to ● Understand the functioning of various organ systems of the body and their interactions Elucidate the physiological aspects of normal growth and development			

Unit	Topic	Hours
I.	**General Physiology**- Cell: morphology, structure and function of cell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis	4
II	**Blood-Introduction**-composition & function of blood, WBC, RBC, Platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups- types, significance, determination, Hemoglobin, Hemostasis.	4
III	**Nervous system and muscle**: Organization of the nervous system. Structure and function of muscle and nerve cells. Functions of the brain, the Spinal cord, the cranial and spinal nerves, and the Motor system. Sensory system. ANS, Synapse, neuromuscular transmission reflex arc, reflex action and reflexes, Cerebrospinal fluid	8
IV	**Respiratory System**: General organization, Mechanics of respiration, Regulation of respiration, Gaseous exchange in lungs and tissues, Pulmonary ventilation, volumes and capacities, Effect of exercise on respiration, hypoxia.	6
V	**Digestive System**-Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver, pancreas & stomach, Gastrointestinal tract disorders	6
VI	**Renal System**: Functions of the kidney, urine formation, Glomerular filtration rate, clearance, Tubular function. Water excretion, concentration of urine-regulation of Na+, Cl-, K+ excretion, Physiology of urinary bladder	6
VII	**Lymphatic and immunological system**: Lymph glands and circulation of lymph, Spleen structure and function, Immunity – Formation of T-cells and B-cells, Antigen, Antibody and Immune response.	6
VIII	**Cardiovascular system:** Functions of the heart, organization of the cardiovascular system, structure and properties of cardiac muscles. Cardiac output, cardiac cycle, and conducting system of the heart. Heart sounds, regulation of heart rate, pulse, blood pressure and its regulation. ECG, cardio-respiratory changes during exercise	8
IX	**Endocrine system-** Physiology of the endocrine glands – Pituitary, Pineal Body, Thyroid, Parathyroid, Adrenal, Gonads, Thymus, Pancreas. Hormones secreted by these glands, their classifications, and their functions.	6
X	**Male and female reproductive system: Male**: functions of testes & penis, pubertal changes in males, testosterone: action & regulations of secretion, ejaculatory mechanism & dysfunction Female: functions of ovaries and uterus, pubertal changes, menstrual cycle, estrogens and progesterone action and regulation. Physiological changes during pregnancy, Placenta and placental circulation.	6
	Total	**60**

Course Name: Basic Human Physiology (Practical) Credit = 1 (30 hours)

Course Rationale: Students will develop an understanding of the normal functioning of human organ systems and explain their physiological processes.

1. Perform blood collection
2. Estimation of Hemoglobin
3. Demonstrate blood cell count – RBC count and WBC count
4. Measure Blood pressure and Pulse Rate
5. Demonstration of ECG
6. Demonstration of EMG
7. Perform Reflexes testing
8. Spirometry and PFT (Pulmonary function test)

*Clinical laboratory rotation/observation can be incorporated wherever possible

Suggested Readings:

- Guyton & Hall – Textbook of Medical Physiology, Elsevier
- C.C. Chatterjee – Human Physiology, Medical Allied Agency
- K. Sembulingam – Essentials of Medical Physiology, Jaypee
- Gerard J. Tortora & Bryan H. Derrickson – Principles of Anatomy and Physiology, 14th Ed., Wiley
- Ross and Wilson – Anatomy and Physiology in Health and Illness, 11th Ed., Elsevier

BPrT 103: BIOCHEMISTRY AND MOLECULAR BIOLOGY

Course Code	Course Title	Credit	Contact Hours
BPrT 103	Biochemistry and Molecular Biology	3	60

Course Rationale

This course provides fundamental knowledge of biochemistry and molecular biology relevant to perfusion practice. Students will understand biochemical principles underlying metabolism, blood gases, electrolytes, acid-base balance, inflammatory responses, and extracorporeal circulation. The course establishes a foundation for interpreting laboratory parameters and managing patients during cardiopulmonary bypass.

Learning Objectives

At the end of the course, students should be able to:

- Explain biochemical principles relevant to blood gases, electrolytes, metabolism, and extracorporeal circulation.
- Understand the fundamentals of molecular biology and inflammatory responses.
- Correlate biochemical changes with cardiopulmonary bypass monitoring and patient management.
- Interpret common biochemical and laboratory parameters encountered during perioperative cardiac care.

Unit	Topic	Hours
I	**Basic Biochemistry and Water Chemistry:** Water, pH, buffers and Henderson–Hasselbalch concept; acids, bases and electrolytes; osmolality and tonicity; proteins and enzymes; plasma proteins and albumin; carbohydrates and glucose metabolism; lipids and membrane structure; clinical chemistry sample handling.	**6**
II	**Blood, Oxygen and Metabolism:** Haemoglobin structure and oxygen binding; oxygen carrying capacity and saturation; glycolysis, Krebs cycle and oxidative phosphorylation; anaerobic metabolism and lactate; ATP and energy metabolism; metabolic response to hypoxia and hypothermia; free radicals and oxidative stress; biochemical markers used in cardiac care.	**6**
III	**Electrolytes, Acid-Base and Organ Function Tests:** Sodium, potassium, calcium and magnesium physiology; bicarbonate, base excess and anion gap; renal function tests; liver function tests; glucose monitoring and insulin; cardiac biomarkers; coagulation biochemistry; interpretation of perioperative laboratory values.	**6**
IV	**Molecular Biology Foundation:** DNA, RNA and protein synthesis; cell injury and apoptosis; inflammatory mediators and cytokines; complement system; genetic basis of disease; molecular diagnostics; biomarkers and personalized medicine; research relevance in perfusion sciences.	**6**
V	**Perfusion Biochemistry Correlations:** Hemolysis and plasma free haemoglobin; ischemia-reperfusion injury; contact activation on artificial surfaces; heparin and protamine biochemistry; cardioplegia solutions; prime solutions and colloids/crystalloids; electrolyte shifts during CPB; interpretation of ABG, lactate and electrolyte reports.	**6**
	Total	**30**

Practical / Tutorial / Clinical Learning Activities (Credit =1,30 hours)

1. Preparation and demonstration of simple buffer systems.
2. Interpretation of electrolyte, ABG and lactate reports.
3. Observation of glucose and lactate monitoring techniques.
4. Demonstration of sample collection, handling and common pre-analytical errors.

5. Case discussions on acid-base disorders and electrolyte imbalance.
6. Preparation of charts depicting biochemical changes during cardiopulmonary bypass.
7. Interpretation of common perioperative laboratory investigations.
8. Seminar presentation on inflammatory response during CPB.

Suggested Readings

1. Harper's Illustrated Biochemistry, McGraw-Hill Education.
2. Satyanarayana U. & Chakrapani U. – Biochemistry, Elsevier.
3. Vasudevan DM, Sreekumari S., Vaidyanathan K. – Textbook of Biochemistry for Medical Students.
4. Nelson DL & Cox MM – Lehninger Principles of Biochemistry.
5. Gravlee GP et al. – Cardiopulmonary Bypass: Principles and Practice.
6. Guyton and Hall – Textbook of Medical Physiology.
7. Gaw A., Murphy M.J., Cowan R.A. – Clinical Biochemistry.

BPrT 104: Introduction to Healthcare System & Perfusion Profession

Course Code	Course Title	Credit	Contact Hours
BPrT 104	Introduction to Healthcare System & Perfusion Profession	1	15

Course Rationale

This course provides students with a comprehensive understanding of the healthcare delivery system, hospital organization, cardiac surgical services, and the role of Perfusion Technology in modern cardiovascular care.

Learning Objectives

At the end of the course, students should be able to:

- Understand the healthcare delivery system in India.
- Explain the role of Perfusion Technologists in cardiac surgery and critical care.
- Describe the organization and functioning of cardiac surgical services.
- Understand operation theatre practices and patient safety measures.
- Identify professional organizations and regulatory bodies governing allied health professions.

Unit	Topic	Hours
I	Healthcare Delivery System in India – Primary, Secondary and Tertiary Healthcare; National Health Mission; National Health Policy; Referral System	3
II	Introduction to Perfusion Technology– History, Evolution, Scope of Practice, Career Opportunities	3
III	Hospital Organization and Cardiac Care Services – CTVS, ICU, Cath Lab, Blood Bank, Perfusion Services	3
IV	Operation Theatre Practices – Sterility, Infection Control, Equipment Familiarization, Surgical Team Dynamics	3
V	Professional Bodies and Regulatory Framework – MoHFW, NCAHP, State Councils, Registration and Licensing	1
VI	Patient Safety, Quality Assurance and Documentation in Cardiac Services	2
	Total	**15**

Suggested Readings

1. Glenn's Thoracic and Cardiovascular Surgery.
2. Cardiopulmonary Bypass: Principles and Practice – Gravlee.
3. Introduction to Allied Health Sciences – NCAHP Guidelines.
4. Manual of Clinical Perfusion – American Society of Extracorporeal Technology (AmSECT)

BPrT 105: COMMUNICATION SKILLS, FUNCTIONAL ENGLISH AND PROFESSIONALISM

Course Code	Course Title	Credit	Contact Hours
BPrT 105	Communication Skills, Functional English and Professionalism	1	15

Course Rationale

This course develops communication, interpersonal, presentation, leadership and professional skills required for effective practice in Perfusion Technology.

Learning Objectives

Communicate effectively with patients, relatives and healthcare professionals. Demonstrate professional behaviour and teamwork.
Develop presentation, documentation and interview skills.
Understand workplace ethics and professionalism.

Unit	Topic	Hours
I	Fundamentals of Communication – Communication Process, Verbal and Non-Verbal Communication, Barriers and Feedback	5
II	Healthcare Communication – Communication with Patients, Relatives and Multidisciplinary Teams	5
III	Functional English – Medical Vocabulary, Scientific Reading, Report Writing, Email Communication	6
IV	Professional Etiquette and Career Development – Grooming, Time Management, Resume Writing, Interview Skills, Presentation Skills	8
V	Professionalism and Leadership – Integrity, Accountability, Confidentiality, Leadership and Conflict Resolution	6
	Total	**30**

Suggested Readings

1. Communication for Healthcare Professionals – Gwen Van Servellen.
2. Functional English Grammar – Graham Lock.
3. Professionalism in Healthcare – ABMS Publications.

Effective Communication in Clinical Practice

BPrT 106: MEDICAL ETHICS, MEDICAL TERMINOLOGY AND DOCUMENTATION

Course Code	Course Title	Credit	Contact Hours
BPrT 106	Medical Ethics, Medical Terminology and Documentation	1	15

Course Rationale

This course introduces ethical principles, medical terminology, legal responsibilities and documentation practices relevant to Perfusion Technology.

Learning Objectives

- Apply ethical principles in clinical practice.
- Understand medico-legal responsibilities.
- Interpret medical terminology used in cardiac sciences.
- Maintain accurate clinical documentation.

Unit	Topic	Hours
I	Principles of Medical Ethics – Beneficence, Non-maleficence, Autonomy and Justice	3
II	Professional Ethics and Legal Responsibilities – Consent, Confidentiality, Negligence, Accountability	3
III	Medical Terminology – Prefixes, Suffixes, Roots, Cardiovascular and Surgical Terminology	3
IV	Clinical Documentation – Medical Records, Perfusion Records, EMR, Data Security	3
V	Quality Assurance and Accreditation – NABH, Documentation Standards, Incident Reporting	3
	Total	**15**

Suggested Readings

- Medical Terminology for Health Professions – Ehrlich & Schroeder.
- Bonnie F. Fremgen – Medical Law and Ethics, Pearson Education
- Jonathan Herring – Medical Law and Ethics, Oxford University Press
- ICMR – Ethical Guidelines for Biomedical Research on Human Participants (2017)
- Hazel Biggs-Healthcare Research Ethics and Law. Regulation, Review &Responsibility. (2010). Cavendish Biomedical Law & Ethics Library

BPrT 107: HOSPITAL ORIENTATION AND INFECTION CONTROL POSTING

Course Code	Course Title	Credit	Contact Hours
BPrT 107	Hospital Orientation and Infection Control	1	15

Course Rationale

This posting familiarizes students with hospital organization, infection prevention practices, patient safety measures and operation theatre environments.

Learning Objectives

- Understand hospital functioning and healthcare delivery.
- Demonstrate infection prevention practices.
- Apply biomedical waste management principles.
- Understand patient safety and occupational health practices.

Unit	Clinical Posting Activities	Hours
I	Hospital Orientation – OPD, IPD, Emergency Services, ICU and OT Services	**2**
II	Clinical Department Exposure – CTVS, Cardiology, ICU, Blood Bank, CSSD, Laboratory and Radiology Services	**2**
III	Infection Prevention and Control – Hand Hygiene, PPE, Isolation Precautions	**2**
IV	Biomedical Waste Management and Occupational Safety	**2**
V	Patient Safety, Fire Safety, Disaster Preparedness and Quality Assurance	**2**
VI	Observation in Cardiac OT and Perfusion Unit – Sterile Techniques, Perfusion Equipment and Workflow	5
	Total	15

Suggested Reading

1. Hospital Infection Control Guidelines – NCDC, Government of India.
2. WHO Guidelines on Hand Hygiene in Healthcare.
3. Biomedical Waste Management Rules, Government of India.
4. NABH Standards for Hospitals.
5. Infection Prevention and Control Manual for Healthcare Facilities

BPrT 108: BASIC EMERGENCY CARE AND FIRST AID

Course Code	Course Title	Credit	Contact Hours
BPrT 108	Basic Emergency Care and First Aid	3	60

Course Rationale

Students will acquire knowledge and **practical skills** necessary to recognize emergencies, provide first aid and perform basic life support.

Learning Objectives

- Assess emergency situations safely.
- Demonstrate CPR and Basic Life Support.
- Provide first aid for common medical and surgical emergencies.

Unit	Topic	Hours
I	Principles of First Aid, Emergency Assessment, Golden Rules of First Aid	**4**
II	Wounds, Bleeding, Burns, Fractures, Sprains and Bandaging Techniques	**2**
III	Poisoning, Snake Bite, Scorpion Bite, Dog Bite and Foreign Body Management	**3**
IV	Shock – Types, Clinical Features and Initial Management	**2**
V	Vital Signs Assessment – Pulse, Blood Pressure, Temperature and Respiration	**2**
VI	Basic Life Support (Adult and Paediatric CPR), Airway Management and Recovery Position	2
	Total	15

Practical / Tutorial / Clinical Learning Activities (Credit =1+1=2, Hours- 30+15=45)

- Adult, child, and infant CPR: Learn the proper techniques for chest compressions, rescue breaths, and AED use.
- Foreign airway obstruction: Understand how to recognize and manage choking in adults, children, and infants.
- Breathing emergencies: Learn how to assess and manage respiratory distress and provide oxygen therapy.
- Automated external defibrillation (AED): Get trained on how to safely and effectively use an AED in an emergency.
- Team dynamics and communication: Develop skills for effective communication and teamwork during emergencies.

Course Name: Cardiovascular Anatomy

Course Code	Course Title	Credit	Contact Hours
BPrT 201	Cardiovascular Anatomy	4	60

Course Rationale

Students will develop an advanced understanding of cardiovascular anatomy and its application in cardiac surgery, cannulation procedures, extracorporeal circulation, and Perfusion Technology practice.

Learning Objectives

At the end of the course, students should be able to:

1. Describe the detailed anatomy of the heart, coronary circulation, and great vessels.
2. Explain the anatomical basis of arterial and venous cannulation procedures.
3. Correlate cardiovascular anatomy with common cardiac surgical interventions.
4. Identify important anatomical structures using models, imaging modalities, and echocardiographic views.
5. Apply anatomical knowledge to safe beginner-level perfusion practice.

Course Content

Unit	Topic	Hours
I	**Detailed Cardiovascular Anatomy**• Heart chambers, valves and septa in greater detail• Aortic root, sinuses and coronary ostia• Mitral and tricuspid valve apparatus• Right and left ventricular anatomy• Coronary artery dominance patterns• Coronary sinus and venous anatomy• Aorta and arch branches• Pulmonary artery and pulmonary veins	15
II	**Cannulation Anatomy**• Ascending aorta cannulation anatomy• Right atrial, bicaval and femoral venous cannulation anatomy• Femoral artery and vein surface landmarks• Axillary and carotid artery anatomy• Aortic dissection and cannulation implications• ECMO cannulation anatomy overview• Vascular complications associated with cannulation• Anatomy of cannulation-related nerves and lymphatics	15
III	**Surgical Anatomy Correlation**• Coronary artery bypass grafting (CABG) anatomy and coronary territories• Valve surgery anatomy• Aortic surgery anatomy• Congenital cardiac defects: ASD, VSD, PDA and TOF• Pericardial reflections and surgical exposure• Sternotomy and re-entry risk anatomy• Transoesophageal echocardiography (TEE) anatomical views• Anatomy related to cardioplegia delivery	15
Total		**45**

Cardiovascular Anatomy Tutorial (Credit = 1, 15 Hours)

Course Rationale

Students will be able to identify cardiovascular anatomical structures and correlate them with perfusion procedures, cardiac surgery, and diagnostic imaging.

Tutorial / Clinical Learning Activities

- Identification of heart chambers, valves and septa using models and specimens.
- Study of coronary artery anatomy and coronary circulation.
- Identification of the aorta, aortic arch branches and pulmonary vessels.
- Demonstration of arterial and venous cannulation sites.
- Study of femoral, carotid and axillary vessel anatomy.
- Coronary artery mapping exercises.
- Correlation of cardiovascular anatomy with radiological images.
- Identification of echocardiographic anatomical views.
- Study of congenital cardiac defects using models and diagrams.
- Clinical case discussions based on cardiovascular anatomy.

*Clinical laboratory/operation theatre observation can be incorporated wherever possible.

1. Case-based discussion.
2. Tutorial and seminar presentation.
3. Relevant practical or clinical observation as per institutional availability.
4. Logbook maintenance and assignment submission.

Suggested Readings

1. Gray's Anatomy for Students — Drake, Vogl & Mitchell, Elsevier.
2. Clinically Oriented Anatomy — Moore, Dalley & Agur, Wolters Kluwer.
3. Netter's Atlas of Human Anatomy — Frank H. Netter, Elsevier.
4. Human Anatomy — B.D. Chaurasia, CBS Publishers.
5. Gray's Anatomy: The Anatomical Basis of Clinical Practice — Susan Standring, Elsevier.
6. Cardiac Surgery in the Adult — Lawrence H. Cohn.
7. Kirklin/Barratt-Boyes Cardiac Surgery — Elsevier.

BPrT 202: Cardiovascular Physiology

Course Code	Course Title	Credit	Contact Hours
BPrT 202	Cardiovascular Physiology	3	45

Course Rationale

This course provides an advanced understanding of cardiovascular, respiratory, and organ perfusion physiology relevant to cardiopulmonary bypass (CPB) and extracorporeal circulation. It emphasizes physiological principles underlying hemodynamic monitoring, oxygen transport, tissue perfusion, and organ protection during cardiac surgery. The course prepares students to interpret physiological parameters and apply them in safe and effective perfusion practice.

Learning Objectives

At the end of the course, students should be able to:

- Explain cardiovascular physiological mechanisms relevant to cardiopulmonary bypass and extracorporeal circulation.
- Describe the principles of oxygen transport, ventilation, gas exchange, and acid-base balance.
- Discuss the physiology of organ perfusion and autoregulation during normal and altered physiological states.
- Interpret physiological variables used in monitoring cardiac surgical patients.
- Perform basic perfusion-related physiological calculations and apply them to clinical scenarios.
- Correlate physiological concepts with patient management during cardiac surgery and extracorporeal support.

Course Content

Unit	Topic	Hours
I	**Cardiovascular Physiology for CPB•** Cardiac output and cardiac index• Preload, afterload and contractility• SVR, PVR and MAP relationships• Frank-Starling mechanism• Coronary perfusion pressure• Ventricular pressure-volume relationships• Shock physiology basics• Hemodynamic targets during CPB	12
II	**Respiratory and Oxygen Transport Physiology•** Ventilation and oxygenation• Oxyhaemoglobin dissociation curve• Oxygen delivery and consumption• Carbon dioxide transport• Acid-base regulation• Hypothermia and gas solubility• Alpha-stat and pH-stat introduction• ABG interpretation basics	**11**
III	**Organ Perfusion Physiology•** Cerebral blood flow and autoregulation• Renal blood flow and AKI risk• Hepatic and splanchnic circulation• Pulmonary vascular resistance• Myocardial oxygen balance• Microcirculation and capillary leak• Inflammatory response to CPB• Lactate as a perfusion marker	11
IV	**Applied Calculations•** BSA calculation awareness• Flow rate calculation basics• DO_2 calculation basics• SVR/PVR formula introduction• Temperature correction awareness• Oxygenator gas-flow concepts• Urine output targets• Clinical scenario interpretation	11
Total		**45**

Practical / Tutorial / Clinical Learning Activities

- Case-based discussions on cardiovascular and perfusion physiology.
- Interpretation of hemodynamic and arterial blood gas data.
- Calculation exercises related to cardiac output, flow rates, BSA, and oxygen delivery.
- Tutorial and seminar presentations on selected physiology topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.BPrT 203: Pathology and Pathophysiology

Course Code	Course Title	Credit	Contact Hours
BPrT 203	Pathology and Pathophysiology	4	75

Course Rationale

This course provides a comprehensive understanding of the mechanisms of disease and the pathological alterations affecting the cardiovascular and other organ systems. Emphasis is placed on disease processes commonly encountered in cardiac surgery and perfusion practice, including the pathophysiological consequences of cardiopulmonary bypass. The course enables students to correlate pathological changes with clinical findings, laboratory investigations, and perioperative patient management.

Learning Objectives

At the end of the course, students should be able to:

- Explain the fundamental mechanisms of cell injury, inflammation, repair, and circulatory disorders.
- Describe the pathology and pathophysiology of major cardiovascular diseases requiring surgical intervention.
- Discuss the systemic effects and complications associated with cardiopulmonary bypass and extracorporeal circulation.
- Correlate pathological findings with clinical presentation, laboratory data, and imaging findings.
- Interpret basic coagulation and pathology-related investigations relevant to perfusion

practice.

- Apply pathophysiological principles in planning safe and effective perfusion management strategies.

Course Content

Unit	Topic	Hours
I	**General Pathology**• Cell injury and adaptation• Necrosis and apoptosis• Inflammation and repair• Thrombosis and embolism• Shock and ischemia• Edema and congestion• Wound healing• Infection-related pathology basics	**15**
II	**Cardiovascular Pathology Basics**• Atherosclerosis and coronary artery disease• Myocardial infarction• Valvular heart disease• Rheumatic heart disease• congenital heart disease overview• Heart failure• Aortic aneurysm and dissection• Pulmonary hypertension	**15**
III	**CPB-Related Pathophysiology**• Haemodilution and coagulopathy• Inflammatory response to extracorporeal circuit• Haemolysis and platelet dysfunction• Ischemia-reperfusion injury• Renal dysfunction after CPB• Neurological complications overview• Pulmonary dysfunction after CPB• Low cardiac output syndrome overview	**15**
	Total	**45**

Practical / Tutorial / Clinical Learning Activities (Credit =1,30 hours)

- Examination and discussion of gross pathology specimens and histopathological images.
- Case-based discussions on cardiovascular diseases and surgical pathology.
- Interpretation of laboratory investigations, coagulation profiles, and pathology reports.
- Tutorials and seminar presentations on selected pathology and pathophysiology topics.
- Clinical correlation exercises linking disease processes with perfusion management.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission

BPrT 204: Microbiology, Immunology and Infection Prevention

Course Code	Course Title	Credit	Contact Hours
BPrT 204	Microbiology, Immunology and Infection Prevention	3	45

Course Rationale

This course introduces the fundamental principles of microbiology, immunology, and infection prevention relevant to Perfusion Technology and cardiac surgical practice. It provides knowledge of infectious agents, host immune responses, and evidence-based infection control measures required to ensure patient safety and maintain aseptic standards in operating rooms, intensive care units, and extracorporeal support environments.

Learning Objectives

At the end of the course, students should be able to:

- Describe the characteristics of common microorganisms and their role in healthcare-associated infections.
- Explain the basic principles of innate and adaptive immunity and their relevance to patient care.
- Discuss immune and inflammatory responses associated with surgery and extracorporeal circulation.
- Apply principles of sterilization, disinfection, and aseptic techniques in clinical practice.

- Identify strategies for preventing infections related to cardiac surgery, invasive devices, and extracorporeal support systems.
- Interpret basic microbiological and infection control data relevant to perfusion practice.

Course Content

Unit	Topic	Hours
I	**Microbiology Basics**• Bacteria, viruses, fungi and parasites overview• Normal flora and pathogenic organisms• Culture, sensitivity and antimicrobial basics• Sterilization and disinfection• Biofilm formation• Hospital pathogens: MRSA, VRE and gram-negative organisms• Bloodstream infection concepts• Sample collection awareness	10
II	**Immunology Basics**• Innate and adaptive immunity• Antigen, antibody and complement• Inflammation and cytokines• Hypersensitivity overview• Transplant immunology awareness• Immune response to artificial surfaces• Systemic inflammatory response syndrome (SIRS)• Immunosuppression and infection risk	10
III	**Infection Prevention in Cardiac Care**• Surgical site infection prevention• Central line infection prevention• Ventilator-associated infection awareness• Antibiotic prophylaxis overview• Sterile handling of perfusion disposables• ECMO circuit infection awareness• Water/heater-cooler infection concern awareness• Biomedical waste and occupational exposure	10
Total		**30**

Tutorial / Clinical Learning Activities (Credit =1,15 hours)

- Demonstration and practice of hand hygiene and PPE usage.
- Observation of sterilization and disinfection procedures.
- Interpretation of basic culture and sensitivity reports.
- Infection control audits and case-based discussions.
- Tutorial/seminar presentations on infection prevention topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.BPrT 205: Basic Pharmacology

Course Code	Course Title	Credit	Contact Hours
BPrT 205	Basic Pharmacology	1	15

Course Rationale

This course introduces the fundamental principles of pharmacology with emphasis on medications commonly encountered in cardiac surgery, critical care, and perfusion practice. It provides students with an understanding of drug actions, pharmacokinetics, pharmacodynamics, medication safety, and the pharmacological agents used in the perioperative management of cardiac surgical patients. The course promotes safe medication awareness and effective communication within the healthcare team.

Learning Objectives

At the end of the course, students should be able to:

- Explain the basic principles of pharmacokinetics and pharmacodynamics.
- Describe the actions, indications, and precautions of commonly used cardiovascular and perioperative drugs.
- Discuss the pharmacological basis of anticoagulation, hemodynamic support, and infection prevention in cardiac surgery.
- Recognize the effects of commonly used medications on cardiovascular physiology and perfusion parameters.
- Demonstrate awareness of medication safety practices, documentation, and communication requirements.

- Apply principles of safe drug handling and administration within the scope of perfusion practice.

Course Content

Unit	Topic	Hours
I	**General Pharmacology**• Pharmacokinetics and pharmacodynamics• Routes of administration• Dose, half-life and clearance• Drug interactions• Adverse drug reactions• Drug safety and documentation• Renal/hepatic dose considerations• Drug calculations awareness	4
II	**Cardiovascular Drugs Introduction**• Inotropes: dopamine, dobutamine, adrenaline awareness• Vasopressors: noradrenaline, vasopressin awareness• Vasodilators: nitro-glycerine and nitroprusside awareness• Antiarrhythmics overview• Beta blockers and calcium channel blockers• Diuretics and antihypertensives• Antiplatelets and anticoagulants overview• Drug effects on hemodynamic	4
III	**Drugs Relevant to Cardiac OT**• Anaesthetic agents overview• Muscle relaxants awareness• Analgesics and sedatives awareness• Antibiotics in cardiac surgery• Heparin and protamine introduction• Cardioplegia drug components• Electrolyte replacement awareness• Emergency drugs overview	4
IV	**Perfusion Safety**• Drug labelling and double-checks• Medication documentation on perfusion chart• Drug dilution awareness• Communication before drug administration• High-alert medication safety• Avoiding look-alike/sound-alike errors• Storage and cold chain awareness• Student limitations in drug handling	3
Total		**15**

Practical / Tutorial / Clinical Learning Activities

- Case-based discussions on pharmacological management in cardiac surgery.
- Tutorial and seminar presentations on selected pharmacology topics.
- Observation of medication preparation, labelling, and documentation practices.
- Drug calculation and dilution exercises.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 206: Public Health, Epidemiology and Healthcare Delivery System

Course Code	Course Title	Credit	Contact Hours
BPrT 206	Public Health, Epidemiology and Healthcare Delivery System	1	15

Course Rationale

This course introduces the principles of public health, epidemiology, and healthcare delivery systems with emphasis on cardiovascular health and allied healthcare services. It provides an understanding of disease prevention, health promotion, healthcare organization, and policy frameworks relevant to Perfusion Technology practice. The course enables students to appreciate the broader healthcare context in which cardiac surgical and perfusion services are delivered.

Learning Objectives

At the end of the course, students should be able to:

- Explain the concepts of health, disease, prevention, and health promotion.
- Describe basic epidemiological measures and their application in healthcare.
- Discuss the burden of cardiovascular diseases and major public health challenges in

India.

- Understand the structure and functioning of the Indian healthcare delivery system.
- Recognize the role of quality assurance, accreditation, and healthcare regulations in patient care.
- Appreciate the public health relevance of perfusion services and allied health professionals in improving healthcare outcomes.

Course Content

Unit	Topic	Hours
I	**Public Health Basics**• Concept of health and disease• Determinants of health• Levels of prevention• Burden of cardiovascular disease in India• Noncommunicable disease risk factors• Health education and screening• National health programs overview• Health equity and access	4
II	**Epidemiology Basics**• Incidence and prevalence• Rates, ratios and proportions• Risk factors and association• Study designs introduction• Screening test sensitivity and specificity• Outbreak and surveillance awareness• Hospital infection surveillance• Data interpretation basics	4
III	**Healthcare Delivery and Policy**• Indian healthcare system structure• Government and private hospital systems• Insurance and health schemes awareness• Tertiary cardiac care services• Quality and accreditation overview• Referral systems and rural access• Human resource needs in allied health• NCAHP and professional regulation awareness	4
IV	**Perfusion Service Public Health Relevance**• Cardiac surgery access and affordability• Blood conservation as a public resource issue• Device safety and procurement ethics• Outcome reporting and registries• Infection surveillance in cardiac OT• Cost-conscious perfusion practice• Disaster preparedness for cardiac units• Community relevance of allied health workforce	3
Total		**15**

Practical / Tutorial / Clinical Learning Activities

- Case-based discussions on public health and healthcare delivery issues.
- Tutorial and seminar presentations on epidemiological and healthcare policy topics.
- Review and interpretation of basic public health and healthcare data.
- Observation of hospital quality assurance and infection surveillance activities.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 207: Basic Computer Applications and Medical Informatics

Course Code	Course Title	Credit	Contact Hours
BPrT 207	Basic Computer Applications and Medical Informatics	2	45

Course Rationale

This course introduces students to fundamental computer applications and medical informatics relevant to healthcare and Perfusion Technology practice. It focuses on digital literacy, data management, electronic health records, healthcare information systems, and the use of computer applications for documentation, communication, audit, and research activities. The course equips students with essential digital skills required for modern clinical practice and healthcare data management.

Learning Objectives

At the end of the course, students should be able to:

- Demonstrate basic proficiency in computer applications commonly used in healthcare

settings.

- Utilize word processing, spreadsheet, and presentation software for academic and clinical purposes.
- Explain the principles and applications of medical informatics and healthcare information systems.
- Apply data management, analysis, and visualization techniques relevant to perfusion practice.
- Understand the importance of cybersecurity, data privacy, confidentiality, and digital professionalism.
- Use digital tools effectively for documentation, audit, communication, and lifelong learning.

Course Content

Unit	Topic	Hours
I	**Computer Basics**• Computer hardware and software• Operating systems and file management• Word processing for reports• Spreadsheet basics• Presentation software• Internet and academic search• Cybersecurity basics• Data backup and confidentiality	**5**
II	**Medical Informatics**• Electronic medical records• Hospital information system• Laboratory information system• Device-generated data• Digital perfusion chart concept• Data privacy and DPDP awareness• Telemedicine awareness• Digital professionalism	**5**
III	**Data Handling for Perfusion**• Spreadsheet formulas for simple calculations• Graphing flow, temperature and laboratory trends• Audit data entry• Basic descriptive statistics• Using reference managers awareness• Image and PDF handling• Creating checklists and forms• Data cleaning and error prevention	**5**
Total		**15**

Practical / Clinical Learning Activities (Credit =1,30 Hours)

- Hands-on exercises in word processing, spreadsheets, and presentation software.
- Creation of perfusion logbooks, audit databases, and clinical documentation templates.
- Literature search and reference management exercises.
- Data entry, graphing, and basic statistical analysis activities.
- Case-based discussions on data privacy, cybersecurity, and digital professionalism.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submissionBPrT 208: Introduction to Perfusion Technology

Course Code	Course Title	Credit	Contact Hours
BPrT 208	Introduction to Perfusion Technology	2	45

Course Rationale

This foundational course introduces students to the principles, equipment, and clinical applications of Perfusion Technology. It provides an overview of cardiopulmonary bypass (CPB), heart-lung machine components, extracorporeal circuits, oxygenators, reservoirs, filters, and circuit preparation. The course establishes the basic knowledge required for understanding advanced perfusion sciences and safe clinical practice in cardiac surgery and extracorporeal support.

Learning Objectives

At the end of the course, students should be able to:

- Describe the historical development and scope of Perfusion Technology.
- Explain the structure and function of major components of the heart-lung machine and extracorporeal circuits.

- Discuss the principles of blood pumping, gas exchange, filtration, temperature regulation, and circuit priming.
- Identify the components of a cardiopulmonary bypass circuit and trace blood flow through the system.
- Demonstrate awareness of perfusion safety principles, equipment checks, and documentation requirements.
- Correlate basic perfusion concepts with patient care during cardiac surgery.

Course Content

Unit	Topic	Hours
I	**Perfusion Technology Overview**• Definition and scope of Perfusion Technology• History and evolution of cardiopulmonary bypass (CPB)• Development of the first heart-lung machine• Indications for cardiopulmonary bypass• Components of the extracorporeal circuit• Basic safety principles in perfusion practice• Flow dynamics, body surface area (BSA) and physiological flow concepts• Overview of perfusionist roles and responsibilities	**5**
II	**Heart-Lung Machine and Circuit Components**• Roller pumps and centrifugal pumps: principles, advantages and limitations• Console operations, safety sensors, pressure monitors and battery backup systems• Tubing materials: PVC, silicone and polyurethane• Circuit anatomy: venous, arterial and suction pathways• Surface coatings and biocompatible circuits• Tubing diameters, resistance and shear stress concepts• Cannulas overview and circuit accessories	**5**
III	**Oxygenators, Reservoirs, Filters and Gas Exchange**• Evolution from bubble oxygenators to membrane oxygenators• Hollow-Fiber membrane oxygenator design and function• Principles of oxygen transfer and carbon dioxide removal• Heat exchangers and temperature management• Venous and cardiotomy reservoirs• Arterial filters and emboli management• Leukocyte-depleting and specialty filters• Oxygenator performance assessment and failure awareness	**5**
Total		**15**

Practical / Tutorial / Clinical Learning Activities (Credit =1,30 hours)

- Identification and demonstration of all heart-lung machine components.
- Tracing blood flow through the extracorporeal circuit.
- Observation of circuit assembly, priming, and de-airing procedures.
- Demonstration of safety devices, pressure monitoring systems, and alarms.
- Preparation of pre-bypass checklists and basic perfusion documentation.
- Interpretation of sample perfusion charts and circuit diagrams.
- Tutorial and seminar presentations on Perfusion Technology topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.BPrT 301: Perfusion Technology – Applied -I

Course Code	Course Title	Credit	Contact Hours
BPrT 301	Perfusion Technology – Applied- I	10	225

Course Rationale

This course provides hands-on and applied training in the assembly, preparation, operation, and monitoring of cardiopulmonary bypass (CPB) systems. Emphasis is placed on circuit setup, priming, de-airing, anticoagulation, monitoring, troubleshooting, and simulation-based learning. The course

bridges theoretical knowledge with supervised practical skills, preparing students for progressive clinical participation in perfusion practice.

Learning Objectives

At the end of the course, students should be able to:

- Assemble and prepare cardiopulmonary bypass circuits using standard protocols and aseptic techniques.
- Explain the principles of circuit priming, de-airing, anticoagulation, and initiation of cardiopulmonary bypass.
- Monitor and interpret essential perfusion parameters during simulated and supervised CPB procedures.
- Recognize common circuit-related problems and describe appropriate troubleshooting measures.
- Demonstrate adherence to safety protocols, documentation standards, and effective team communication.
- Perform basic perfusion-related tasks under supervision and maintain accurate clinical records.

Course Content

Unit	Topic	Hours
I	**CPB Circuit and Assembly**• Circuit design and blood pathway• Tubing packs and connectors• Arterial and venous lines• Pump heads and occlusion awareness• Oxygenator and reservoir selection• Filters and shunts• Pressure and temperature monitoring points• Assembly sequence and sterility	10
II	**Priming and De-Airing**• Crystalloid, colloid and blood prime concepts• Prime volume and haemodilution• Mannitol, bicarbonate and heparin in prime awareness• De-airing principles• Recirculation and warming/cooling check• pre-bypass safety checklist• Emergency prime awareness• Documentation of setup	10
III	**Conduct of CPB – Basics**• Anticoagulation and ACT target basics• Initiation of bypass• Maintaining flow, pressure and venous drainage• Temperature management• Gas flow and oxygenation control• ABG and electrolyte monitoring• Urine output and perfusion adequacy• Separation from bypass overview	10
IV	**Monitoring and Troubleshooting**• Low venous return• High arterial line pressure• Oxygenator performance issues• Air in circuit awareness• Haemolysis and pressure trauma• Pump failure and power failure awareness• Communication during troubleshooting• post-case cleaning and equipment check	**15**
Total		45

Practical / Tutorial / Clinical Learning Activities (Credit =5+2= 7, 150+30=180 hours)

- Dry laboratory assembly of cardiopulmonary bypass circuits.
- Supervised priming, de-airing, and circuit preparation exercises.
- Simulation-based CPB initiation and conduct sessions.
- Monitoring of pressure, flow, temperature, and gas exchange parameters.
- Emergency drills for air embolism, power failure, and low venous return scenarios.
- Case-based discussions and troubleshooting workshops.
- Tutorial and seminar presentations on Perfusion Technology topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance, competency assessment, and assignment submission.BPrT 302: Cardiovascular Pharmacology

Course Code	Course Title	Credit	Contact Hours
BPrT 302	Cardiovascular Pharmacology	4	75

Course Rationale

This course provides an in-depth understanding of pharmacological agents used in cardiac surgery, cardiopulmonary bypass, and perioperative cardiovascular care. Emphasis is placed on anticoagulation management, vasoactive medications, cardioplegia-related drugs, and medications commonly encountered in the cardiac operating room. The course enables students to understand drug actions, monitoring requirements, safety considerations, and their impact on perfusion management.

Learning Objectives

At the end of the course, students should be able to:

- Explain the pharmacological principles of anticoagulation and reversal during cardiopulmonary bypass.
- Describe the mechanisms, indications, and physiological effects of vasoactive and cardiovascular drugs.
- Discuss the pharmacological basis of cardioplegia and myocardial protection strategies.
- Identify medications commonly used in the cardiac operating room and intensive care environment.
- Recognize adverse drug reactions, drug interactions, and medication-related complications relevant to perfusion practice.
- Apply principles of medication safety, documentation, and communication in the perioperative setting.

Course Content

Unit	Topic	Hours
I	**Anticoagulation Pharmacology**• Heparin mechanism of action• Activated clotting time (ACT) monitoring• Heparin dose-response awareness• Antithrombin deficiency awareness• Heparin resistance basics• Protamine reversal• Protamine reactions• Heparin-induced thrombocytopenia (HIT) awareness	10
II	**Vasoactive Drugs**• Inotropes and mechanism overview• Vasopressors and vasodilators• Effects on SVR, PVR and MAP• Use during weaning from CPB awareness• Communication of vasoactive support• Drug preparation safety• Medication documentation• Adverse effects awareness	**5**
III	**Cardioplegia Pharmacology**• Potassium-induced cardiac arrest• Calcium and magnesium relevance• Lidocaine and procaine awareness• Crystalloid versus blood cardioplegia• Warm and cold cardioplegia concepts• Single-dose versus repeat-dose strategies• Drug safety in cardioplegia preparation• Myocardial protection goals	10
IV	**Other Cardiac OT Drugs**• Anaesthetic agents overview• Antiarrhythmic drugs• Diuretics and renal protective drugs• Antifibrinolytic agents• Antibiotics and surgical prophylaxis• Insulin and glucose control• Electrolyte replacement therapy• Emergency resuscitation drugs awareness	**5**
Total		**30**

Practical / Tutorial / Clinical Learning Activities (Credit =1+1=2) (Hours=15+30=45)

- Case-based discussions on cardiovascular pharmacology and perfusion-related drug management.

- Drug calculation and dosage interpretation exercises.
- Demonstration of ACT monitoring and anticoagulation management principles.
- Observation of medication preparation, labelling, and administration practices in the cardiac operating room.
- Review of cardioplegia formulations and myocardial protection strategies.
- Tutorials and seminar presentations on selected pharmacology topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 303: Haematology and Blood Component Therapy

Course Code	Course Title	Credit	Contact Hours
BPrT 303	Haematology and Blood Component Therapy	3	60

Course Rationale

This course provides fundamental knowledge of haematology, coagulation, and Blood Component Therapy relevant to cardiac surgery and Perfusion Technology. It focuses on blood components, haemostasis, coagulation monitoring, transfusion practices, and blood conservation strategies used during cardiopulmonary bypass. The course prepares students to understand laboratory investigations, transfusion requirements, and blood management principles essential for safe perfusion practice.

Learning Objectives

At the end of the course, students should be able to:

- Describe the structure and functions of blood cells and components involved in haemostasis.
- Explain the mechanisms of coagulation, fibrinolysis, and common bleeding disorders.
- Discuss the principles of blood grouping, compatibility testing, and transfusion medicine.
- Interpret basic haematological and coagulation investigations relevant to cardiac surgery.
- Understand blood conservation strategies and transfusion management during cardiopulmonary bypass.
- Apply principles of transfusion safety, traceability, and hemovigilance in clinical practice.

Course Content

Unit	Topic	Hours
I	**Haematology Basics**• RBC, WBC and platelet morphology• Haemoglobin and haematocrit• Anaemia and polycythaemia basics• Platelet function• Coagulation cascade• Fibrinolysis• Common coagulation tests• Blood sample handling	5
II	**Transfusion Medicine**• ABO and Rh blood groups• Crossmatch and compatibility testing• Packed RBC, FFP, platelets and cryoprecipitate• Massive transfusion principles• Transfusion reactions• Hemovigilance• Storage and transport of blood components• Irradiated and leuko reduced blood products awareness	5
III	**Blood Management in Cardiac Surgery**• Haemodilution during CPB• Bleeding after CPB• ACT, PT, aPTT, INR, fibrinogen and platelet count interpretation• TEG/ROTEM awareness• Cell salvage basics• Ultrafiltration and haemoconcentration• Antifibrinolytics awareness• Blood conservation strategies	5
Total		`15

Practical / Tutorial / Clinical Learning Activities (Credit=1+1=2,Hours 30+15=45)

- Demonstration of blood grouping and compatibility testing procedures.
- Interpretation of haematology, coagulation, and transfusion medicine reports.

- Case-based discussions on transfusion decisions and blood conservation strategies.
- Observation of blood component handling, storage, and transport procedures.
- Cell salvage and blood management demonstrations where available.
- Tutorials and seminar presentations on haematology and transfusion medicine topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 304: Professionalism and Values

Course Code	Course Title	Credit	Contact Hours
BPrT 304	Professionalism and Values	3	45

Course Rationale

This course develops professional attitudes, ethical values, communication skills, and teamwork competencies essential for safe and effective perfusion practice. It emphasizes professional conduct within the cardiac operating room environment, patient-cantered care, ethical decision-making, and continuous professional development. The course prepares students to function responsibly as members of multidisciplinary healthcare teams while upholding the highest standards of professional behaviour.

Learning Objectives

At the end of the course, students should be able to:

- Demonstrate professional conduct and appropriate workplace behaviour in clinical settings.
- Apply principles of effective communication, teamwork, and human factors to enhance patient safety.
- Recognize ethical responsibilities and professional obligations in perfusion practice.
- Maintain patient confidentiality, privacy, and respect in all professional interactions.
- Reflect on personal performance and utilize feedback for professional growth.
- Develop habits of lifelong learning, accountability, and continuous professional development.

Course Content

Unit	Topic	Hours
I	**Professional Conduct in OT**• Punctuality and preparedness• Sterile discipline and restricted access behaviour• Respectful communication• Confidentiality and privacy• Working under supervision• Accountability for delegated tasks• Professional appearance• Avoiding distractions and unsafe behaviour	10
II	**Teamwork and Human Factors**• Human factors in cardiac surgery• Situational awareness• Closed-loop communication• Task sharing and role clarity• Fatigue, stress and error risk• Briefing and debriefing• Speaking up for safety• Psychological safety	10
III	**Values and Ethics**• Patient-centred care• Integrity and honesty• Justice and fair resource use• Respect for patients and colleagues• Duty to maintain competence• Ethical handling of errors• Incident reporting culture• Lifelong learning values	10
Total		**30**

Tutorial / Clinical Learning Activities (Credit=1,15 Hours)

- Case-based discussions on professionalism, ethics, and patient safety.
- Role-play exercises focusing on communication, teamwork, and conflict resolution.
- Reflective writing and portfolio development activities.

- Participation in tutorials, seminars, and group discussions.
- Observation of professional conduct and team interactions in clinical settings.
- Development of individual professional growth and learning plans.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 401: Perfusion Technology – Clinical I

Course Code	Course Title	Credit	Contact Hours
BPrT 401	Perfusion Technology – Clinical- I	10	210

Course Rationale

This course provides supervised clinical training in the conduct of cardiopulmonary bypass and perioperative perfusion management. Students gain experience in patient assessment, circuit preparation, intraoperative monitoring, troubleshooting, documentation, and team communication. The course integrates theoretical knowledge with clinical application and promotes the development of competency, professionalism, and patient safety awareness in the cardiac operating room environment.

Learning Objectives

At the end of the course, students should be able to:

- Prepare for cardiopulmonary bypass by reviewing patient information, laboratory data, and procedural requirements.
- Assist in the setup, conduct, and monitoring of adult cardiopulmonary bypass procedures under supervision.
- Interpret clinical and perfusion monitoring parameters during cardiac surgery.
- Recognize common perfusion-related problems and participate in troubleshooting measures.
- Maintain accurate documentation and communicate effectively with members of the cardiac surgical team.
- Demonstrate professional behaviour, patient safety awareness, and adherence to institutional protocols during clinical practice.

Course Content

Unit	Topic	Hours
I	**Clinical Case Preparation**• Review of patient diagnosis and surgical procedure• Blood group, laboratory investigations and risk factors• Equipment and disposables selection• Prime strategy basics• Anticoagulation plan awareness• Blood conservation plan• Temperature management strategy• pre-bypass team briefing	**15**
II	**Adult CPB Workflow**• Cannulation support and team communication• Initiation of cardiopulmonary bypass• Maintaining flow and arterial pressure• Ventilation and gas management• Cardioplegia coordination• Cross-clamp and rewarming phases• Weaning from bypass• Protamine administration and post-bypass monitoring	**20**
III	**Clinical Monitoring**• Arterial and venous pressure monitoring• MAP and pump flow assessment• Temperature monitoring sites• ACT, ABG and electrolyte monitoring• Haematocrit and glucose monitoring• Urine output assessment• SvO_2 and lactate awareness• Alarm management and trend analysis	**20**
IV	**Troubleshooting and Safety**• Inadequate venous return• Low MAP and high MAP situations• High arterial line pressure• Poor oxygenation and gas exchange issues• Air in circuit awareness•	

	Electrical failure management awareness• Oxygen supply issues• Emergency communication and crisis response	**20**
Total		75

Practical / Tutorial / Clinical Learning Activities (Credit =4+1=5, Hours 120+15=135)

- Participation in supervised cardiopulmonary bypass procedures.
- Clinical observation of patient preparation, cannulation, bypass conduct, and weaning.
- Monitoring and interpretation of perfusion parameters during cardiac surgery.
- Case-based discussions on clinical decision-making and troubleshooting.
- Simulation exercises for emergency and crisis management scenarios.
- Tutorial and seminar presentations on clinical perfusion topics.
- Participation in postoperative handover, audit, and documentation activities.
- Maintenance of clinical logbook and competency records.
- Relevant practical and clinical postings as per institutional requirements.

BPrT 402: Core Principles of Anaesthesia for Extracorporeal Circulation Technologies

Course Code	Course Title	Credit	Contact Hours
BPrT 402	Core Principles of Anaesthesia for Extracorporeal Circulation Technologies	7	135

Course Rationale

This course provides Perfusion Technology students with an understanding of anaesthetic principles relevant to cardiac surgery and extracorporeal circulation. It emphasizes perioperative patient management, physiological monitoring, hemodynamic interactions, blood gas analysis, and multidisciplinary communication between anaesthesia and perfusion teams. The course prepares students to function effectively within the cardiac surgical team while ensuring patient safety during cardiopulmonary bypass and related procedures.

Learning Objectives

At the end of the course, students should be able to:

- Explain the basic principles of anaesthesia relevant to cardiac surgery and extracorporeal circulation.
- Describe perioperative monitoring techniques and their significance during cardiopulmonary bypass.
- Correlate anaesthetic management with perfusion-related physiological and hemodynamic changes.
- Interpret blood gas, hemodynamic, and monitoring data in collaboration with the anaesthesia team.
- Recognize special clinical situations that may influence perfusion and anaesthetic management.
- Demonstrate effective communication and teamwork during perioperative cardiac care.

Course Content

Unit	Topic	Hours
I	**Anaesthesia Basics for Perfusionists**• Preoperative assessment awareness• Monitoring lines and invasive pressure monitoring• Induction and maintenance of anaesthesia overview• Ventilation before and after CPB• Anaesthetic drugs and hemodynamic effects• Muscle relaxants and analgesia awareness• Temperature monitoring and warming devices• Anaesthesia record correlation	15

II	**Blood Gas and Hemodynamic Interface•** ABG interpretation with the anaesthesia team• Ventilator changes and gas exchange• Vasoactive drug communication• TEE and NIRS awareness• Anticoagulation coordination• Transfusion coordination• Weaning from bypass physiology• Post CPB hemodynamic management	15
III	**Special Situations•** Difficult airway awareness• Pulmonary hypertension and right ventricular dysfunction• Low ejection fraction (EF) patients• Massive bleeding management awareness• Anaphylaxis and protamine reactions• Pregnancy and cardiac surgery awareness• Paediatric anaesthesia awareness• Emergency return to bypass	15
IV	**Team Communication•** Briefing and surgical timeout procedures• Communication during cannulation and CPB initiation• Cross-clamp and cardioplegia communication• Rewarming and weaning communication• Closed-loop medication confirmation• Crisis communication• Patient handover procedures• Debriefing and quality improvement discussions	15
Total		**60**

Practical / Tutorial / Clinical Learning Activities (Credit =2+2=4, Hour=60+15=75)

- Observation of anaesthetic induction and maintenance during cardiac surgical procedures.
- Participation in multidisciplinary case discussions involving anaesthesia and perfusion teams.
- Interpretation of hemodynamic monitoring, ABG reports, and perioperative physiological data.
- Observation of TEE, NIRS, invasive monitoring systems, and ventilator management.
- Simulation exercises on crisis management, communication, and emergency scenarios.
- Tutorials and seminar presentations on anaesthesia-related topics.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 403: Research Methodology and Biostatistics

Course Code	Course Title	Credit	Contact Hours
BPrT 403	Research Methodology and Biostatistics	3	45

Course Rationale

This course introduces the principles of research methodology and biostatistics relevant to healthcare and Perfusion Technology. It provides students with the knowledge and skills required to understand scientific literature, conduct basic research activities, interpret data, and participate in quality improvement initiatives. The course also emphasizes research ethics, academic integrity, and evidence-based practice to support lifelong learning and professional development.

Learning Objectives

At the end of the course, students should be able to:

- Explain the fundamental concepts and processes involved in scientific research.
- Formulate research questions, objectives, and hypotheses relevant to healthcare practice.
- Apply basic biostatistical methods for data organization, analysis, and interpretation.
- Understand ethical principles governing biomedical research and publication.
- Critically evaluate research literature and clinical evidence.
- Participate in audits, quality improvement projects, and basic research activities related to perfusion practice.

Course Content

Unit	Topic	Hours
I	**Research Fundamentals**• Meaning and need of research• Research problem and research question• Aims and objectives• Hypothesis and variables• Literature review• Study designs• Sampling basics• Bias and confounding awareness	**5**
II	**Biostatistics Basics**• Types of data• Mean, median, mode and standard deviation• Percentages and proportions• Tables and graphs• Normal distribution awareness• Correlation and regression awareness• p-value and confidence interval introduction• Spreadsheet-based data analysis	**5**
III	**Research Ethics**• Informed consent in research• Ethics committee/Institutional Review Board (IRB) role• Confidentiality and anonymization• Risk-benefit assessment• Plagiarism and academic integrity• Authorship ethics• Clinical audit versus research• Data storage and privacy	10
IV	**Perfusion Research Applications**• Case report writing• Clinical audit of perfusion indicators• Quality improvement projects• Device and equipment audit• Blood conservation audit• ECMO and CPB registry awareness• Poster and oral presentation techniques• Minor project planning	**10**
Total		**30**

Practical / Tutorial / Clinical Learning Activities Credit =1, Hours=15

- Critical appraisal of published research articles.
- Literature search and reference management exercises.
- Development of research questions, objectives, and study proposals.
- Basic statistical calculations using spreadsheet software.
- Preparation of case reports, audit reports, and research presentations.
- Tutorial and seminar presentations on research methodology topics.
- Participation in quality improvement and audit activities where available.

- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 501: Perfusion Technology – Advanced- I

Course Code	Course Title	Credit	Contact Hours
BPrT 501	Perfusion Technology – Advanced- I	10	210

Course Rationale

This course builds upon the foundational and clinical principles of Perfusion Technology by introducing advanced concepts in myocardial protection, Pediatric perfusion, complex cardiac surgery, and emerging extracorporeal technologies. It provides students with broader exposure to specialized perfusion practices while emphasizing patient safety, clinical decision-making, multidisciplinary communication, and professional responsibilities within the scope of undergraduate perfusion education.

Learning Objectives

At the end of the course, students should be able to:

- Explain the principles and methods of myocardial protection during cardiac surgery.
- Describe the unique physiological and perfusion considerations in Pediatric cardiac surgery.
- Discuss perfusion management challenges associated with aortic and other complex cardiac procedures.
- Demonstrate awareness of advanced extracorporeal support technologies and their clinical applications.
- Correlate perfusion strategies with organ protection and patient outcomes.
- Apply knowledge of advanced perfusion concepts in supervised clinical and simulation-based environments.

Course Content

Unit	Topic	Hours
I	**Myocardial Protection•** Myocardial ischemia and reperfusion injury• Principles of cardioplegia• Antegrade and retrograde cardioplegia delivery• Blood and crystalloid cardioplegia• Warm, cold and tepid cardioplegia strategies• Single-dose and multidose concepts• Topical cooling awareness• Monitoring adequacy of myocardial protection	15
II	**Pediatric Perfusion Introduction•** Differences between adult and Pediatric physiology• Small extracorporeal circuits and prime volume considerations• Hemodilution concerns in Pediatric patients• Temperature management strategies• Overview of congenital heart diseases• Ultrafiltration in paediatric cardiac surgery• Communication within the paediatric cardiac team• Undergraduate scope and transition to advanced practice	15
III	**Aortic and Special Surgery Awareness•** Aortic aneurysm and dissection overview• Deep hypothermic circulatory arrest (DHCA) awareness• Cerebral perfusion strategies overview• Left heart bypass awareness• Minimally invasive cardiac surgery and peripheral CPB• Pregnancy and cardiac surgery awareness• Redo sternotomy risk awareness• Organ protection during complex cardiac surgery and emergency preparedness	**15**
IV	**Emerging Technologies – Broad Exposure•** ECMO and extracorporeal life support (ECLS) overview• Intra-aortic balloon pump (IABP) overview• Ventricular assist devices (VAD) overview• Organ preservation systems awareness• Cell salvage and blood conservation technologies• Hemoadsorption and inflammatory modulation awareness• Perfusion data management and digital monitoring• Simulation in perfusion education and future developments	15

Total	60

Practical / Tutorial / Clinical Learning Activities (Credit =4+2=6, Hours=120+30=150)

- Observation and discussion of myocardial protection strategies during cardiac surgery.
- Clinical exposure to paediatric and congenital cardiac surgery cases where available.
- Case-based discussions on complex aortic and special cardiac surgical procedures.
- Demonstration and observation of advanced perfusion technologies including ECMO, IABP, VAD, and cell salvage systems.
- Simulation exercises involving advanced perfusion scenarios and crisis management.
- Tutorials and seminar presentations on emerging developments in perfusion science.
- Relevant practical or clinical observation as per institutional availability.
- Maintenance of logbook and competency records.
- Assignment preparation and case presentations.

BPrT 502: Cardiovascular Pathology and Pathophysiology

Course Code	Course Title	Credit	Contact Hours
BPrT 502	Cardiovascular Pathology and Pathophysiology	8	165

Course Rationale

This course provides an advanced understanding of cardiovascular diseases, congenital heart defects, and the pathophysiological changes encountered during cardiac surgery and cardiopulmonary bypass. It emphasizes disease mechanisms, clinical manifestations, surgical implications, organ dysfunction associated with extracorporeal circulation, and their relevance to perfusion planning. The course enables students to correlate pathology with clinical decision-making and safe perfusion practice.

Learning Objectives

At the end of the course, students should be able to:

- Explain the pathology and pathophysiology of major adult cardiovascular diseases.
- Describe the anatomical and physiological basis of common congenital heart diseases.
- Discuss organ-specific pathophysiological changes associated with cardiopulmonary bypass.
- Correlate disease processes with surgical interventions and perfusion management strategies.
- Interpret clinical, laboratory, and imaging findings relevant to cardiovascular disorders.
- Identify risk factors and communicate pathophysiological considerations during perioperative patient management.

Course Content

Unit	Topic	Hours
I	**Adult Cardiovascular Pathophysiology**• coronary artery disease• Acute coronary syndrome• Valvular stenosis and regurgitation• Rheumatic heart disease• Aortic aneurysm and dissection• Heart failure• Cardiomyopathies• Pulmonary hypertension	15
II	**Congenital Heart Disease Basics**• Acyanotic lesions: ASD, VSD and PDA• Cyanotic lesions: Tetralogy of Fallot (TOF) and Transposition of Great Arteries (TGA) overview• Single ventricle physiology awareness• Shunt physiology basics• Pulmonary blood flow concepts• Pediatric hypoxia and cyanosis• Surgical repair overview• Broad perfusion implications of congenital heart disease	15

III	**CPB Complications and Organ Pathophysiology**• Inflammatory response to cardiopulmonary bypass• Coagulopathy and bleeding disorders• Acute kidney injury (AKI)• Neurological injury and embolic events• Pulmonary dysfunction• Endocrine and glucose metabolism changes• Gastrointestinal and hepatic dysfunction• post-perfusion syndrome awareness	15
Total		**45**

Practical / Tutorial / Clinical Learning Activities (Credit 3+2=5, Hours 90+30=120)

- Case-based discussions on cardiovascular diseases and surgical management.
- Correlation of pathological findings with clinical presentation and perfusion requirements.
- Interpretation of laboratory investigations, imaging studies, and hemodynamic data.
- Review of surgical cases involving CABG, valve surgery, congenital heart disease, and aortic procedures.
- Tutorials and seminar presentations on cardiovascular pathology topics.
- Clinical observation of patients undergoing cardiac surgical procedures where available.
- Risk assessment exercises and perfusion planning discussions.
- Logbook maintenance and assignment submission.

BPrT 503: Healthcare Management and Leadership

Course Code	Course Title	Credit	Contact Hours
BPrT 503	Healthcare Management and Leadership	2	30

Course Rationale

This course introduces the principles of healthcare management, leadership, quality assurance, and patient safety relevant to perfusion services. It emphasizes resource management, departmental organization, quality improvement, professional leadership, and ethical decision-making in healthcare settings. The course prepares students to understand the administrative and managerial aspects of perfusion practice while fostering leadership skills, accountability, and a culture of patient safety.

Learning Objectives

At the end of the course, students should be able to:

- Describe the organizational structure and management principles of a perfusion service.
- Explain quality assurance, patient safety, and risk management practices in healthcare.
- Demonstrate awareness of leadership principles, teamwork, and professional development.
- Discuss inventory management, equipment maintenance, and resource utilization in perfusion services.
- Recognize legal, ethical, and regulatory responsibilities associated with healthcare management.
- Apply principles of communication, conflict resolution, and continuous quality improvement in professional practice.

Course Content

Unit	Topic	Hours
I	**Perfusion Service Management**• Organization of a perfusion department• Duty roster and case allocation awareness• Inventory planning and management• Disposable stock control and expiry monitoring• Capital equipment maintenance• Vendor coordination and ethical procurement practices• Cost awareness in charitable and private institutions• Emergency stock preparedness	8
II	**Quality and Patient Safety**• Standard Operating Procedures (SOPs) and checklists• Incident reporting and root cause analysis• Quality indicators in cardiopulmonary bypass• Audit culture and continuous quality improvement• NABH and JCI accreditation awareness• Equipment calibration and preventive maintenance• Traceability of disposables and consumables• Safety training and emergency drills	8

III	**Leadership and Education**• Leadership styles in healthcare• Communication with administration and healthcare teams• Training and mentoring juniors and students• Conflict resolution strategies• Feedback and performance appraisal basics• Professional meetings and continuing professional development (CPD)• Documentation of departmental activities• Building and sustaining a culture of safety	7
IV	**Legal and Ethical Management**• Confidential records management• Policy and protocol adherence• Resource allocation ethics• Device failure reporting and documentation• Consent and communication boundaries• Professional registration and regulatory awareness• Occupational safety and staff welfare• Transparent handling of errors and adverse events	7
Total		**30**

Practical / Tutorial / Clinical Learning Activities

- Case-based discussions on healthcare management and leadership scenarios.
- Review of departmental policies, SOPs, and quality assurance documents.
- Participation in audits, inventory reviews, and quality improvement exercises where available.
- Leadership and communication workshops through role-play and group activities.
- Seminar presentations on patient safety, accreditation standards, and healthcare management topics.
- Observation of departmental management processes and multidisciplinary team interactions.
- Relevant practical or clinical observation as per institutional availability.
- Logbook maintenance and assignment submission.

BPrT 601: Perfusion Technology – APPLIED- II

Course Code	Course Title	Credit	Contact Hours
BPrT 601	Perfusion Technology – Applied -II	7	135

Course Rationale

This course builds upon the foundational principles of extracorporeal circulation and focuses on advanced cardiopulmonary bypass technologies, modern perfusion equipment, biocompatibility, hemodynamics, filtration systems, thermal management, emboli prevention, and safety protocols. Emphasis is placed on the application of engineering principles, advanced monitoring, troubleshooting, and evidence-based perfusion practices to optimize patient outcomes during cardiac surgery and mechanical circulatory support.

Learning Objectives

At the end of the course, students should be able to:

- Explain advancements in perfusion pumps, oxygenators, biomaterials, and circuit technologies.
- Compare the design and operational characteristics of roller and centrifugal pumps.
- Describe blood-material interactions and strategies to improve biocompatibility.
- Apply principles of fluid mechanics and hemodynamics to extracorporeal circuits.
- Understand thermal regulation and heat exchanger operation during cardiopulmonary bypass.
- Evaluate oxygenator performance and identify device-related complications.
- Describe filtration technologies and emboli prevention strategies.
- Calculate hemodilution parameters and blood conservation strategies.
- Perform comprehensive pre-bypass safety checks and equipment verification.
- Integrate advanced monitoring and troubleshooting principles into clinical perfusion practice.

Course Content

Unit	Topic	Hours
I	(Kinetic/Displacement/ Hydrodynamic)**Mechanisms and Modern Perfusion Systems**• Evolution from early finger pumps to the DeBakey roller pump• Development of centrifugal pump technology• Magnetically levitated centrifugal pumps and reduction of shear stress• Transition from conventional tubing to biocompatible circuits• Heparin-bonded tubing systems• Miniaturization of extracorporeal circuits• Closed versus open circuit systems• Minimally Invasive Extracorporeal Circulation (MiECC)• Development of transportable ECMO systems• Roller pumps versus centrifugal pumps: advantages and limitations• Perfusion console operation and safety features• Pressure monitors, alarms, battery backup systems• Body Surface Area (BSA) calculations and physiological flow determination	**10**
II	**Surface Coatings, Blood Activation and Biocompatibility**• Blood interaction with artificial surfaces• Pathophysiology of Systemic Inflammatory Response Syndrome (SIRS)• Complement activation pathways• Intrinsic coagulation pathway activation• Contact activation and thrombogenesis• Heparin-bonded circuit technology• Covalent and ionic heparin bonding mechanisms• Reduction of thrombosis and inflammatory response• Alternative biocompatible coatings• Phosphorylcholine-coated circuits• Albumin-coated surfaces• Synthetic polymer surface modifications• Clinical applications of biocompatible circuits	**10**
III	**Fluid Mechanics and Integrated Thermal Management**• Principles of extracorporeal blood flow• Laminar and turbulent flow characteristics• Reynolds number and flow prediction• Application of Poiseuille's Law in perfusion circuits• Influence of tubing diameter and length on resistance• Pressure gradients within extracorporeal circuits• Shear stress and hemolysis mechanisms• Protection of erythrocytes during CPB• Oxygenator and cannula pressure dynamics• Heat exchanger design and operation• Conductive and convective heat transfer• Placement of heat exchangers within CPB circuits• Hypothermia and organ protection strategies• Controlled rewarming protocols• Prevention of gaseous micro emboli during temperature management	**5**
IV	**Performance Evaluation, Filtration and Emboli Management**• Evaluation of oxygenator gas exchange performance• Interpretation of pre- and post-membrane blood gases• Assessment of oxygen transfer efficiency• Carbon dioxide removal efficiency• Monitoring transmembrane pressure gradients (Delta P)• Recognition of oxygenator dysfunction• Protein fouling and thrombosis formation• Plasma leakage and wet-lung syndrome• Oxygenator change-out procedures• Pre-bypass filtration systems• Arterial line filters and filtration mechanics• Leukocyte depletion technologies• Lipid filtration systems• Air and particulate emboli classification• Bubble detection technologies• Doppler flow monitoring systems• Emboli prevention strategies• Neurological complications associated with microemboli	**10**

V	**Hemodilution, Blood Conservation and Safety Verification•** Hemodilution physiology and mathematical modelling• Calculation of dilutional hematocrit and hemoglobin• Impact of hemodilution on oxygen delivery• Blood viscosity and tissue perfusion relationships• Retrograde Autologous Priming (RAP)• Venous Antegrade Priming (VAP)• Blood conservation strategies during CPB• Transfusion thresholds and decision-making• Ultrafiltration techniques• Comprehensive pre-bypass safety checklists• Calibration of pressure transducers• Calibration of blood gas monitoring systems• Temperature probe verification• Emergency backup systems• Battery and electrical safety checks• Hand-crank operation and emergency preparedness• Oxygen supply verification• Documentation and quality assurance procedures	**10**
Total		**45**

Practical / Tutorial / Clinical Learning Activities Credit=2+2=4, Hours=60+30=90)

- Comparative setup and operation of roller and centrifugal pump systems.
- Demonstration of modern perfusion consoles and integrated monitoring systems.
- Calculation of body surface area, cardiac index, and target flow rates.
- Laboratory demonstrations of blood-material interactions and biocompatible coatings.
- Simulation exercises involving pressure monitoring and flow dynamics.
- Heat exchanger operation and temperature management workshops.
- Oxygenator performance assessment using blood gas interpretation.
- Filtration system demonstrations and arterial filter setup.Air embolism detection and prevention simulations.
- Hemodilution calculations and blood conservation exercises.
- Pre-bypass safety checklist drills.
- Emergency oxygenator failure and pump failure simulations.
- Seminar presentations on emerging perfusion technologies.
- Clinical observation of advanced CPB and ECMO systems where available.
- Logbook maintenance and competency documentation.

Suggested Practical Competencies

- Operate and compare roller and centrifugal pump systems.
- Calculate physiological flow rates and hemodynamic parameters.
- Assess oxygenator function using blood gas analysis.
- Monitor and interpret pressure gradients within extracorporeal circuits.
- Demonstrate safe thermal management during CPB.
- Perform filtration system setup and verification.
- Recognize and manage embolic risks.
- Calculate dilutional hematocrit and transfusion requirements.
- Conduct comprehensive pre-bypass safety assessments.
- Demonstrate competency in emergency troubleshooting procedures.

Recommended Textbooks

- Gravlee GP, Davis RF, Hammon JW, Kussman BD. Cardiopulmonary Bypass: Principles and Practice.
- Stammers AH, Mejak BL. Foundations of Perfusion Practice.
- Toomasian JM, Bartlett RH. Extracorporeal Circulation for Adult and Pediatric Applications.
- Kaplan JA. Kaplan's Cardiac Anesthesia.
- Hensley FA, Martin DE. A Practical Approach to Cardiac Anesthesia.
- AmSECT Standards and Guidelines for Perfusion Practice.

Recommended References

- AmSECT Standards and Guidelines.
- EACTS/EACTA Cardiopulmonary Bypass Guidelines.
- Society of Thoracic Surgeons (STS) Perfusion Practice Guidelines.
- Extracorporeal Life Support Organization (ELSO) Guidelines.

- American Heart Association (AHA) Scientific Statements on CPB and ECMO.

BPrT 602: Perfusion Technology – Clinical -II

Course Code	Course Title	Credit	Contact Hours
BPrT 602	Perfusion Technology – Clinical -II	7	135

Course Rationale

This course provides advanced supervised clinical exposure in perfusion practice, focusing on complex cardiac surgical procedures, perioperative planning, crisis management, and postoperative patient care. It emphasizes clinical decision-making, risk assessment, troubleshooting, multidisciplinary communication, and documentation. The course prepares students to integrate theoretical knowledge with practical skills while functioning safely and effectively within the cardiac surgical team.

Learning Objectives

At the end of the course, students should be able to:

- Participate in preoperative planning and preparation for routine and complex cardiac surgical procedures.
- Apply perfusion principles in the management of patients undergoing advanced cardiac surgery under supervision.
- Recognize and respond appropriately to common clinical emergencies and perfusion-related crises.
- Interpret perioperative clinical data and contribute to patient management discussions.
- Demonstrate effective communication, documentation, and teamwork in the operating room and intensive care settings.
- Evaluate postoperative outcomes and identify opportunities for quality improvement and patient safety enhancement.

Course Content

Unit	Topic	Hours
I	**Supervised Clinical Case Planning**• Review of diagnosis and surgical procedure• Risk assessment and checklist preparation• Prime and circuit selection• Blood availability and conservation planning• Temperature and cardioplegia strategy• Anticoagulation plan awareness• Emergency preparedness• Multidisciplinary team briefing	5
II	**Complex Clinical Management Basics**• Redo cardiac surgery awareness• Combined CABG and valve surgery awareness• Low ejection fraction (EF) patients• Aortic disease and complex vascular procedures• Pulmonary hypertension and right ventricular dysfunction• Renal dysfunction and fluid balance considerations• Coagulopathy management awareness• Difficult weaning and return-to-bypass awareness	15

III	**Crisis Troubleshooting•** Power failure management awareness• Oxygen supply failure• Pump head malfunction• Oxygenator failure• Massive air embolism awareness• High arterial line pressure• Poor venous drainage• Emergency communication, handover, and documentation	15
IV	**ICU Interface and Post-CPB Care•** post-bypass laboratory investigations and hemodynamics• Protamine administration and bleeding observation• Handover to intensive care unit (ICU) team• Overview of postoperative complications• IABP and ECMO handover awareness• Documentation review and audit• Case debriefing• Learning from adverse events and quality improvement activities	10
Total		**45**

Practical / Tutorial / Clinical Learning Activities Credit =2+2=4, Hours =60=30=90)

- Participation in supervised clinical case planning and preparation.
- Observation and assisted involvement in complex cardiac surgical procedures.
- Clinical monitoring and interpretation of perfusion, hemodynamic, and laboratory parameters.
- Simulation-based training in crisis management and troubleshooting.
- Participation in postoperative handovers, case discussions, and multidisciplinary rounds.
- Case-based discussions on complex cardiac surgical and perfusion scenarios.
- Tutorial and seminar presentations on advanced clinical perfusion topics.
- Relevant practical or clinical observation as per institutional availability.
- Maintenance of clinical logbook and competency records.
- Assignment submission and reflective learning exercises.

BPrT 603: Perfusion Technology – Advanced- II

Course Code	Course Title	Credit	Contact Hours
BPrT 603	Perfusion Technology – Advanced -II	6	120

Course Rationale

This course provides broad exposure to advanced and emerging areas of Perfusion Technology while preparing students for professional practice, higher education, and lifelong learning. It introduces advanced perfusion applications, professional standards, technological innovations, and career pathways relevant to contemporary perfusion practice. The course emphasizes safe professional conduct, evidence-based practice, technological awareness, and preparedness for future specialization.

Learning Objectives

At the end of the course, students should be able to:

- Describe advanced applications of Perfusion Technology in specialized clinical settings.
- Explain professional standards, regulatory requirements, and ethical responsibilities in perfusion practice.
- Discuss recent technological innovations and emerging trends in extracorporeal circulation.
- Demonstrate awareness of quality improvement, research, and digital technologies in perfusion.
- Identify opportunities for professional development, higher studies, and specialization.
- Develop a career plan aligned with professional, academic, and research goals.

Course Content

Unit	Topic	Hours
	Advanced Perfusion Breadth – Basic Level• Paediatric and neonatal cardiopulmonary bypass overview• Complex congenital cardiac surgery awareness• Aortic surgery and deep hypothermic circulatory arrest (DHCA) awareness• Cerebral perfusion strategies overview• Heart and lung transplant perfusion	**15**

I	awareness• Mechanical circulatory support awareness• ECMO and extracorporeal life support overview• non-cardiac perfusion applications overview **Ventricular Decompression**	
II	**Standards, Regulation and Certification Awareness•** Practice standards and standard operating procedures (SOPs)• Ethical and legal responsibilities in perfusion practice• Continuing professional development (CPD) and lifelong learning **Cardiogenic Shock Support**	**5**
III	**Technology and Innovation Awareness•** Advances in oxygenator and pump technologies• Mini-circuits and biocompatible surface coatings• Point-of-care coagulation testing technologies• Perfusion information systems and digital documentation• Simulation-based perfusion training• Artificial intelligence and healthcare data analytics awareness• Quality dashboards and performance monitoring• Emerging research questions and future innovations in perfusion science **Cannula Selection:** Technical specifications of specialized, multi-stage femoral and jugular cannulae designed to accommodate the spatial restrictions of robotic arms. **Normothermic Ex-Vivo Machine Perfusion (NMP)Circuit Mechanics: Metabolic Assessment: Organ Optimization: Hematology and Complex Anticoagulation** Wearable artificial lungs Nanotechnology coatings Future focus: patient mobility AI-controlled perfusion	**15**
IV	**Endovascular Clamping:** The operational mechanics of endo-aortic balloon occlusion catheters (e.g., Endo Clamp) as a minimally invasive alternative to traditional external aortic cross-clamps. **Remote Management:** Formulating strategies for delivering antegrade cardioplegia and venting the aortic root entirely through integrated, multi-lumen peripheral access **5.** **Targeted Regional Perfusion in Oncology** Techniques for systemic vascular isolation and the maintenance of independent extracorporeal circuits for targeted hepatic or extremity perfusion. **Isolated Hepatic Perfusion (IHP)Vascular Isolation Dynamics:** The complex surgical and percutaneous routing required to completely isolate the hepatic artery and retro hepatic inferior vena cava from the systemic circulation. **Tissue Viability and Oxygenation:** Managing an independent mini-circuit equipped with a membrane oxygenator to sustain extremity tissue viability and regulate precise regional temperatures during high-dose drug exposure. Career planning and professional growth strategies	**10**
Total		**45**

Practical / Tutorial / Clinical Learning Activities (Credit=2+1=3, Hours=60+15=75)

- Case-based discussions on advanced perfusion applications and emerging technologies.
- Seminar presentations on recent developments in perfusion science and extracorporeal support.
- Review and discussion of professional standards, guidelines, and regulatory frameworks.
- Exposure to simulation-based learning and advanced clinical scenarios where available.
- Portfolio development, logbook review, and career planning exercises.
- Literature review and appraisal of recent perfusion research publications.
- Discussions on postgraduate education, certification pathways, and professional advancement.
- Relevant practical or clinical observation as per institutional availability.
- Assignment preparation and submission.

BPrT 701, 801 & 802: Internship (Semester VII & VIII)

Course Code	Course Title	Credit	Contact Hours
BPrT 701, 801 & 802	Internship	54	2340

Course Rationale

The internship provides a structured transition from classroom learning to supervised clinical practice in Perfusion Technology. It enables students to integrate knowledge of cardiovascular physiology, perfusion science, extracorporeal circulation, patient monitoring, and professional ethics into real-world clinical settings.

Through rotations in cardiac operating rooms, perfusion services, intensive care units, extracorporeal support services, and related departments, students develop technical competence, clinical judgment, communication skills, and professional responsibility. The internship prepares graduates for safe entry-level perfusion practice and lifelong professional development within multidisciplinary healthcare teams.

Internship Duration

12 Months (Semester VII & VIII)

Schedule: 42 hours/week (7 hours/day, 6 days/week)

Learning Outcomes

At the end of the internship, students should be able to:

- Participate safely in the preparation, operation, and post-procedure management of cardiopulmonary bypass circuits under supervision.
- Demonstrate competency in equipment preparation, priming, monitoring, troubleshooting, and documentation.
- Assist in perioperative perfusion care while adhering to safety protocols and ethical standards.
- Apply infection prevention, quality assurance, and patient safety principles in clinical practice.
- Communicate effectively with surgeons, anaesthesiologists, perfusionists, and other healthcare professionals.
- Maintain accurate clinical records, logbooks, and quality documentation.
- Demonstrate professionalism, leadership qualities, and readiness for independent entry-level practice.
- Participate in audit, research, and quality improvement activities related to perfusion services.

Table Internship Rotation Structure & Competencies

Area	Duration (Months)	Competencies
Cardiopulmonary Bypass (Adult Cardiac Surgery)	4	Circuit preparation, priming, de-airing, CPB monitoring, perfusion charting, anticoagulation monitoring, patient safety protocols
Cardiac Operating Room & Clinical Perfusion Practice	2	Equipment setup, cannulation awareness, cardioplegia delivery observation, communication during surgery, troubleshooting assistance
Intensive Care Unit (Cardiac ICU)	2	Hemodynamic monitoring, postoperative care awareness, ventilator basics, IABP/ECMO observation, multidisciplinary communication
ECMO / Mechanical Circulatory Support Services	2	ECMO circuit identification, monitoring principles, anticoagulation awareness, emergency preparedness, device safety
Research, Audit and Quality Improvement	2	Literature review, audit participation, data collection, outcome analysis, quality improvement projects, report preparation

`Internship Rotation Plan

- **Posting Guidelines:** Every student shall complete all prescribed rotations with documented competency acquisition.
- **Attendance & Conduct:** Minimum 90% attendance and adherence to institutional regulations

are mandatory.

- **Clinical Supervision:** Students shall perform activities only under the supervision of qualified perfusionists and authorized faculty.
- **Assessment:** Internship shall be competency-based and non-CGPA contributing unless otherwise specified by the university.
- **Certification:** Internship completion certificate shall be awarded upon satisfactory completion and verification by the HOD/Coordinator and Head of Institution.

Competency Domains for Alignment

Domain	Representative Competencies
Cognitive & Clinical Reasoning	Perfusion planning, physiological interpretation, problem solving, clinical decision awareness
Technical & Psychomotor Skills	Circuit assembly, priming, monitoring, equipment handling, troubleshooting, documentation
Professionalism & Ethics	Patient safety, confidentiality, accountability, ethical practice, infection prevention
Communication & Teamwork	Interdisciplinary communication, handover, documentation, teamwork in the cardiac operating room
Research & Quality Improvement	Clinical audit, data collection, outcome evaluation, literature review, evidence-based practice
Leadership & Management	Resource utilization, equipment management, initiative, professional responsibility

Internship Logbook Requirements Daily

Clinical Log

- Date-wise recording of procedures observed and assisted.
- Documentation of clinical activities and learning experiences.
- Supervisor verification and signature.

Weekly Learning Objectives

- Rotation-specific goals.
- Reflection on clinical experiences.
- Progress review with supervisor.

Competency Checklist

- Circuit assembly and priming.
- Equipment identification and operation.
- Monitoring and documentation.
- Safety procedures and troubleshooting.
- Clinical communication and professionalism.

Supervisor Evaluation

Assessment using a structured rating scale covering:

- Technical competence.
- Clinical understanding.
- Professional behaviour.
- Communication skills.
- Safety awareness.
- Reliability and teamwork.

Formative Assessment Methods

- Direct Observation of Procedural Skills (DOPS)
- Objective Structured Practical Examination (OSPE)
- Mini Clinical Evaluation Exercise (Mini-CEX)
- Case Presentations
- Reflective Portfolios
- Logbook Assessment
- Clinical Viva Voce
- Supervisor Evaluations
- Audit and Research Project Reports
- Simulation-Based Assessments

Internship Completion Requirements

Students must satisfactorily complete:

- Prescribed clinical rotations.
- Required minimum attendance.
- Competency checklist validation.
- Logbook submission.
- Clinical case presentations.
- Research/audit assignments.
- Professional conduct requirements.

Internship Certification

The internship completion certificate shall include:

- Clinical rotation details and duration.
- Total internship hours completed.
- Competencies achieved.
- Audit, research, and quality improvement activities undertaken.
- Certification by the HOD/Coordinator and Head of Institution.
- Board of examiners for 7th & 8th semester:
- HOD of B.Sc. (PrT): Chairperson
- Programme Co-ordinator/Course Co-ordinator/Chief of B.Sc. (PrT)/In charge of B.Sc. (PrT): Co-chairperson
- Subject Experts: Internal examiners (two) members

Note: The B.Sc. (PrT) degree shall be awarded only after successful completion and validation of the prescribed internship requirements.

BPrT 802: Dissertation / Project

Course Code	Course Title	Credits	Contact Hours
BPrT 802	Dissertation / Project	6	180

Course Learning Outcomes

At the end of the course, the student will be able to:

- Identify and formulate a research problem relevant to Perfusion Technology.
- Conduct a comprehensive review of scientific literature.
- Design and execute a research study using appropriate methodology.
- Collect, analyse, and interpret research data.
- Apply ethical principles in clinical and biomedical research.
- Prepare a structured dissertation following academic standards.
- Present research findings effectively through oral and written communication.
- Demonstrate evidence-based clinical reasoning and critical thinking skills.

Course Content

Unit	Topics	Hours
I	Research problem identification, literature review, research objectives, hypothesis formulation, research ethics, proposal preparation	36
II	Research methodology, study design, sampling	36

	techniques, data collection tools, protocol development	
III	Data collection, statistical analysis, interpretation of results, data presentation	36
IV	Dissertation writing, referencing, plagiarism awareness, scientific communication and manuscript preparation	36
V	Seminar presentation, dissertation submission, viva voce, defence of research findings	36
	Total	**180**

Assessment Pattern

Component	Marks
Research Proposal & Progress Review	15
Literature Review	15
Data Collection & Analysis	20
Dissertation Report	20
Seminar Presentation	10
Viva Voce	20
Total	**100**

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B.Sc. (Perfusion Technology)

LOGBOOK

(YEAR)



5.2 *B.Sc. (PrT)*

Annexure I

INTERNSHIP LOG BOOK

INTERNSHIP STUDENT RECORD

1. **Student Details**
   Name of Student: .....
   Roll Number / Registration Number: .....
   Course / Branch: .....
   Year / Semester:.....
   College / Institution: .....
   Contact Number: .....
   Email ID: .....

2. Internship Organization Details
   Name of Organization: .....
   Address: .....
   Department / Division: .....

3. Faculty Mentor
   Name: .....
   Department: .....
   Contact Number: .....

Annexure II

DECLARATION BY THE STUDENT

I, _____ (Name of the Student), bearing Roll Number _____, studying _____ (Course) at _____(Name of the Institution), hereby declare that the internship log report submitted by me is a record of the work carried out during the internship period from _____ to _____ at _____(Name of the Organization).

I further declare that this work is original and has been completed by me under the guidance and supervision of the concerned authorities. The information and data presented in this report are true to the best of my knowledge and belief. I have duly acknowledged all sources of information used in the preparation of this report.
I understand that any false statement or plagiarism found in this report may lead to disciplinary action as per the rules and regulations of the institution.

Place:_____
Date: _____
Signature of the Student: _____

Annexure III

CERTIFICATE

This is to certify that Mr./Ms. _____, Roll No. _____, a student of B.Sc. (PrT), has satisfactorily completed and maintained the prescribed Clinical Internship/Training Log Book as per the curriculum requirements of the course.
The student has undergone clinical training in the Department of Perfusion Technology at _____ _____ (Hospital/Institution Name) during the period from ____ to _____. The log book contains a true record of the clinical procedures, observations, case exposures, and professional activities performed and/or assisted by the student under the supervision of qualified faculty members and clinical preceptors.
The student's performance, attendance, clinical skills, professional conduct, and maintenance of records have been found satisfactory and in accordance with the requirements prescribed by the institution and regulatory authorities.
This certificate is issued for academic purposes and forms an integral part of the student's clinical training records.

Place: _____
Date: _____

Signature of Clinical Supervisor

Signature of Head of Department / Principal Date: _____

Seal of Institution: _____

Annexure IV

Clinical Log Book Evaluation Table

Sl. No.	Evaluation Component	Maximum Marks	Obtained Marks	Remarks
1	Attendance in Clinical Posting	10		
2	Maintenance of Log Book	10		
3	Case Documentation & Record Keeping	10		
4	Cardiopulmonary Bypass (CPB) Observation Cases	10		
5	CPB Assisted Cases (Under Supervision)	10		
6	ECMO Observation/Assistance	10		
7	Equipment Handling & Maintenance	10		
8	Academic Presentations / Seminars	10		
9	Professionalism, Ethics & Communication Skills	10		
10	Viva Voce	10		
Total		**100**		

ANNEXURE – V

Student Information

Particulars	Details
Student Name	
Registration Number	
Batch	
Year/Semester	
Institution Name	
Department	
Clinical Posting Period	From _____to _____
Faculty In-charge	

ANNEXURE –VI

Clinical Case Record

Sl. No.	Date	Hospital No.	Diagnosis	Procedure	Student Role (Observed/Assisted/ Performed)	Supervisor Signature
1						
2						
3						

ANNEXURE – VII

Cardiopulmonary Bypass Case Log

Sl. No.	Date	Procedure Type	Age/Sex	CPB Time	Aortic Cross Clamp Time	Student Role	Faculty Signature
1							
2							
3							

ANNEXURE – VIII

ECMO Exposure Record

Sl. No.	Date	VA/VV ECMO	Indication	Duration	Student Activity	Supervisor Signature
1						
2						
3						

ANNEXURE – IX

Clinical Skill Competency Assessment

Sl. No.	Clinical Skill/ Procedure	Observation (O)	Assisted (A)	Performed Under Supervision (PS)	Independently Performed (IP)	Faculty Signature	Date
1	Heart-Lung Machine Preparation						
2	Circuit Assembly & Priming						
3	Anticoagulation Monitoring						
4	ACT Measurement & Interpretation						
5	Arterial Blood Gas Analysis						
6	Cardiopulmonary						

Sl. No.	Clinical Skill/ Procedure	Observation (O)	Assisted (A)	Performed Under Supervision (PS)	Independently Performed (IP)	Faculty Signature	Date
	Bypass Initiation						
7	CPB Monitoring						
8	Weaning from CPB						
9	ECMO Circuit Setup						
10	Intra-Aortic Balloon Pump Monitoring						
11	Cell Saver Operation						
12	Hemofiltration Procedures						
13	Perfusion Record Documentation						
14	Infection Control Practices						
15	Emergency Perfusion Protocols						
16	IABP						

ANNEXURE – X

Seminar / Journal Club / CME Participation

Date	Topic	Type (Seminar/Journal Club/CME)	Presenter/Participant	Faculty Signature
1				
2				
3				

ANNEXURE – XI

Table Professional Behavior Assessment

Component	Maximum Marks	Marks Obtained	Faculty Remarks
Attendance & Punctuality	10		
Professional Conduct/ ethics	10		
Communication Skills	10		
Clinical Knowledge	10		
Technical Skills	10		
Case Documentation	10		

Component	Maximum Marks	Marks Obtained	Faculty Remarks
Logbook Maintenance	10		
Seminar/Presentation	10		
Patient Safety Awareness	10		
Responsibility	10		
Total	100		

ANNEXURE – XII

Semester Logbook Assessment

Assessment Parameter	Weightage (%)	Marks
Clinical Attendance	20	
Skill Competency Achievement	30	
Case Participation	20	
Logbook Documentation	10	
Professional Behavior	10	
Viva Voce	10	
Total	**100**	

ANNEXURE – XIII

Clinical Posting Attendance Record

Month	Department	Days Posted	Days Attended	Attendance (%)	Faculty Signature

ANNEXURE – XIV

Equipment Maintenance Checklist

Equipment	Checked	Calibration Verified	Remarks	Signature
Heart-Lung Machine				
Heater-Cooler Unit				
ACT Machine				
Blood Gas Analyzer				
ECMO Console				

ANNEXURE – XV

Research and Academic Activities

Activity	Title	Date	Outcome	Faculty Signature
Poster Presentation				
Paper Presentation				
Research Project				
CME/Workshop				

Annexure - XVI

Perfusionist Oath
I _____son/daughter of _____solemnly declare that I shall always strive to raise the prestige and dignity of the profession and shall always so comport myself as to neither effect the reputation of the profession adversely. I shall always respect the patient's right and uphold the doctrine of confidentiality regarding privileged patient information.
I willingly bind myself to the observance of the Code of Professional Ethics for Perfusionists. In letter and spirit in order to discharge a Perfusionist's obligation towards patients, community and society as enunciated in the Code.
Date: _____
Name: _____Address: _____ _____
Institution: _____
Batch: _____
Signature: _____

Annexure XVII

CARDIOPULMONARY BYPASS CHECK LIST

Patient Details
Perfusionist
Patient identity, MRD no., blood group confirmed **1.**
Procedure confirmed **2.**
Allergies checked
Chart reviewed
Blood products arranged
Pre-Assemble Checklist

HLM: Power connected☐, startup normal☐,
backup power (UPS/battery) ☐
Hand crank available☐, tube holder & flow calibration checked ☐

Gas Supply: Line connected ☐ flow checked☐, vaporizer filled & operational ☐
Backup O_2 tank with flow meter available ☐

Heater Cooler: Startup normal☐ water connections verified ☐

Sterility: Packages intact☐ expiry checked☐ equipment clean ☐

Accessories: Emergency light source☐ tubing clamp☐
backup circuit available ☐

Post-Assemble Check List

Pump: Occlusion set☐ flow rate indicator corrects☐ rollers
rotate freely ☐

Oxygenator: Gas line attached☐ exhaust unobstructed☐ heat
exchanger intact☐
venous reservoir vented ☐

Cardioplegia: De-bubbled☐ leak-free☐ operational ☐

Tubing's: Condition inspected☐ connections secure☐
one-way valves correct ☐

De-bubbling: Tubing's☐ oxygenator☐ cardioplegia☐ MUF circuit ☐

Monitoring: Circuit & patient temperature probes placed ☐
Pressure transducers calibrated, limits checked ☐ Online
sensors calibrated ☐

Safety & Alarms: Low level alarm engaged ☐
Air detector engaged ☐
Pressure alarm limits set (arterial & cardioplegia) ☐ Entire
circuit debubbled & leak-free ☐

Before Starting CPB: Perfusate corrected, blood added, warm prime ☐ Temperature probes connected (rectal, nasal, venous) ☐ Pre-CPB urine checked (quantity/color) ☐
Cardioplegia solutions checked & connected ☐ Lines
clamped, shunts closed ☐
Vents & suction lines tested with fluids ☐

Anticoagulation: Heparin added in prime ☐
Patient heparinization time & dose confirmed ☐ ACT value
achieved ☐

Assisted Venous Return: Cardiotomy positive-pressure relief valve present ☐
Negative pressure relief valve unobstructed ☐ Vacuum
regulator operational ☐

Termination Checklist: Shunts closed ☐
Vents removed ☐ Ventilation on ☐

Post-Bypass Checklist: Announce bypass terminated ☐
Venous line clamped ☐
Pump suctions off (half protamine) ☐
Vaporizer shut off ☐
Cross-connect & circulate for emergent restart ☐

Restart of Bypass: Heparin time & dose confirmed ☐
Components debubbled ☐ Alarms re-engaged ☐
Gas flow confirmed ☐
Arterial pump assigned correctly ☐

Annexure XVIII

Indian Journal of Extracorporeal Technology (IJECT) Perfusion

List of Journals

Indian Journal of Thoracic and Cardiovascular Surgery (IJTC) Annals of Cardiac Anaesthesia (ACA)
Journal of Extra-Corporeal Technology (JECT)
The Journal of Thoracic and Cardiovascular Surgery (JTCVS)
Journal of Heart and Lung Transplantation (JHLT) ISHLT Critical Care Medicine
Artificial Organs
ASAIO Journal
Euro ELSO Journal Club

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