

SRI GURU RAM DAS UNIVERSITY OF HEALTH SCIENCES
B.Sc. PERFUSION TECHNOLOGY Session 2026–2027 (BPERT.2.13)
3 Years Academic Training + 1 Year Compulsory Clinical Internship

Semester I

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-201	Human Anatomy	Foundation	3+0+1	4	30+70=100T 10+40=50P
BPERT-202	Human Physiology	Foundation	3+0+1	4	30+70=100T 10+40=50P
BPERT-203	General Microbiology & Infection Prevention	Foundation	2+0+1	3	30+70=100T 10+40=50P
BPERT-204	Basic Biochemistry	Foundation	2+0+1	3	30+70=100T 10+40=50P
BPERT-205	Professional Communication & English	Professional	2+0+0	2	NC
BPERT-206	Medical Terminology & Clinical Documentation	Professional	2+0+0	2	NC
BPERT-207	Introduction to Healthcare & Professional Practice	Professional	2+0+0	2	NC
Total Credits			16+0+4	20	600

Semester II

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-208	Applied Biochemistry	Foundation	2+0+1	3	30+70=100T 10+40=50P
BPERT-209	Applied Pharmacology & Critical Care	Foundation	2+1+0	3	30+70=100T
BPERT-210	Introduction to Perfusion Technology-I	Core	2+0+3	5	30+70=100T 10+40=50P
BPERT-211	Quality, Patient Safety & Infection Control	Core	2+0+0	2	NC
BPERT-212	Clinical Skills-I: ICU & Critical Care	Core	0+0+5	5	30+70=100T
BPERT-213	Digital Health & Computer Applications	Professional	1+0+1	2	NC
Total Credits			9+1+10	20	500

Semester III

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-301	Pathology	Foundation	3+0+2	5	30+70=100T 10+40=50P
BPERT-302	Introduction to Perfusion Technology-II	Core	3+0+2	5	30+70=100T 30+70=100P
BPERT-303	Fundamentals of Pumps, Oxygenators, Filters & Blood Components	Core	3+1+2	6	30+70=100T 30+70=100P
BPERT-304	Medical Emergencies & Patient Care	Core	3+0+0	3	10+40=50T
Total Credits			12+1+6	19	600

Semester IV

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-305	Applied Pathophysiology	Foundation	2+1+1	4	10+40=50T 10+40=50P
BPERT-306	Pharmacology for Critical Care & CPB	Foundation	2+1+0	3	30+70=100T
BPERT-307	Conduct of Cardiopulmonary Bypass	Core	3+0+3	6	30+70=100T 30+70=100P
BPERT-308	Medical Disorders, Critical Care & Perioperative Management	Core	3+0+2	5	30+70=100T 30+70=100P
BPERT-309	Professional Ethics, Law & Patient	Professional	2+0+0	2	NC

	Rights				
Total Credits			12+2+6	20	600

Semester V

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-401	Myocardial Protection & Drugs in CPB	Core	3+1+2	6	30+70=100T 30+70=100P
BPERT-402	Special Situations in Perfusion Technology	Core	3+1+0	4	30+70=100T
BPERT-403	Mechanical Circulatory Support	Core	2+1+2	5	30+70=100T 30+70=100P
BPERT-404	Quality Improvement, Audit & Professional Practice	Professional	2+0+1	3	NC
Total Credits			10+3+5	18	500

Semester VI

Course No.	Course Title	Type	L+T+P	Credits	Assessment
BPERT-405	Advanced Perfusion	Core	3+1+2	6	30+70=100T 30+70=100P
BPERT-406	Advanced & Recent Developments in CPB and Perfusion	Core	3+1+2	6	30+70=100T 30+70=100P
BPERT-407	Research Methodology & Biostatistics	Professional	2+1+0	3	30+70=100T
BPERT-408	Hospital management	Professional	2+0+1	3	NC
Total Credits			10+3+5	18	500
<i>Semester VII & VIII- One year Internship</i>			Total	115	3300

Course Structure for the Bachelors in Perfusion Technology (Code-BPERT.2.13) Session 2025					
Course No.	Course Title	Course Type	L+T+P	Credits / week	Weightage Theory/ Practical
Semester-I					
BPert-ANT.201	Anatomy of cardiovascular system & respiratory system	Foundation	3+0+0	3	30+70=100
BPert-PHY.201	Physiology of cardiovascular system & respiratory system	Foundation	3+0+0	3	30+70=100
BPert-BIC.201	Biochemistry- Cycles & pathways	Foundation	2+0+1	3	30+70=100
BPert.201	Introduction to Perfusion technology -History of CPB & equipments used in CPB	Core	3+0+0	3	30+70=100
ECO.250	English and communication skills	Elective	2+0+0	2	NC*
BPert.225	Practical in CPB	Core	0+0+5	5	30+70=100
Total Credits			13+0+6	19	500
Semester-II (revised)					
BPert-ANT.202	Anatomy-II	Foundation	3+0+0	3	30+70=100T
BPert-PHY.202	Physiology-II	Foundation	3+0+0	3	30+70=100T
BPert-BIC.202	Applied Biochemistry	Foundation	2+0+1	3	30+70=100T 10+40=50P
BPert-PHA.201	Applied Pharmacology	Foundation	3+0+0	3	30+70=100T
BPert.202	Introduction to Perfusion Technology-I	Core	2+0+3	5	30+70=100T 10+40=50P
BPert.203	Introduction to Quality and patient safety	Elective	2+0+0	2	NC
COM.250	Computer Applications	Elective	2+0+0	2	NC
Total Credits			17+0+4	21	600
Semester-III					
BPert-PAT.301	Pathology	Foundation	3+0+2	5	30+70=100T 10+40=50P
BPert-302	Introduction to Perfusion Technology-II	Foundation	3+0+2	5	30+70=100T 30+70=100P
BPert.303	Fundamentals of Pumps, Oxygenators, Filters & Blood Components	Core	3+1+2	6	30+70=100T 30+70=100P
BPert.304	Medical Emergencies & Patient Care	Core	3+0+0	3	10+40=50T
Total Credits			12+1+6	19	600
Semester-IV					
BPert-PAT.305	Applied Pathophysiology	Foundation	2+1+1	4	10+40=50T 10+40=50P
BPert-PHA.306	Pharmacology for Critical Care & CPB	Foundation	2+1+0	3	30+70=100T
BPert.307	Conduct of Cardiopulmonary Bypass	Core	3+0+3	6	30+70=100T 30+70=100P
BPert.308	Medical Disorders, Critical Care & Perioperative	Core	3+0+2	5	30+70=100T 30+70=100P

	Management				
BPERT.309	Professional Ethics, Law & Patient Rights	Elective course	2+0+0	2	NC
Total Credits			11+1+6	18	600
Semester-V					
BPERT.401	Myocardial Protection & Drugs in CPB	Core course	3+1+2	6	30+70=100T 30+70=100P
BPERT.402	Special Situations in Perfusion Technology	Core course	3+1+0	4	30+70=100T
BPERT.403	Mechanical Circulatory Support	Core course	2+1+2	5	30+70=100T 30+70=100P
BPERT.404	Quality Improvement, Audit & Professional Practice	Elective course	2+0+1	3	NC
Total Credits			10+3+5	18	500
Semester-VI					
BPERT.405	Advanced Perfusion	Core course	3+1+2	6	30+70=100T 30+70=100P
BPERT.406	Advanced & Recent Developments in CPB and Perfusion	Core course	3+1+2	6	30+70=100T 30+70=100P
BPERT.407	Research Methodology & Biostatistics	Elective course	2+1+0	3	30+70=100T
BPERT.408	Hospital management	Elective course	2+1+0	3	NC
Total credits			10+4+4	18	500
7semester+8semester					
Perfusion internship	1 paper presentation or 1 case report Internship (One year) -Minimum 140 days per semester (Total 280 days) & 90% Attendance requirement				
Grand Total			73+9+30	115	3300

Course Structure for the Bachelors in Perfusion Technology (Code-BPERT.2.13) Session 2024						
Course No.	Course Title	Course Type	L+T+P	Credits / week	Total credits	Weightage IA/Theory/ Practical
Semester-I						
BPERT-ANT.201	Anatomy of cardiovascular system & respiratory system	Foundation course	3+0+0	3	45	50+50=100
BPERT-PHY.201	Physiology of cardiovascular system & respiratory system	Foundation course	3+0+0	3	45	50+50=100
BPERT-BIC.201	Biochemistry- Cycles & pathways	Foundation course	2+0+1	3	45	50+50=100
BPERT.201	Introduction to Perfusion technology -History of CPB & equipments used in CPB	Core course	3+0+0	3	45	50+50=100
ECO.250	English and communication skills	Elective course	2+0+0	2	32	NC*
BPERT.225	Practical in CPB	Core course	0+0+5	5	80	100
Total Credits			14+0+6	20	292	500

Semester-II						
BPert-ANT.202	Anatomy of renal system & CNS	Foundation course	3+0+0	3	45	50+50=100
BPert-PHY.202	Physiology of renal system & general hematology	Foundation course	3+0+0	3	45	50+50=100
BPert-BIC.202	Biochemistry - Buffer system metabolic acidosis/ alkalosis hemostasis	Foundation course	3+0+0	3	45	50+50=100
BPert.202	Introduction to Perfusion technology -Components and functioning of CPB with diagrams	Core course	3+0+0	3	45	50+50=100
COM.250	Computer Applications	Elective course	2+0+0	2	32	NC*
BPert.226	Practical in CPB	Core course	0+0+5	5	80	100
Total Credits			14+0+5	19	292	500
Semester-III						
BPert-ANT.301	Embryology of Heart	Foundation course	3+0+0	3	45	50+50=100
BPert-PHA.301	General Pharmacology	Foundation course	3+0+0	3	45	50+50=100
BPert.301	Pathophysiology- Anomalies and diseases of aorta	Core course	3+0+0	3	45	50+50=100
BPert.302	Effects of CPB on various organ systems, haematological aspects of CPB	Core course	3+0+0	3	45	50+50=100
HVE.350	Human Values & ethics	Elective	2+0+0	2	32	NC*
BPert.325	Practical in CPB	Core course	0+0+5	5	80	100
Total Credits			14+0+5	19	292	500
Semester-IV (Revised)						
BPert-PAT.302	Applied Pathology	Foundation	2+1+1	4	10+40=50T 10+40=50P	
BPert-PHA.302	Pharmacology drugs	Foundation	3+0+0	3	30+70=100T	
BPert.303	Conduction of CPB	Core	3+0+3	6	30+70=100T 30+70=100P	
BPert.304	Embryology of Cardio-Respiratory Systems	Core	3+0+2	5	30+70=100T 30+70=100P	
CRP.350	Community Rehabilitation practice	Elective course	2+0+0	2	NC	
Total Credits			11+1+6	18	600	
Semester-V						
BPert.401	Myocardial Protection & Drugs in CPB	Core course	3+1+2	6	30+70=100T 30+70=100P	
BPert.402	Special Situations in Perfusion Technology	Core course	3+1+0	4	30+70=100T	
BPert.403	Mechanical Circulatory Support	Core course	2+1+2	5	30+70=100T 30+70=100P	
BPert.404	Medical Law and Ethics	Elective course	2+0+0	2	NC	
Total Credits			10+3+4	17	500	
Semester-VI						
BPert.405	Advanced Perfusion	Core course	3+1+2	6	30+70=100T	

					30+70=100P
BPERT.406	Advanced & Recent Developments in CPB and Perfusion	Core course	3+1+2	6	30+70=100T 30+70=100P
BPERT.407	Research Methodology & Biostatistics	Elective course	2+1+0	3	30+70=100T
BPERT.408	Hospital management	Elective course	2+0+1	3	NC
Total credits			10+3+5	18	500
7semester+8semester					
Perfusion internship	1 paper presentation or 1 case report Internship (Six Month) -Minimum 1800 hours (calculated based on 6 hours per day for one year of internship)				
Grand Total Credits			73+9+30	112	3100

Detailed Course Content

BPERT-201: Human Anatomy | Credits: 4 | 3+0+1 | 100 T + 50 P

Course Rationale: Provides the anatomical foundation required for cardiac surgery, vascular access, cannulation, CPB and critical-care practice. General anatomy is selectively taught with emphasis on clinically relevant structures.

Course Learning Outcomes:

1. Identify major anatomical structures and anatomical planes relevant to patient care.
2. Describe thoracic, cardiac, pulmonary and vascular anatomy relevant to CPB.
3. Relate great-vessel and coronary anatomy to common cardiac procedures.
4. Identify major sites and anatomical considerations for arterial and venous access.
5. Interpret basic chest radiographs and recognise major anatomical landmarks.
6. Demonstrate safe surface-anatomy and model-based identification skills.

Unit-wise Content

Unit	Content	Hours
I	General anatomy, terminology, planes, tissues, bones, joints, muscles and clinically relevant surface anatomy. General Embryology	5
II	Thorax and respiratory system: thoracic cage, diaphragm, mediastinum, pleura, lungs, tracheobronchial tree and hilum.	10
III	Heart and great vessels: chambers, valves, pericardium, coronary circulation, conduction system, aorta, pulmonary trunk, pulmonary veins and venae cavae.	10
IV	Head, neck, nervous and autonomic systems with relevance to airway management, vascular access and neurological monitoring.	8
V	Abdomen, pelvis, kidneys, liver, spleen and major vessels; selected applied anatomy relevant to critical care.	5
VI	Applied anatomy for CPB: sternotomy, pericardial access, cannulation sites, vascular access, extracorporeal circulation and basic chest imaging.	7

Practical / Skills

1. Identify heart, lungs and great vessels on models/specimens.
2. Demonstrate surface landmarks for major arteries and veins.
3. Identify relevant structures on basic chest X-ray.
4. Demonstrate anatomical basis of common cannulation sites.
5. Draw simplified heart, great vessels and CPB-related anatomy diagrams.

Suggested Teaching-Learning Methods: Anatomical models; specimen demonstration; labelled diagrams; radiology-based teaching; case-based learning

Suggested Assessment: Written examination plus practical spotter/OSPE and applied anatomy viva.

BPERT-202: Human Physiology | Credits: 4 | 3+0+1 | 100 T + 50 P

Course Rationale: Builds the physiological understanding required to manage circulation, oxygenation, acid-base balance, temperature and fluid-electrolyte changes during CPB and critical care.

Course Learning Outcomes:

1. Explain cardiovascular and respiratory physiology relevant to extracorporeal circulation.

2. Calculate and interpret basic cardiac output and oxygen-delivery concepts.
3. Explain oxygen transport, ventilation-perfusion and gas exchange.
4. Interpret basic ECG, blood pressure and haemodynamic patterns.
5. Explain fluid, electrolyte and acid-base homeostasis.
6. Relate CPB to changes in normal cardiovascular, respiratory and metabolic physiology.

Unit-wise Content

Unit	Content	Hours
I	Cell physiology, homeostasis, body fluids, blood, RBCs, WBCs, platelets, haemostasis and transfusion principles.	8
II	Cardiovascular physiology: cardiac cycle, cardiac output, stroke volume, BP, coronary/systemic/pulmonary circulation, ECG and shock.	10
III	Respiratory physiology: ventilation, lung volumes, V/Q, diffusion, O ₂ /CO ₂ transport, hypoxia, hypercapnia and acid-base balance.	9
IV	Nervous and neuromuscular physiology; autonomic regulation; physiological basis of anaesthesia and neurological monitoring.	5
V	Renal, fluid-electrolyte and endocrine physiology; temperature regulation and critical illness.	6
VI	Applied perfusion physiology: oxygen delivery/consumption, haemodilution, temperature, CPB effects, weaning and shock.	7

Practical / Skills

1. Blood pressure measurement and interpretation.
2. Pulse and heart-sound assessment.
3. Basic ECG identification.
4. Haemoglobin and haematological measurements as available.
5. Demonstration/interpretation of respiratory parameters.
6. ABG and acid-base case interpretation.

Suggested Teaching-Learning Methods: Concept maps; calculations; bedside demonstrations; simulation; clinical cases

Suggested Assessment: Written examination + OSPE/case-based practical assessment.

BPERT-203: General Microbiology | Credits: 3 | 2+0+1 | 100 T + 50 P

Course Rationale: Provides the microbiological foundation needed for asepsis, sterilisation, infection

prevention and safe extracorporeal practice.

Course Learning Outcomes:

1. Explain basic microbial classification and pathogenicity.
2. Demonstrate principles of microscopy and staining.
3. Describe sterilisation, disinfection and aseptic technique.
4. Explain specimen collection, transport, culture and antimicrobial susceptibility testing.
5. Apply infection-prevention principles in OT, ICU and perfusion areas.

Unit-wise Content

Unit	Content	Hours
I	Laboratory safety, microscopy, sterilisation and disinfection.	8
II	Bacteria: morphology, growth, nutrition, normal flora, genetics and pathogenicity.	10

III	Culture media, specimen collection/transport, aerobic and anaerobic culture and identification.	10
IV	Smear preparation, Gram/acid-fast/other stains and antimicrobial susceptibility testing.	10
V	Healthcare-associated infection prevention, hand hygiene, PPE and antimicrobial resistance.	7

Practical / Skills

1. Microscopy and basic staining.
2. Gram and Ziehl–Neelsen staining demonstration.
3. Culture-media demonstration.
4. Antimicrobial susceptibility demonstration.
5. Hand hygiene/PPE competency station.

Suggested Teaching-Learning Methods: Demonstration; laboratory practice; infection-control drills

Suggested Assessment: Written examination + practical/OSPE.

BPERT-204: Basic Biochemistry | Credits: 3 | 2+0+1 | 100 T + 50 P

Course Rationale: Introduces biochemical processes needed to understand energy metabolism, blood chemistry, acid-base balance and organ function during cardiac surgery.

Course Learning Outcomes:

1. Explain carbohydrate, lipid and protein metabolism at an applied undergraduate level.
2. Relate ATP production and metabolic pathways to tissue function.
3. Explain vitamins and clinically relevant deficiencies.
4. Interpret basic biochemical parameters relevant to perfusion.
5. Relate metabolic changes to CPB and critical illness.

Unit-wise Content

Unit	Content	Hours
I	Carbohydrates, glycolysis, pyruvate, acetyl-CoA, TCA cycle, gluconeogenesis, glycogen and pentose phosphate pathway.	10
II	Amino acids and proteins: classification and structural levels.	8
III	Vitamins: fat-soluble and water-soluble vitamins and clinical relevance.	7
IV	Lipids, fatty acids, triglycerides and ketone-body metabolism.	8
V	Integrated metabolism and biochemical relevance to cardiac/critical illness.	12

Practical / Skills

1. Qualitative carbohydrate/protein tests as appropriate.
2. Demonstration of pH meter and spectrophotometer.
3. Interpretation of common biochemical reports.
4. Case-based interpretation of glucose, electrolytes and cardiac markers.

Suggested Teaching-Learning Methods: Laboratory demonstration; clinical interpretation; small-group case discussion

Suggested Assessment: Written examination + practical/OSPE.

BPERT-205: Professional Communication & English | Credits: 2 | 1+0+1 | 100

Course Rationale: Develops the communication skills required for safe patient care, multidisciplinary

teamwork and professional documentation.

Course Learning Outcomes:

1. Communicate clearly with patients and healthcare professionals.
2. Give structured clinical handovers.
3. Present a clinical case in an organised manner.
4. Write concise clinical notes, emails and incident reports.
5. Use professional terminology accurately.

Unit-wise Content

Unit	Content	Hours
I	Professional communication, listening, empathy, non-verbal communication and patient-centred interaction.	7
II	Clinical handover, SBAR, team communication and escalation.	6
III	Case presentation, seminar presentation and scientific speaking.	6
IV	Professional writing: email, clinical note, incident report and CV.	6
V	Communication in emergencies, conflict management and interprofessional teamwork.	5

Practical / Skills

1. SBAR handover.
2. Five-minute case presentation.
3. Professional email and clinical-note writing.
4. Emergency communication simulation.

Suggested Teaching-Learning Methods: Role play; simulation; presentations; peer feedback

Suggested Assessment: Continuous assessment, communication OSCE and portfolio.

BPERT-206: Medical Terminology & Clinical Documentation | Credits: 2 | 1+0+1 | 100

Course Rationale: Provides a practical vocabulary for interpreting orders, reports, records and communication used in perfusion and critical care.

Course Learning Outcomes:

1. Construct and interpret medical terms using roots, prefixes and suffixes.
2. Interpret common abbreviations and symbols safely.
3. Understand terminology related to cardiovascular, respiratory, nervous, renal and endocrine systems.
4. Read basic diagnostic reports and clinical orders.
5. Maintain accurate paper and electronic clinical documentation.

Unit-wise Content

Unit	Content	Hours
I	Roots, prefixes, suffixes, abbreviations, symbols and spelling.	6
II	Cardiovascular and respiratory terminology.	7
III	Neurological, renal, endocrine and musculoskeletal terminology.	5
IV	Diagnostic, surgical and procedural terminology.	6
V	Clinical records, EHR entries, reports and confidentiality.	6

Practical / Skills

1. Terminology-building exercises.
2. Interpret sample orders/reports.

3. Prepare a mock clinical record.
4. Electronic documentation exercise.

Suggested Teaching-Learning Methods: Interactive worksheets; EHR simulation; case records

Suggested Assessment: Portfolio + written assessment + documentation OSPE.

BPERT-207: Introduction to Healthcare & Professional Practice | Credits: 2 | 2+0+0 | 100

Course Rationale: Introduces the Indian healthcare environment, professional roles, patient rights, quality concepts and the place of perfusion services within a multidisciplinary system.

Course Learning Outcomes:

1. Describe primary, secondary and tertiary healthcare structures.
2. Explain the role of perfusion technologists within the cardiac-care team.
3. Describe basic national health-system concepts and public-health programmes.
4. Explain patient rights, safety culture and professional responsibilities.
5. Identify pathways for multidisciplinary care and referral.

Unit-wise Content

Unit	Content	Hours
I	Healthcare delivery system, primary/secondary/tertiary care and public/private sectors.	6
II	National health programmes, health policy and community participation.	5
III	Patient rights, safety culture and multidisciplinary healthcare.	6
IV	Overview of AYUSH and health systems in India; appropriate professional boundaries.	5
V	Role of allied health professionals and career pathways.	8

Suggested Assessment: Written examination + reflective professional-practice assignment.

Semester II

BPERT-208: Applied Biochemistry | Credits: 3 | 2+0+1 | 100 T + 50 P

Course Rationale: Connects biochemical laboratory knowledge with ABG, electrolytes, renal/hepatic function and cardiac biomarkers encountered in perfusion and ICU practice.

Course Learning Outcomes:

1. Describe specimen collection and anticoagulant selection.
2. Explain pH, buffers, blood gases and electrolytes.
3. Interpret basic ABG patterns.
4. Relate renal, hepatic and cardiac biochemical tests to clinical care.
5. Recognise pre-analytical errors affecting laboratory results.

Unit-wise Content

Unit	Content	Hours
I	Specimens, tubes, anticoagulants, collection, transport and pre-analytical variables.	8
II	Laboratory apparatus, pipettes, balances, pH meter and spectrophotometer.	7
III	Acid-base, pH, buffers, blood gases and electrolytes.	12
IV	Liver, renal and cardiac biochemical profiles.	10
V	Carbohydrate, lipid and protein chemistry with clinical application.	8

Practical / Skills

1. ABG report interpretation.
2. Electrolyte interpretation.
3. Urinalysis demonstration.
4. Interpretation of LFT/RFT/cardiac-marker reports.
5. Demonstration of pH meter/spectrophotometer.

Suggested Teaching-Learning Methods: Case-based laboratory interpretation; demonstrations

Suggested Assessment: Written + practical/OSPE.

BPRT-209: Applied Pharmacology & Critical Care | Credits: 3 | 2+1+0 | 100

Course Rationale: Provides pharmacological knowledge directly applicable to haemodynamic management, anaesthesia, anticoagulation and critical care.

Course Learning Outcomes:

1. Explain pharmacokinetics and pharmacodynamics at an applied level.
2. Identify major cardiovascular and CNS drugs used around cardiac surgery.
3. Explain anticoagulants, antiplatelets and reversal agents.
4. Recognise important adverse effects and drug interactions.
5. Relate drug choice to haemodynamic and perfusion situations.

Unit-wise Content

Unit	Content	Hours
I	General pharmacology: routes, absorption, distribution, metabolism, excretion, potency, efficacy, adverse reactions and toxicity.	8
II	Autonomic drugs and skeletal muscle relaxants.	8
III	CNS drugs, anaesthetics, analgesics and sedatives.	8
IV	Cardiovascular drugs: vasopressors, vasodilators, antianginals, antiarrhythmics and diuretics.	12
V	Anticoagulants, antiplatelets, thrombolytics, antibiotics and selected endocrine/respiratory drugs.	9

Suggested Teaching-Learning Methods: Drug charts; clinical cases; dose/calculation exercises; simulation

Suggested Assessment: Written examination + prescription/chart interpretation exercises.

BPRT-210: Introduction to Perfusion Technology-I | Credits: 5 | 2+0+3 | 100 T + 50 P

Course Rationale: Introduces the history, principles, equipment and workflow of CPB and establishes the first technical competencies.

Course Learning Outcomes:

1. Describe the history and principles of CPB.
2. Identify major heart-lung-machine components.
3. Explain oxygenator, pump, tubing, reservoir and heat-exchanger functions.
4. Explain basic cannulation, priming and temperature-management concepts.
5. Demonstrate safe setup and identification of a CPB circuit.

Unit-wise Content

Unit	Content	Hours
I	History and evolution of CPB; role of the perfusion technologist.	6
II	Heart-lung machine components, pump systems and circuit diagrams.	10
III	Oxygenators, reservoirs, filters, tubing and heat exchangers.	10
IV	Cannulation principles, priming fluids, haemodilution and temperature	12

	management.	
V	Hemofiltration, monitoring, ACT, basic blood-gas monitoring and safety checks.	7

Practical / Skills

- Identify all circuit components.
- Assemble a basic circuit on a simulation platform.
- Prepare and check a priming plan.
- Demonstrate pump and pressure-monitoring setup.
- Perform a pre-use equipment safety checklist.
- Explain emergency stop and manual-crank principles.

Suggested Teaching-Learning Methods: Simulation laboratory; equipment demonstration; structured skills stations

Suggested Assessment: Written + OSPE + skill checklist.

BPERT-211: Quality, Patient Safety & Infection Control | Credits: 2 | 2+0+0 | 100

Course Rationale: Develops a safety-first approach to perfusion and hospital practice.

Course Learning Outcomes:

- Apply hand hygiene, PPE and aseptic principles.
- Explain biomedical-waste segregation and safe disposal.
- Describe basic NABH/JCI-oriented quality concepts without treating standards as a memorisation exercise.
- Recognise common patient-safety hazards.
- Explain BLS, emergency preparedness and incident reporting.

Unit-wise Content

Unit	Content	Hours
I	Quality of care, quality improvement, patient safety and hospital standards.	7
II	BLS, primary assessment, first aid, triage, airway support and CPR.	8
III	Biomedical waste, PPE, sterilisation and cross-infection prevention.	9
IV	Antimicrobial resistance and rational antibiotic use.	6
V	Disaster preparedness, emergency management and incident reporting.	5

Suggested Teaching-Learning Methods: Demonstration; drills; safety walk-rounds; case discussion

Suggested Assessment: Written + safety/CPR competency checklist.

BPERT-212: Clinical Skills-I: ICU & Critical Care | Credits: 5 | 0+0+5 | 100

Course Rationale: Provides early supervised exposure to the ICU environment and prepares students to

understand monitoring, ABG, ventilation, fluid balance and post-CPB care.

Course Learning Outcomes:

- Measure and record basic vital signs safely.
- Recognise normal and abnormal haemodynamic patterns.
- Interpret basic ABG parameters.
- Understand ventilator monitoring and oxygenation.

5. Assess fluid balance and urine output.
6. Observe post-cardiac-surgery ICU management.
7. Understand basic ECMO circuit monitoring.
8. Recognise common emergencies and initiate basic supervised responses.
9. Follow infection-control and patient-safety practices.
10. Present a basic ICU case.

Unit-wise Content

Unit	Content	Hours
I	ICU orientation, patient identification, safety, infection control and basic assessment.	4
II	ECG, BP, arterial pressure waveform, CVP, rhythm and perfusion monitoring.	5
III	Oxygen therapy, ventilator basics, SpO2 and ABG interpretation.	5
IV	Post-CPB care, temperature, fluid balance, bleeding, drains, coagulation and low-output states.	5
V	ECMO/MCS introduction, circuit observation and emergency recognition.	5
VI	Cardiac arrest, BLS, airway emergencies, shock and blood-product considerations.	4
VII	Charts, documentation, case presentation and multidisciplinary rounds.	2

Practical / Skills

1. ICU orientation and safety checklist.
2. Vital-sign and ECG monitoring.
3. Arterial-line/CVP observation.
4. ABG interpretation.
5. Ventilator monitoring.
6. Fluid-balance calculation.
7. Post-CPB assessment.
8. ECMO circuit observation.
9. ICU case presentation.

Suggested Teaching-Learning Methods: Clinical posting; bedside teaching; simulation; case presentation

Suggested Assessment: Continuous clinical assessment + logbook + case presentation.

BPRT-213: Digital Health & Computer Applications | Credits: 2 | 1+0+1 | 100

Course Rationale: Provides basic digital competencies for modern clinical practice, data handling and academic work.

Course Learning Outcomes:

1. Use basic word-processing, spreadsheet and presentation tools.
2. Enter and retrieve clinical data appropriately in a simulated EHR.
3. Prepare simple tables and graphs.
4. Search scientific literature using appropriate keywords.
5. Apply principles of confidentiality and data security.

Unit-wise Content

Unit	Content	Hours
I	Computer and digital-health fundamentals.	5

II	EHR, clinical documentation and data confidentiality.	7
III	Spreadsheets, tables, charts and basic calculations.	7
IV	Literature search, reference management and academic presentations.	6
V	Data security, passwords, privacy and responsible digital practice.	5

Practical / Skills

1. Prepare a clinical spreadsheet.
2. Create a simple clinical graph.
3. Enter a mock EHR record.
4. Conduct a structured literature search.
5. Prepare a 5-slide academic presentation.

Suggested Assessment: Practical portfolio + computer-based OSPE.

Semester III

BPRT-301: Pathology for Perfusion Practice | Credits: 5 | 3+0+2 | 100 T + 50 P

Course Rationale: Provides only the pathology necessary for understanding blood, coagulation, organ injury, cardiac disease and transfusion-related problems encountered in perfusion practice.

Course Learning Outcomes:

- Explain basic mechanisms of cell injury, inflammation and healing.
- Recognise common haematological and coagulation disorders.
- Explain transfusion principles and reactions.
- Relate pathology of cardiac and respiratory disease to perfusion.
- Interpret selected laboratory findings relevant to perfusion.

Unit-wise Content

Unit	Content	Hours
I	Cell injury, inflammation, healing, haemodynamic disorders and selected neoplasia concepts.	8
II	Anaemia, WBC disorders, thrombocytopenia, leukemia overview, bleeding disorders and DIC.	12
III	Blood collection, anticoagulants, CBC, smear, PT, APTT, ESR and laboratory safety.	10
IV	Transfusion medicine: donor selection, grouping, cross-match, components, storage and reactions.	9
V	Clinical pathology: urinalysis and selected organ-system pathology relevant to CPB.	6

Practical / Skills

11. Peripheral smear and basic haematology demonstration.
12. Blood grouping/Rh typing.
13. Interpret CBC/PT/APTT.
14. Urinalysis.
15. Transfusion-reaction case discussion.

Suggested Assessment: Written + practical/OSPE.

BPERT-302: Introduction to Perfusion Technology-II | Credits: 5 | 3+0+2 | 100 T + 50 P

Course Rationale: Builds from basic equipment knowledge to integrated interpretation of CPB monitoring,

cardiac diagnostics and common diseases requiring perfusion support.

Course Learning Outcomes:

1. Explain the evolution and principles of extracorporeal circulation.
2. Identify monitoring equipment used in OT and ICU.
3. Interpret basic ECG, CXR, echocardiography, angiography and laboratory information.
4. Describe common cardiac, respiratory and congenital conditions encountered in cardiac surgery.
5. Relate diagnostic findings to perfusion planning.

Unit-wise Content

Unit	Content	Hours
I	History/evolution of cardiac surgery and CPB.	7
II	Extracorporeal circulation, biocompatibility, asepsis, HLM, oxygenator, heater-cooler, ACT and monitoring devices.	12
III	ECG, CXR, echocardiography, coronary angiography, ABG, renal/hepatic/coagulation profiles.	10
IV	IHD, ACS, MI, cardiomyopathy, heart failure and respiratory disorders.	9
V	Congenital heart disease and valvular/rheumatic disease: overview and perfusion relevance.	7

Practical / Skills

1. ECG identification.
2. CXR review.
3. Basic echocardiography/angiography orientation.
4. ACT-machine demonstration.
5. CPB-machine assembly simulation.

Suggested Assessment: Written + diagnostic OSPE + case presentation.

BPERT-303: Fundamentals of Pumps, Oxygenators, Filters & Blood Components | Credits: 6 | 3+1+2 | 100 T + 50 P

Course Rationale: Develops a sound understanding of the hardware and blood-management principles

underlying extracorporeal circuits.

Course Learning Outcomes:

1. Explain types and principles of pumps.
2. Compare oxygenator designs and performance principles.
3. Identify filters, tubing and heat exchangers.
4. Explain blood components and blood-conservation strategies.
5. Demonstrate basic circuit component selection and safe handling.

Unit-wise Content

Unit	Content	Hours
I	Oxygenators: historical and modern membrane systems; design and function.	8
II	Pumps: roller, centrifugal and peristaltic systems; principles and characteristics.	13

III	Filters, tubing, heat exchangers and safety components.	10
IV	Blood components, haemoconcentration, CUF, MUF, cell salvage and blood conservation.	9
V	Coagulation disorders relevant to extracorporeal circulation.	5

Practical / Skills

1. Identify pump and oxygenator types.
2. Assemble a simplified circuit.
3. Identify filters and tubing.
4. Demonstrate temperature-control setup.
5. Demonstrate blood-component selection through case scenarios.

Suggested Assessment: Written + practical/OSPE + viva.

BPERT-304: Medical Emergencies & Patient Care | Credits: 3 | 3+0+0 | 100

Course Rationale: Provides the emergency and patient-care foundation needed for safe work in cardiac OT, ICU and emergency environments.

Course Learning Outcomes:

1. Perform structured primary assessment under supervision.
2. Recognise common cardiac and respiratory emergencies.
3. Explain basic airway, CPR, fluid and transfusion principles.
4. Communicate and document emergencies appropriately.
5. Apply safe patient handling and transport principles.

Unit-wise Content

Unit	Content	Hours
I	Emergency-service organisation, monitoring, fluids, blood transfusion, airway management, CPR, ventilation and acid-base/electrolyte basics.	10
II	Cardiac and respiratory emergencies: shock, heart failure, MI, arrhythmias, asthma, COPD and pneumothorax.	12
III	Neurological emergencies, seizures, head injury and trauma care.	7
IV	Patient-centred care, communication, rights, reporting and safe transfer.	8
V	Special patient groups and common acute conditions relevant to hospital practice.	8

Suggested Teaching-Learning Methods: Simulation; emergency drills; case discussion

Suggested Assessment: Written + emergency-scenario assessment.

Semester IV

BPERT-305: Applied Pathophysiology | Credits: 4 | 2+1+1 | 100 T + 50 P

Course Rationale: Integrates disease mechanisms with the physiological problems encountered during cardiac surgery and CPB.

Course Learning Outcomes:

1. Explain major cardiovascular and respiratory disease mechanisms.
2. Relate disease states to oxygen delivery, haemodynamics and perfusion planning.
3. Recognise renal, pulmonary and systemic complications relevant to CPB.
4. Interpret selected pathological findings in clinical cases.

Unit-wise Content

Unit	Content	Hours
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I	Atherosclerosis, IHD, MI and hypertension.	8
II	Heart failure, rheumatic/infective heart disease, congenital heart disease, aneurysms and cardiomyopathies.	10
III	Atelectasis, pulmonary oedema, ARDS, COPD, asthma, bronchiectasis and restrictive disease.	10
IV	Pulmonary embolism, pulmonary hypertension and pneumonia.	8
V	Renal disease, diabetes-related organ injury, pleural/pericardial effusion and systemic effects relevant to CPB.	9

Practical / Skills

1. Interpret disease-based case sheets.
2. Identify major cardiac and pulmonary pathology specimens/images.
3. Relate pathology to expected perfusion challenges.

Suggested Assessment: Written + case-based practical.

BPert-306: Pharmacology for Critical Care & CPB | Credits: 3 | 2+1+0 | 100

Course Rationale: Reorganises the broad pharmacology content around medicines that students are likely to encounter in perioperative, ICU and CPB practice.

Course Learning Outcomes:

1. Explain antimicrobial therapy at a clinically appropriate level.
2. Describe anticoagulants, antiplatelets, antifibrinolytics and reversal agents.
3. Explain respiratory, endocrine and GI drugs encountered in ICU.
4. Recognise drug-related hazards and interactions relevant to perfusion.

Unit-wise Content

Unit	Content	Hours
I	Antimicrobials and principles of rational antimicrobial use.	8
II	Heparin, protamine, antiplatelets, antifibrinolytics and thrombolytics.	10
III	Respiratory drugs, bronchodilators, mucolytics, steroids and NSAIDs.	8
IV	Endocrine drugs and glucose management.	8
V	GI drugs, antiemetics, diuretics and selected ICU medications. Anticoagulants, antiplatelets, thrombolytics, antibiotics and selected endocrine/respiratory drugs.	6

Suggested Teaching-Learning Methods: Drug cards; case-based prescribing review; medication-safety exercises

Suggested Assessment: Written examination + medication-chart interpretation.

BPert-307: Conduct of Cardiopulmonary Bypass | Credits: 6 | 3+0+3 | 100 T + 50 P

Course Rationale: This is a major competency course. It integrates pre-bypass preparation, circuit assembly, initiation, maintenance, monitoring, myocardial protection, troubleshooting and weaning.

Course Learning Outcomes:

1. Prepare equipment and perform a structured pre-bypass checklist.
2. Explain cannulation and circuit-setup principles.
3. Conduct simulated CPB safely under supervision.
4. Monitor flow, pressure, temperature, oxygenation, ABG, ACT, electrolytes and haematocrit.
5. Recognise and respond to common CPB problems in simulation.

6. Demonstrate structured weaning-from-CPB decision making under supervision.

Unit-wise Content

Unit	Content	Hours
I	Priming solutions, haemodilution, crystalloid/colloid concepts and pre-bypass preparation.	8
II	Patient preparation, arterial/venous cannulation and cardioplegia cannulation principles.	10
III	Initiation and conduct of CPB, gas management, venting, suction, ABG/ACT and adequacy of perfusion.	12
IV	Equipment selection, oxygenator/cannula/tubing selection and safety checks.	7
V	Cardioplegia systems, temperature management and blood-management principles.	8

Practical / Skills

1. Pre-bypass checklist.
2. CPB circuit assembly and priming.
3. ABG and ACT interpretation.
4. Simulated initiation of CPB.
5. Simulated maintenance of CPB.
6. Simulated weaning.
7. Troubleshooting scenarios: inadequate venous return, high line pressure, air, oxygenator/gas-exchange problem, power/pump failure.

Suggested Teaching-Learning Methods: High-fidelity/low-fidelity simulation; supervised OT exposure;
case-based troubleshooting

Suggested Assessment: Written + OSPE/OSCE + simulation competency assessment.

BPRT-308: Medical Disorders, Critical Care & Perioperative Management | Credits: 5 | 3+0+2 | 100 T + 50 P

Course Rationale: Integrates the broad ICU content in the submitted curriculum and focuses it on conditions that affect perfusion, postoperative care and extracorporeal support.

Course Learning Outcomes:

1. Recognise major cardiac, respiratory, neurological, renal and metabolic problems in critically ill patients.
2. Interpret basic fluid, electrolyte and acid-base disturbances.
3. Understand ventilator and haemodynamic support.
4. Apply infection prevention, nutrition and transport principles.
5. Relate critical illness to post-CPB management.

Unit-wise Content

Unit	Content	Hours
I	Cardiac and respiratory disease, shock, arrhythmia, cardiac arrest and postoperative cardiac ICU care.	10
II	Neurological, renal, gastrointestinal and infectious disorders relevant to ICU.	10
III	Blood loss, anaemia, fluids, electrolytes and acid-base disorders.	10

IV	Infection prevention, sepsis, MODS, nutrition and fluid balance.	8
V	Special populations and selected toxicological/emergency conditions.	7

Practical / Skills

1. Vital and haemodynamic monitoring.
2. Ventilator-monitoring scenarios.
3. Fluid/electrolyte calculation.
4. ABG case interpretation.
5. Transport of critically ill patient—simulation.
6. Post-CPB ICU case presentation.

Suggested Assessment: Written + practical/OSPE + case presentation.

BPERT-309: Professional Ethics, Law & Patient Rights | Credits: 2 | 2+0+0 | 100

Course Rationale: Provides the ethical and legal foundation needed for responsible allied-health practice.

Course Learning Outcomes:

1. Explain autonomy, confidentiality, informed consent and patient rights.
2. Recognise professional negligence and documentation risks.
3. Apply ethical principles to routine clinical dilemmas.
4. Describe medico-legal records and incident reporting.
5. Demonstrate professional conduct and respect for patient dignity.

Unit-wise Content

Unit	Content	Hours
I	Medical ethics, professional code, autonomy, beneficence, non-maleficence and justice.	7
II	Confidentiality, consent, patient rights and communication.	7
III	Medical records, medico-legal cases, disclosure, retention and documentation.	8
IV	Negligence, malpractice, indemnity and incident/near-miss reporting.	7
V	End-of-life care, organ donation and ethical decision-making.	6

Suggested Assessment: Case-based written assessment + ethics scenario discussion.

Semester V

BPERT-401: Myocardial Protection, Anticoagulation & Drugs in CPB | Credits: 6 | 3+1+2 | 100 T + 50 P

Course Rationale: Develops advanced understanding of myocardial protection, anticoagulation, reversal and haemodynamic drug use during CPB.

Course Learning Outcomes:

1. Explain crystalloid and blood cardioplegia strategies.
2. Describe common cardioplegia solutions and delivery systems.
3. Explain heparin monitoring, heparin resistance, HIT and reversal.
4. Relate vasoactive and inotropic drugs to CPB and postoperative haemodynamics.
5. Explain temperature management and organ effects of CPB.

Unit-wise Content

Unit	Content	Hours
I	Myocardial protection: St Thomas, del Nido, Custodiol/HTK, blood cardioplegia and delivery systems.	10

II	Vasodilators, vasoconstrictors, antiarrhythmics, diuretics, inotropes and selected sedative/analgesic drugs.	12
III	Heparin dosing/monitoring, heparin resistance, HIT, alternatives and protamine.	10
IV	Temperature management, hypothermia, rewarming and temperature gradients.	6
V	Systemic effects of CPB: CNS, respiratory, renal, hepatic, immune and inflammatory responses.	7

Practical / Skills

1. Prepare/compare cardioplegia plans using case scenarios.
2. Interpret ACT/heparin-monitoring cases.
3. Identify common vasoactive/inotropic agents.
4. Simulate temperature-management decisions.
5. Case-based drug selection.

Suggested Assessment: Written + drug/cardioplegia OSPE + viva.

BPERT-402: Special Situations in Perfusion Technology | Credits: 4 | 3+1+0 | 100

Course Rationale: Prepares students for situations requiring modification of standard CPB strategies.

Course Learning Outcomes:

1. Explain perfusion principles for aortic surgery.
2. Describe pregnancy and paediatric perfusion considerations.
3. Explain DHCA, ACP and RCP principles.
4. Describe minimally invasive and selected non-cardiac perfusion procedures.
5. Apply structured safety checklists to special cases.

Unit-wise Content

Unit	Content	Hours
I	Aortic aneurysm/dissection and thoracic vascular disease.	8
II	Foetal circulation, CPB in pregnancy, reperfusion injury and special CPB checklists.	10
III	Paediatric and infant CPB: circuits, cannulae and blood prime concepts.	8
IV	DHCA, ACP/RCP, alpha-stat and pH-stat concepts.	10
V	Minimally invasive cardiac surgery, non-cardiac CPB and perfusion safety devices.	9

Practical / Skills

1. Special-case circuit planning.
2. DHCA/ACP/RCP simulation.
3. Paediatric circuit identification.
4. Case-based imaging interpretation.
5. Safety-device identification.

Suggested Assessment: Written + case-based practical/seminar.

BPERT-403: Mechanical Circulatory Support & ECMO | Credits: 5 | 2+1+2 | 100 T + 50 P

Course Rationale: Provides structured undergraduate-level exposure to IABP, ECMO and VAD concepts, monitoring and emergency recognition.

Course Learning Outcomes:

1. Explain principles and indications of IABP, ECMO and VADs.
2. Identify circuit/device components.
3. Interpret basic flow, pressure and oxygenation information.
4. Recognise common device complications and emergencies.
5. Demonstrate safe observation/handling skills within the student scope of practice.

Unit-wise Content

Unit	Content	Hours
I	IABP: components, balloon, indications, insertion/removal concepts, monitoring and complications.	8
II	ECMO: VV/VA concepts, components, indications, contraindications and monitoring.	12
III	VADs: components, indications, limitations and total artificial heart overview.	8
IV	MCS emergencies, anticoagulation, oxygenation and troubleshooting principles.	9
V	Recent developments and multidisciplinary management.	8

Practical / Skills

1. IABP waveform/triggering demonstration.
2. ECMO circuit assembly simulation.
3. Flow/pressure monitoring.
4. VAD component identification.
5. Emergency scenario discussion.

Suggested Assessment: Written + MCS/ECMO OSPE + case presentation.

BPERT-404: Quality Improvement, Audit & Professional Practice | Credits: 3 | 2+0+1 | 100 T + 50 P

Course Rationale: Introduces students to quality improvement, clinical audit, equipment safety and professional accountability.

Course Learning Outcomes:

1. Define a quality indicator and clinical audit.
2. Identify process and outcome measures in perfusion services.
3. Participate in a simple quality-improvement cycle.
4. Recognise equipment and documentation risks.
5. Prepare a basic audit or quality-improvement poster.

Unit-wise Content

Unit	Content	Hours
I	Quality indicators, patient safety culture and incident reporting.	7
II	Clinical audit, audit cycle and root-cause concepts.	7
III	Equipment safety, maintenance, calibration and inventory.	7
IV	Documentation, handover and multidisciplinary teamwork.	6
V	Mini quality-improvement project and presentation.	8

Practical / Skills

1. Develop a simple audit tool.
2. Perform a simulated safety audit.
3. Prepare a quality-improvement poster.
4. Conduct a mock incident review.

Suggested Assessment: Portfolio + mini-audit + presentation.

Semester VI

BPERT-405: Advanced Perfusion & Perfusion Safety | Credits: 6 | 3+1+2 | 100 T + 50 P

Course Rationale: Consolidates advanced perfusion management, complex extracorporeal support and prevention/management of perfusion accidents.

Course Learning Outcomes:

1. Integrate advanced CPB monitoring and safety principles.
2. Explain peripheral bypass and assisted venous drainage concepts.
3. Describe perfusion approaches for complex cardiac and thoracic procedures.
4. Recognise mechanical, electrical, gas and patient-related perfusion emergencies.
5. Demonstrate structured emergency response in simulation.

Unit-wise Content

Unit	Content	Hours
I	Advanced extracorporeal support, peripheral bypass, femoral-femoral bypass and peripheral cannulation.	12
II	Vacuum-assisted venous drainage, kinetic augmentation, suction bypass and advanced circuit concepts.	10
III	Advanced paediatric and complex perfusion principles.	10
IV	Perfusion accidents: mechanical/electrical failure, air, pressure, oxygenation and coagulation problems.	15
V	Team response, safety culture, incident review and prevention.	13

Practical / Skills

1. Advanced circuit planning.
2. Emergency pump-failure simulation.
3. Air-in-circuit response simulation.
4. Oxygenator/gas-supply failure scenario.
5. Perfusion accident communication drill.
6. Case presentation.

Suggested Assessment: Written + high-stakes simulation/OSCE + competency logbook.

BPERT-406: Advanced & Recent Developments in CPB and Perfusion | Credits: 6 | 3+1+2 | 100 T + 50 P

Course Rationale: Provides an evidence-informed overview of emerging and advanced perfusion practice while keeping undergraduate expectations realistic.

Course Learning Outcomes:

1. Describe current developments in perfusion technology at an appropriate undergraduate level.
2. Explain perfusion for paediatric, aortic, minimally invasive and selected non-cardiac procedures.
3. Discuss ECMO and extracorporeal support developments.
4. Evaluate benefits, limitations and safety considerations of new technologies.
5. Present a recent research paper or technology review.

Unit-wise Content

Unit	Content	Hours
I	Advanced paediatric perfusion and complex congenital surgery.	8

II	ECMO, thoracic aortic surgery, DHCA and cerebral perfusion.	12
III	Perfusion outside the conventional OT, invasive cardiology and selected non-cardiac applications.	8
IV	Minimally invasive surgery, safety devices and perfusion-system developments.	10
V	Recent evidence, emerging technologies, experimental perfusion and future directions.	10

Practical / Skills

1. Journal/paper presentation.
2. Technology appraisal.
3. Case-based discussion.
4. Simulation of selected advanced techniques.

Suggested Assessment: Written + seminar/paper presentation + practical case discussion.

BPRT-407: Research Methodology, Biostatistics | Credits: 3 | 2+1+0 | 100

Course Rationale: Enables students to understand, interpret and communicate clinical research without

requiring advanced mathematical statistics.

Course Learning Outcomes:

1. Formulate a focused clinical research question.
2. Distinguish common study designs.
3. Understand sampling, variables and basic sample-size concepts.
4. Summarise data using appropriate descriptive statistics.
5. Interpret confidence intervals, p-values and basic statistical tests.
6. Read tables/graphs and identify common sources of bias.
7. Prepare a brief evidence-based presentation.

Unit-wise Content

Unit	Content	Hours
I	Research questions, literature search, study designs, variables and measurement.	4
II	Data presentation, frequency distributions, tables, graphs and descriptive statistics.	4
III	Mean, median, mode, range, variance, SD and IQR; choosing summaries.	4
IV	Probability, normal distribution, sampling, confidence intervals and basic significance testing.	3
V	Common tests: chi-square, t-test, non-parametric tests and correlation—conceptual use.	2
VI	Bias, confounding, ethics, plagiarism, referencing and evidence appraisal.	3

Practical / Skills

1. Prepare a data dictionary.
2. Create a simple table/graph.
3. Interpret a clinical research table.
4. Critically appraise one perfusion paper.
5. Prepare a 5–7 minute journal presentation.

Suggested Assessment: Written + research appraisal assignment/presentation.

BPert-408: Hospital Systems & Leadership | Credits: 3 | 2+0+1 | 100

Course Rationale: Prepares students for transition from undergraduate training to supervised professional employment and lifelong learning.

Course Learning Outcomes:

1. Explain hospital organisation and cardiac OT/ICU workflow.
2. Describe basic staffing, equipment and resource management.
3. Demonstrate leadership and teamwork principles.
4. Prepare professional documentation and a CV.
5. Plan continuing professional development and career progression.

Unit-wise Content

Unit	Content	Hours
I	Hospital organisation, cardiac OT, ICU, CSSD, blood bank and allied departments.	8
II	Staffing, scheduling, inventory, equipment maintenance and documentation.	8
III	Leadership, teamwork, communication, conflict resolution and handover.	8
IV	Quality, safety, accreditation and professional accountability.	6
V	Career development, CV/interview skills, continuing education and higher studies.	5

Practical / Skills

1. Prepare a CV.
2. Mock interview.
3. Develop a duty/skill roster.
4. Map a cardiac OT workflow.
5. Prepare a professional development plan.

Suggested Assessment: Portfolio + viva/presentation + practical assignment.

7. Compulsory Clinical Internship – Semesters VII & VIII

The internship is an integral component of the four-year programme. It shall commence only after successful completion of the academic requirements of Semesters I–VI, subject to university rules. The internship is intended to consolidate knowledge and develop supervised entry-level clinical competence.

Internship Duration

One full academic year (Semesters VII and VIII). The curriculum intentionally removes the conflicting six-month/1800-hour statement from the submitted version. Actual duty hours, weekly off-days, leave and attendance shall follow university and hospital regulations.

Recommended Internship Rotation

Posting	Indicative Duration	Core Learning Focus
Orientation & induction	5 days	Hospital orientation, OT/ICU safety, infection control, documentation, professional conduct and emergency procedures.
Cardiac OT / CVTS Perfusion	Majority of internship	Pre-bypass assessment, circuit preparation, priming, CPB conduct, monitoring, myocardial protection, weaning, troubleshooting and documentation.

Cardiac ICU	30 days	Post-CPB care, haemodynamic monitoring, ventilation, ABG, fluids/electrolytes, bleeding, transfusion, ECMO observation and case presentation.
Blood Bank / Transfusion	5–10 days	Blood grouping, components, cross-match, storage, transfusion safety and reactions.
CSSD / Record & Quality	10–15 days	Sterilisation, instrument flow, documentation, quality and infection prevention.
Emergency/Casualty	5–10 days	BLS, emergency assessment, airway, shock and patient transport.
Biomedical Engineering	3–5 days	Equipment safety, maintenance, preventive checks and troubleshooting.
Research/Academic activity	Throughout internship	Case report, audit/research activity, seminar and professional presentation.

Internship Competency Framework

Each skill should be recorded using four levels:

Level	Meaning
1 – Observe	Student observes the procedure and explains the basic principle.
2 – Assist	Student assists a trained professional under direct supervision.
3 – Perform under supervision	Student performs the skill safely with direct supervision.
4 – Demonstrate competence	Student performs consistently at the expected undergraduate entry level, with appropriate supervision and escalation.

Minimum Internship Competencies

1. Follow patient-identification, infection-control and OT/ICU safety procedures.
2. Complete a pre-bypass equipment and safety checklist.
3. Identify and prepare the CPB circuit and major components.
4. Assist with circuit assembly and priming.
5. Understand and assist with initiation and maintenance of CPB under supervision.
6. Monitor and record flow, pressure, temperature, oxygenation, ACT, ABG and relevant laboratory parameters.
7. Assist with cardioplegia and myocardial-protection procedures.
8. Recognise common CPB abnormalities and immediately escalate concerns.
9. Assist with weaning from CPB under supervision.
10. Understand blood conservation, haemoconcentration and transfusion principles.
11. Observe and participate, within scope, in IABP/ECMO/MCS care.
12. Interpret basic ICU monitoring and postoperative cardiac-surgery trends.
13. Maintain accurate perfusion records and clinical documentation.
14. Communicate effectively during handover and emergencies.
15. Participate in multidisciplinary rounds and case discussions.
16. Demonstrate ethical and professional behaviour.
17. Complete a case report or approved academic project and present it.
18. Demonstrate readiness for supervised entry-level professional practice.

Internship Logbook – Recommended Sections

Section	Examples
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OT/CPB	Case date, diagnosis, procedure, circuit, oxygenator, pump, priming, anticoagulation, monitoring, cardioplegia, CPB duration, temperature, complications and outcome.
ICU	Vitals, ECG, invasive monitoring, ABG, ventilation, fluids, drains, blood products, vasoactive support and case presentation.
MCS/ECMO	Device/circuit observation, indication, flow/pressure/oxygenation monitoring and emergency observations.
Skills	Checklist with Observe/Assist/Perform/Competent levels.
Quality & Safety	Safety checklist, incident/near-miss learning, infection-control activities and audit.
Academic	Seminar, case report, journal presentation, research/audit work.
Professionalism	Attendance, communication, teamwork, punctuality and feedback.

Internship Assessment

Component	Suggested Weight/Approach
Continuous formative assessment	Faculty/senior perfusionist observation using competency checklist.
Logbook	Completion, accuracy, reflective learning and verified procedures.
Mid-internship review	Formal feedback and individual learning plan.
Case presentation	Structured clinical case presentation.
Case report/project	One approved case report, audit or small academic project.
Final competency assessment	OSCE/OSPE or structured clinical assessment.
Professional behaviour	Communication, teamwork, patient safety and documentation.

The exact marks and pass criteria should be notified by the University through the applicable examination regulations.

8. Student-Friendly Teaching and Assessment Framework

Recommended Teaching-Learning Methods

1. Short concept-focused lectures rather than prolonged monologues.
2. Case-based learning in every clinical/perfusion subject.
3. Simulation laboratory for CPB, ICU and emergency scenarios.
4. Demonstration followed by supervised student practice.
5. OSPE/OSCE stations for equipment, interpretation and safety skills.
6. Bedside teaching during clinical postings.
7. Small-group seminars and journal clubs.
8. Flipped learning for selected technical topics.
9. Clinical logbooks with faculty feedback.
10. Interdisciplinary teaching with anaesthesia, cardiac surgery, ICU, nursing and biomedical engineering teams.

Recommended Assessment Blueprint

Assessment Method	Purpose
MCQ/SAQ	Core knowledge and terminology.
Structured written	Conceptual understanding and clinical reasoning.

questions	
OSPE	Equipment identification, calculations, interpretation and technical skills.
OSCE	Communication, emergency response, patient safety and clinical reasoning.
Case-based assessment	Integration of basic science and perfusion knowledge.
Logbook	Longitudinal evidence of clinical exposure and competency.
Seminar/journal presentation	Communication and evidence appraisal.
Portfolio	Professional development, audit, reflection and documentation.

9. Recommended Skill Progression

Stage	Expected Student Activity
Semester I	Identify and explain; basic laboratory and communication skills.
Semester II	Observe and assist; basic ICU and CPB-equipment skills.
Semester III	Perform selected basic skills in simulation under supervision.
Semester IV	Integrate patient assessment with CPB conduct and troubleshooting.
Semester V	Apply advanced concepts to special situations and MCS.
Semester VI	Manage complex simulated cases and demonstrate safety-focused reasoning.
Internship	Perform appropriate entry-level tasks under supervision and demonstrate documented competence.

10. One Clinical Case Per Unit/Module

To reduce rote learning, every major module should include at least one clinically oriented case. Suggested cases include:

1. Congenital heart disease: identify anatomy and explain perfusion implications.
2. Adult valve surgery: plan basic CPB equipment and monitoring.
3. Low haematocrit during CPB: relate physiology, haemodilution and blood management.
4. High ACT/low ACT scenario: interpret anticoagulation monitoring.
5. ABG during CPB: identify acid-base and gas-exchange abnormality.
6. Low venous return: work through a structured CPB troubleshooting algorithm.
7. High arterial-line pressure: identify possible causes and immediate escalation.
8. Post-CPB low cardiac output: integrate haemodynamics, drugs and ICU care.
9. ECMO patient: identify circuit, flow and oxygenation variables.
10. Perfusion equipment failure: communicate and implement the institutional emergency protocol.

11. Curriculum Mapping to Graduate Competencies

Competency	Introduced	Developed	Consolidated
Basic anatomy/physiology	Sem I	Sem II–IV	Sem VI/Internship
CPB equipment	Sem II	Sem III	Sem IV–VI/Internship
CPB conduct	Sem II	Sem IV	Sem V–VI/Internship
ICU skills	Sem II	Sem IV	Internship
MCS/ECMO	Sem II observation	Sem V	Sem VI/Internship
Patient safety	Sem I–II	Sem III–V	Sem VI/Internship
Professional communication	Sem I	Sem II–IV	Internship

Research/evidence	Sem I–III exposure	Sem VI	Internship
Ethics/law	Sem I exposure	Sem IV–V	Internship
Leadership/employability	Sem II	Sem V	Sem VI/Internship

12. Recommended Faculty and Clinical Delivery Model

1. Each core perfusion course should have a designated course coordinator.
2. Practical classes should maintain an appropriate student-to-equipment ratio.
3. Clinical postings should have an identified faculty/senior-perfusion mentor.
4. Students should not independently perform high-risk clinical procedures beyond their authorised level of training.
5. Every clinical skill should have a written competency checklist.
6. Simulation should be used before first exposure to high-risk procedures wherever feasible.
7. Feedback should be documented after major clinical/simulation assessments.

13. Editorial and Technical Corrections Made

1. Standardised inconsistent course titles and removed duplicated/ambiguous course numbering.
2. Corrected terminology such as 'Conduction of CPB' to 'Conduct of Cardiopulmonary Bypass'.
3. Corrected 'Asics of pumps' to 'Fundamentals of Pumps, Oxygenators, Filters & Blood Components'.
4. Changed generic 'Pharmacology drugs' to clinically descriptive pharmacology titles.
5. Standardised 'Mechanical Circulatory Support Device' to 'Mechanical Circulatory Support & ECMO'.
6. Removed repetition within the Medical Law and Ethics topic list.
7. Separated general pathology from perfusion-oriented applied pathophysiology.
8. Reframed hospital management content for perfusion professional practice.
9. Made the four-year duration and one-year internship internally consistent.
10. Standardised headings, outcomes, units, practical skills and assessment language.

BPERT.404: MEDICAL LAW AND ETHICS

RATIONALE

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competency.

Topic and contents	Hours
The important and relevant topics that need to focus on are as follows: 1. Medical ethics - Definition - Goal - Scope 2. Introduction to Code of conduct 3. Basic principles of medical ethics – Confidentiality 4. Malpractice and negligence - Rational and irrational drug therapy 5. Autonomy and informed consent - Right of patients 6. Care of the terminally ill- Euthanasia 7. Organ transplantation 8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.	18

9. Professional Indemnity insurance policy 10. Development of standardized protocol to avoid near miss or sentinel events 11. Obtaining an informed consent. 12. Medical ethics - Definition - Goal - Scope 13. Introduction to Code of conduct 14. Basic principles of medical ethics – Confidentiality 15. Malpractice and negligence - Rational and irrational drug therapy 16. Autonomy and informed consent - Right of patients 17. Care of the terminally ill- Euthanasia 18. Organ transplantation 19. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects. 20. Professional Indemnity insurance policy 21. Development of standardized protocol to avoid near miss or sentinel events 22. Obtaining an informed consent.	
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S.No.	Title of Book	Author	Publication
1	Medical Law and Ethics	Bonnie F. Fremgen	Pearson
2	Medical Law and Ethics	Jonathan Herring	OUP UK
3	Medical Law and Ethics	Purosottam Behera	Mittal Publications
4	Reflections on Medical Law and Ethics in India	Bismi Gopalakrishnan, Mercy Khaute, B. Sandeepa Bhat	Eastern Law House

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