

Curriculum for Diploma in Medical Technology on Cardiac Perfusion

The State Medical Faculty of Bangladesh

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September 2022

Curriculum for Diploma in Medical Technology on Cardiac Perfusion

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Mohakhali, Dhaka

Supported by-

National Heart Foundation Hospital & Research Institute

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Preface

Curriculum is a formal plan of educational experiences and activities offered to a learner under the guidance of an educational institution. Curriculum in fact is an organised plan of course outlines, along with the objectives and learning experiences to be used for achievement of these activities. With increasing public expectations about the health care services, specially in the emergency & pandemic situation like COVID 19 the quality of care itself is under scrutiny all over the world. Therefore a positive change is needed in the role of Medical Technologists. The role of teachers and students in teaching and learning to bring a positive changes in allied health professionals education also needs to be reviewed and further developed to make it more competency based.

This revised Health Technology (HT) competency based curriculum has been developed and scientifically designed, making it responsive to the needs of the learners and focussed towards the need of the stakeholders and country. The present HT curriculum with its assessment method is expected to effectively judge competencies acquired with those which are required to cater the health needs of our people. It is gratifying to note that all concerned in the promotion of allied health science in the country have involved themselves in the planning and formulation of this competency based & community oriented need-based curriculum.

More emphasis has been given on ethics, communication skills, behavioural science, basic computer science, communicative English, primary health care, climate change, environment and sanitation. Total duration of the curriculum has been increased from 3 years to 4years. List of competencies have been identified to acquire those by the provision of logbook based hands on training in this curriculum. Though the curriculum is not the sole determinants of the outcome, yet then it is very important as it guides the faculty members in preparing their instruction, tells the students where to go, what to do and what knowledge, skills and attitude they are expected to develop.

In conclusion, I would like to state that, the curriculum planning process should be continuous, dynamic and never-ending. If it is to serve best, the needs of the individual students, educational institutions and the expectations of people community to whom we are ultimately accountable, are required to be evaluated and given due attention.

I congratulate all who were involved in designing and developing the competency based curriculum, particularly the Director (Research, Publication, Curriculum Development), ADG (ME) & Directors of DGME, Secretary, SMFB, members of the working group and the involved faculty members of CME. My special thanks to National Professor Brig (Rtd) Abdul Malik, President, National Heart Foundation Hospital & Research Institute for all sorts of support. My special thanks to all others who were involved in the development of this curriculum.

Prof AKM Amirul Morshed

Director General

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Foreword

Curriculum development is not a static process rather it is a dynamic process. But it was also said that “It is easier to change a graveyard than to change a curriculum”. This curriculum was developed a few years back in 2009, but it was needed to be updated to make it more technology oriented students centred and competency based.

Initially there were policy level meetings and meeting of the Curriculum Working Group of different disciplines/courses from Institute of Health Technologies (IHTs) to prepare a draft curriculum. Subsequently, in order to develop a consensus, decision was taken to hold review workshops through active participation of different groups of faculty members. A taskforce group examined the revised curriculum to give it a final shape.

The revised Curriculum for Health Technology (HT) is expected to be implemented for the newly admitted students of the next session. The success of this curriculum, which is made more competence based and need-based, depends on its proper implementation with active leadership of the ME&FWD, MOH&FW, DGME, SMFB, Principals & Teachers of IHT with interactive participation of students.

It is expected that this curriculum will serve as present day guideline for the students of IHT and its faculty members. In order to ensure further improvement, this curriculum needs constant review and revision with time to time updating.

My sincere thanks to Prof AKM Amirul Morshed Khasru, Director General (In charge), DGME for his guidance & supervision with their team involving ADG (ME) and all the Directors of DGME. My special thanks to National Professor Brig (Rtd) Abdul Malik, President, National Heart Foundation Hospital & Research Institute for all sorts of support. I like to thank all the members of working committee of IHT Curriculum Development Committee for their continuous technical assistance and co-ordination to prepare this curriculum. The technical team comprising the faculty members of the Centre for Medical Education (CME), SMFB, DGME deserve special appreciation. Lastly, I would like to extend my deep and sincere gratitude to all Principals & Teachers of different IHTs, subject experts, faculty members and others computer and secretarial support staff of CME & DGME who shared their expertise and worked hard to produce this valuable document.

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Acknowledgement

This is indeed a pleasant responsibility to bring out this curriculum on Diploma in Health Technology course, which has been developed through a participatory approach by a team of policy peoples, teachers of IHTs and medical educationists. It aims to review and update the Health Technology (HT) curriculum.

I would like to express my deep gratitude to Prof AKM Amirul Morshed Khasru, Director General (In charge), DGME for his overall supervision in this activity along with ADG (Admin), ADG(ME) & Directors of DGME, under the leadership of whom the plan of reviewing and updating the IHT curriculum has been materialized, and who provided immense support and encouragement to finish the work. My special thanks to National Professor Brig (Rtd) Abdul Malik, President, National Heart Foundation Hospital & Research Institute for all sorts of support.

I am grateful to all the resource persons/teachers from different institutes, subject experts, Principals of IHT specially the faculty of Center for Medical Education (CME), DGME & SMFB who devoted their immense efforts, time and hard work to develop this curriculum. My special thanks to Professor Dr. Md. Humayun Kabir Talukder, Director (Research, Publication & Curriculum Development), DGME working & co-ordinator, IHT curriculum reviewing & updating committee for his continuous efforts without which it would not have been possible to complete this work. My thanks to all other faculty members & staffs of DGME, SMFB & CME, who were involved directly or indirectly in preparation of this curriculum.

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Course Overview

Course Aims:

The aim of the 4 years Diploma Programme in Cardiac Perfusion Technology to equip the students with relevant professional knowledge, skills, techniques and ethical value to produce competent, compassionate, reflective and dedicated perfusion technologist to serve the nation.

Course Objectives:

After successful completion of the course, students will be able to:

- Operate and maintains the heart and lung machine, extracorporeal circulation equipment, auto-transfusion devices, intra-aortic balloon pump (IABP), and other ventricular assistive devices
- Demonstrate knowledge and understanding of the various long-term circulatory assist devices currently used in perfusion care; and various extracorporeal circuit designs used in perfusion care other than the traditional heart-lung circuit (for example, liver transplant circuits, left heart bypass circuits, isolated lung/organ/limb perfusion circuits, etc.);
- Describe techniques for perfusion care that are particular to various patient populations (for example, pregnant patients, patients with pathologies such as sickle cell anemia or other chronic and acute blood component pathologies, organ transplant recipient patients, patients with religious beliefs that affect blood product usage, etc.);
- Understand and describe advances in basic science as applied to perfusion care technologies, such as innovative disposable products, 'bio-compatible' disposable products, recent advances in pharmacological therapies associated with perfusion care (myocardial protection, complement activation, etc.);
- Describe innovations in transplant technology and organ procurement;
- Understand and describe use of CPB as related to treatment of a trauma patient; and the use of CPB as related to treatment of various malignant pathologies;
- Demonstrate knowledge and understanding of advanced theories of safety and risk issues as they present within the field of perfusion care, including catastrophic events and device failures;
- Explain advanced theories of myocardial protection as they present within the field of perfusion care;
- Understand and describe the topic of air embolism, including but not limited to: causes, prevention, treatment, etc.;
- Understand and explain advanced theories of hypo-, hyper-, and normothermic CPB as it is practiced within the field of perfusion care;

- Understand and describe application of extracorporeal support and resuscitation outside of the operating room suite;
- Understand and describe non-cardiovascular applications of cardiopulmonary bypass;
- Understand and explain the various theories of legal liability that may affect the practice of perfusion care;
- Demonstrate knowledge and understanding of matters of bereavement and other matters affecting the patient and/or his family, and the perfusion caregiver during surgical intervention, including loss of life issues;
- Understand and evaluate evidence to support or refute contemporary perfusion practices;
- Explain quality improvement strategies;
- Tackle tense situations in order to focus on what must be done to keep a patient alive.
- Exhibit excellent communication abilities in a close-knit team environment round out the skills and qualities needed in perfusion technologist.
- Administer intravenous drugs, medical gases, fluids, and blood products required as ordered by the surgeon/anesthesiologist,
- Employ therapeutic modalities such as hemoconcentration, hypothermia, and hemodilution
As ordered by the surgeon/anesthesiologist
- Measure blood and oxygen parameters before employing appropriate mechanical and pharmacological techniques
- Monitor the respiratory and circulatory system during the use of equipment
- Review patient's medical chart to determine appropriate components for the cardiopulmonary circuit,
- Assess hemodynamic and blood work results, and makes appropriate changes to equipment and techniques.
- Provide technical services related to equipment including quality assurance, minor repair, assembly, calibration, operation, sterilization, and minor adjustments of equipment, routine maintenance, testing, and evaluation of new equipment.
- Order routine supplies and monitors for adequate inventory levels

Course Details

A. **Course Title:** Diploma in Medical Technology (Perfusion).

B. Course Philosophy and Rational

Cardiovascular diseases are an emergent problem in our country and throughout the world. As patients with cardiovascular diseases are increasing, to provide quality medical services, a good cardiac team is essential. The team consists of Cardiac Surgeons, Anaesthesiologists, Perfusionist, Nurses and other supporting staff. To meet this demand National Heart Foundation Hospital and Research Institute is interested to start Diploma in Cardiac Perfusion Technology Course in line with other diploma courses in Medical Technology under The State Medical Faculty of Bangladesh.

C. Conditions for entrance:

1. Qualifications & prerequisite:

- (i) SSC Science or equivalent with Science with Physics, Chemistry and Biology.
- (ii) Candidate has to secure required grade point in the SSC examinations which will be decided by the concern competent authority.
- (iii) Candidate passed SSC examination in current Year and previous 3rd Year is eligible for admission or as decided by the authority for each year of admission.

D. Examinations for Entrance/Admission Test:

All candidates are to sit for admission tests through prescribed rules and examination method as specified in the advertisement. Selection of the candidates will be done on merit basis as based on marks obtained in the admission test.

Despite the general merit in consideration for selection the reserved quota for different groups of applicants as specified in the advertisement shall be maintained on the merit basis for the respective reserved quota as well. Candidates selected for admission will have to appear before the Medical Boards as organized by the respective Institute of Health/ Medical Technology.

A. Course structure and duration

Total duration of the course will be 4 years

The course will be of four years' duration. The total period is divided into 4 parts-1st year, 2nd year, 3rd year and 4th year. In each there will be 40 weeks of teaching and learning at the end of which there will be a year final examination. Supplementary examinations will be held 6 months of the year final examination.

Year	Duration
1 st Year	12 months
2 nd Year	12 months
3 rd Year	12 months
4 th Year	12 months

NB: All academic activities including yearly faculty examination of each phase must be completed within the specified time of the phase.

NB: Total duration for completion of the four years (4) course will be 07 years after admission in 1st year

E. Distribution of the papers with teaching /learning hour's as per year wise:

1st year

Exams	Papers	Subjects	Lecture (in hours)	Tutorial (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours
						Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative assessment	I	English	66	34	-	7 days	10 days	10 days	15 days	100
	II	Basic Anatomy	70	60	70					200
	III	Basic Physiology	75	60	65					200
	IV	Basic Community Medicine & Behavioral Science	150	50	-					200
	V	Basic computer science	25	-	75					100
		Total	386	204	210	17 days		25 days		800
		Grand total	800 hours			42 days				800 hours

2nd year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours	
					Preparatory leave	Exam time	Preparatory leave	Exam time		
Teaching-learning both formative & summative assessment	I	Physics	40	30	7 days	10days	10 days	15days	70	
	II	Chemistry	80	20					100	
	III	Basic Microbiology & Parasitology	80	20					100	
	IV	Pharmacology & Bio-chemistry	100	150					250	
	V	Introduction to Perfusion Technology	100	200					300	
		Total	400	420	17 days		25 days		820	
		Grand total	820 hours			42 days				820 hours

3rd year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Formative Exam		Summative exam		Total Hours
					Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching-learning both formative & summative assessment	I	Pathology, Hematology & Transfusion Medicine	100	150	7 days	10 days	10 days	15 days	250
	II	Clinical Cardiovascular Technology	100	150					250
	III	Clinical Perfusion Technology	100	150					250
		Total	300	450	17 days		25 days		750
		Grand total	750 hours		42 days				750 hours

4th Year

Exams	Papers	Subjects	Lecture (in hours)	Institutional Academic Lab based Practical Training/ Demonstration (in hours)	Special attachment at relevant lab based advance training (in hours)	Formative Exam		Summative exam		Total Hours
						Preparatory leave	Exam time	Preparatory leave	Exam time	
Teaching- learning both formative &	I	Applied Perfusion Technology	100	150	150	7 days	10 days	10 days	15 days	400
	II	Advanced Perfusion Technology	100	150	150					400
		Total	200	300	300	17 days		25 days		800
		Grand total	800 hours			42 days				800 hours

F. Teaching & learning methods, media and faculty members

The following teaching and learning methods will be followed:

1. Large Group Teaching Lecture aided by –
 - Multimedia
 - Computer
 - Chalk board
 - OHP/ Slide projector
 - Hand-outs
2. Small Group Teaching-
 - Tutorial/ Demonstration
 - Students interaction
3. Practical session-
 - Use of practical manual Chalk board
 - Performing the task/examination by the student
 - Writing the practical note book
 - Log book
4. Lab Placement-
 - In small groups for performing activities by the student themselves as per log book
5. Faculty members-
 - Subject oriented teacher (Professor/ Associate professor/ Assistant professor/Lecturer/Instructor will be illegible to perform lecture/theoretical class.
 - Subject oriented instructors will be illegible to perform practical/demonstration class.

G. Assessment

- Examination will be held on month of January & July of every year.

B. Assessment Methods:

- There will be in-course/formative (card/ item) and end-course/summative (terminal) assessment for the students in each part (1st, 2nd, 3rd & 4th year) of the course i.e. formative and year final examination.
 - There will be year final examination at the end of each academic year and one supplementary examination 6 months after each regular year-final examination.
 - Formative assessment will be done through items and cards ending exam.
- In the year-final examination marks allocation will be as follows:
- 50% from year-final written examination
 - 10% from the formative examinations (Card final examination/Item marks).
 - 40% from the oral and practical examinations.
 - In written assessment Short Answer Question (SAQ) and Multiple choice question (MCQ)-true/false, in practical along with traditional objective structure practical examination (OSPE) & in oral structure oral examination (SOE) will be utilized

Eligibility for appearing in the year-final examination:

- Certificate from the respective head of institutes regarding students obtaining at least 75% attendance in all aspects (theory, practical, tutorial, residential field practice) during one academic year.
- Obtaining at least 50% marks in the formative examinations.

- No objection Certificate from the respective head of institutes regarding taking part any activities contrary to the discipline of the institute.
- No student shall be allowed to appear in the Year II, Year III and Year IV Final examinations unless the student passes all the subjects of 1st, 2nd and 3rd year Final examinations respectively.

Carry on

- One can be eligible to attend the classes of 2nd year after passing at least 3 subjects among 5 subjects of 1st year.
- One can be eligible to attend the classes of 3rd year after passing at least 3 subjects among 5 subjects of 2nd year.
- One can be eligible to attend the classes of 4th year after passing at least 2 subjects among 3 subjects of 3rd year.

C. Assessment personnel:

- Subject oriented teacher (Professor/ Associate professor/ Assistant professor/Lecturer will be eligible to be an examiner, moderator and able to evaluate the examination script.
- Subject oriented instructors will be eligible to undertake the practical examinations

Grading

Numerical percentage of Marks	GPA letter Grade	GPA Numerical Grade (Grade points)
85% and above	A ⁺	4
81% to less than 85%	A	3.75
76% to less than 80%	A ⁻	3.5
71% to less than 75%	B ⁺	3.25
66% to less than 70%	B	3.00
61% to less than 65%	B ⁻	2.75
Only 60%	C	2.50
Less than 60%	F	0

Pass Marks/Grade-C

Written Exam - 60%

Practical - 60%

Oral - 60%

Student shall have to pass written, oral, practical and formative separately in each paper of the examination.

Results will be publish in GPA system and number of the subjects will be reflected in the academic transcript.

H. Examinations & distribution of marks as per each year

1st Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative Exam	Total Marks
I	English	75	15	-	10	100
II	Basic Anatomy	100	40	40	20	200
IV	Basic Physiology	100	40	40	20	200
V	Basic Community Medicine & Behavioral Science	100	40	40	20	200
VI	Basic computer science	50	--	40	10	100
	Total	425	135	160	80	800

2nd Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
I	Physics	75	10	15	--	100
II	Chemistry	75	10	15	--	100
III	Basic Microbiology & Parasitology	100	40	40	20	200
IV	Pharmacology & Bio-chemistry	100	40	40	20	200
V	Introduction to Perfusion Technology	100	40	40	20	200
Total		450	140	150	60	800

3rd Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
I	Pathology, Hematology & Transfusion Medicine	100	40	40	20	200
II	Clinical Cardiovascular Technology	100	40	40	20	200
III	Clinical Perfusion Technology	100	40	40	20	200
Total		300	120	120	60	600

4th Year Examination

Paper	Subjects	Written Exam	Oral Exam	Practical Exam	Formative exam	Total Marks
II	Applied Perfusion Technology	100	40	40	20	200
II	Advanced Perfusion Technology	100	40	40	20	200
<i>Special Lab Attachment</i>						
Total		200	80	80	40	400

I. This curriculum is meant for the guidance of four groups for people --

- Students to guide them in what to learn and how to learn
- Teachers to guide them in what to teach and how to teach
- Examiners to guide them in what to evaluate and how to evaluate
- Concerned policy persons to guide how to implement this curriculum with proper--
 - Governance
 - Guidelines
 - Faculty members with updated organogram
 - Institutional academic lab
 - Attached OPD
 - Special lab attachment as per future job
 - Appropriate students friendly academic environment
 - Teachers to be oriented about the implementation of curriculum
 - Log book to be prepared

J. Required faculty members of the concerned subject/discipline are as follows to implement this curriculum --

- Professor..... 1
- Associate Professor..... 1
- Assistant Professor..... 2
- Lecturer..... 3
- Instructor..... 4
- Technologist..... 5

1st Year

Paper I: Subject - English

Total hours: 100 hour
Lecture: 66 hour
Practical / Tutorial: 34 hours

Total marks-100
Written-75
Oral & practical- 15
Formative 10

Objectives:

At the end of the course the students will be able to: -

- read & write any story in English and attain HSC level English proficiency
- talk proficiency in English grammar (article, tense, voice, phrases & idioms)
- write letters in English (private, Official etc.)
- translate & retranslate in English
- read and write essays on different topics in English
- develop listening skills in English
- communicate with each other in English
- read and write laboratory reports/findings in English
- follow written and oral instructions in English of the seniors/authorities

List of Competencies

Ability to--

- write Paragraph, Letter, Application & report in English
- show skill in reading, writing ,listening & conversations in English
- understand & interpret any reports or manuals in English
- read & write any story in English and attain HSC level English proficiency
- write letters in English (private, Official etc.).
- translate & retranslate in English
- read and write essays on different topics in English
- develop listening skills in English
- communicate with each other in English

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial
1.	<p>Text book: English for Today-Published by N.C.T.B. (Intermediate)</p> <p>Unit- Three: Learning English.</p> <ol style="list-style-type: none"> 1. Learning a language 2. Why to learn English 3. How to learn English 4. Different learners, different ways 5. Dealing with grammar 6. Integrated skills development 7. How to use dictionary <p>Unit-Six: Our Environment.</p> <ol style="list-style-type: none"> 1. The environment and the ecosystem 2. How the environment is polluted. 3. The world is getting warmer. 4. Let's not be cruel to them. 5. Beware of pollution. 6. Forests should stay. 7. How to manage waste. <p>Unit-Twenty-four: People, People Everywhere</p> <ol style="list-style-type: none"> 1. What's the problem? 2. Kalim Majhee's boat. 3. The rootless. 4. Why is there discrimination? 5-7. The Revenge. 	16	

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial
2.	<p>Grammar:</p> <p>Articles :</p> <ul style="list-style-type: none"> ▪ Indefinite & definite articles <p>Tense:</p> <ul style="list-style-type: none"> ▪ Present, Past & Future tense <p>Voice :</p> <ul style="list-style-type: none"> ▪ Active voice ▪ Passive voice ▪ Voice change <p>Speeches:</p> <ul style="list-style-type: none"> ▪ Direct speeches ▪ Indirect speeches <p>Linkers</p> <ul style="list-style-type: none"> ▪ In addition ▪ Besides ▪ Moreover ▪ However ▪ Because ▪ Either or , neither nor <p>Idioms & Phrases :</p> <p>Subjects & predicate</p> <p>Parts of speech-</p> <ul style="list-style-type: none"> ▪ Noun & its classification ▪ Pronoun & its classification ▪ Adjective & its classification ▪ Verb-Adverb <p>Conjugation</p> <p>Preposition</p> <p>Punctuation (capitalization, fragment, end, comma, semi colon, colon, hyphen, underlining)</p> <p>Spelling</p> <p>Wrong words</p> <p>Translation (Bengali to English, English to Bengali), short story writing, technical description, comprehension.</p>	22	
	<p>Paragraph writing :</p> <p>Letter writing:</p> <p>Application writing:</p> <p>Report writing :</p>	10	
	Telegrams & E-mail:	2	

Course Contents of English (Part -II)**Marks = 25+25**

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial
	Communicative English : <ul style="list-style-type: none">▪ Reading skill▪ Writing skill▪ Listening skill▪ Conversations skill	4 4 4 4	8 8 8 10
	Total	66	34

Teaching Methods:

Lecture
Practical/ Tutorial/Communication

Media:

Multimedia,
Laptop,
OHP,
White Board/marker
Black board/ chalk
Wall chart
VCD, DVD, CD

Assessment:

Written – SAQ -75 marks
Practical - Reading, Listening & conversation& oral -15 marks
Formative -10 marks

Paper II: Subject - Basic Anatomy

Total hours: 200 hours
Lecture: 70 hours
Tutorial: 60 hours
Practical/Demons: 70 hours

Total marks-200
Written-100
Oral-40
Practical- 40
Formative- 20

Objectives:

At the end of the course the students will be able to: -

- acquaint with the anatomical terminologies
- demonstrate a comprehensive knowledge base about the major anatomical organ, system and structure of human body
- identify major anatomical organ, system and structure of human body
- identify the specific structures and organs and application of such knowledge in studying their individual disciplines.
- perform surface marking of important organ of human body.

List of Competencies:

Ability to--

- demonstrate a comprehensive knowledge base about the major anatomical organ, system and structure of human body
- identify major anatomical organ, system and structure of human body
- identify the specific structures and organs and application of such knowledge in studying their individual disciplines.
- do surface marking of important organ of human body.

Course Contents of Basic Anatomy

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	Introductory Anatomy : a) Anatomical Terminologies : i) Definition of Anatomy ii) Anterior, Posterior, superior, inferior, medial, lateral & median plane. b) i) Systems of Human body ii) Human cell: structure and classification. iii) Cell division: types. Phases of mitosis iv) Tissue: Types of tissues.	10	05	10
2.	Musculoskeletal system: ▪ component ▪ Types of bones & joints ▪ short description of important bones	10	10	05
3.	Cardio-vascular system. ▪ Location & Basic structure of cardiovascular system ▪ Short description of heart, major arteries, capillaries/veins	10	05	10
4.	Respiratory system ▪ Basic structure of respiratory system ▪ Description of larynx, trachea, bronchi, bronchioles and alveoli ▪ Gross Anatomy of lung	06	06	10

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
5.	Gastro-intestinal and Hepatobiliary system: <ul style="list-style-type: none"> ▪ Short description of the different parts of alimentary system: mouth, tongue, esophagus, stomach, small and large intestine, rectum & anal canal ▪ Anatomy of salivary glands, pancreas, liver, gall bladder 	10	10	10
6.	Genito –urinary system: <ul style="list-style-type: none"> ▪ Anatomy of urinary system ▪ Male genital system: ▪ Female genital system 	10	10	10
7.	Nervous system and Endocrine system. <ul style="list-style-type: none"> ▪ Basic structure of nervous system ▪ Parts of nervous system and short description of brain, spinal cord, cranial nerves, peripheral nerves ▪ Autonomy of nervous system and short description of sense organs-eye, ear, nose, throat, tongue and skin ▪ Important endocrine glands 	12	12	10
8.	Lymphatic System : <ol style="list-style-type: none"> 1. Anatomy of lymph nodes and vessels 	02	02	05
	Total	70	60	70

Teaching Methods:

Lecture
 Tutorial
 Practical/ Demonstration

Media:

Multimedia,
 Laptop,
 OHP,
 White Board/Marker,
 Black/board
 Skeleton
 Wall chart
 Microscope

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
 Practical or OSPE 40 marks, Oral/SOE-40 marks, formative-20 marks

Paper III: Subject - Basic Physiology

Total hours: 200 hours

Lecture: 75 hours

Tutorial: 60

Practical: 65

Total marks-200

Written-100

Oral -40

Practical- 40

Formative- 20

Objectives:

At the end of the course the students will be able to: -

- demonstrate a comprehensive knowledge on functional aspects of different important components, organs and systems of human body.
- apply the practical knowledge of human physiology in studying and performing the allotted tasks in their individual discipline.

List of Competencies

- ability to demonstrate a comprehensive knowledge on functional aspects of different important components, organs and systems of human body.
- ability to apply the practical knowledge of human physiology in studying and performing the allotted tasks in their individual discipline.

Course Contents of Basic Physiology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	Introductory Physiology: <ul style="list-style-type: none"> • Physiological terminologies • Basic structure and organizations of human body • Cell physiology and metabolism/multiplication of living cells • General functions of different systems of the body: Musculoskeletal/Respiratory/ Circulatory/Digestive/Urinary/Nervous/ Endocrine/Immune/ Reproductive 	10	04	10
2.	Musculoskeletal system : <ul style="list-style-type: none"> ▪ Physiological components of musculoskeletal system ▪ Functions of important muscles, bones & joints of human body ▪ Movements of joints 	10	10	05
3.	Cardiovascular System: <ul style="list-style-type: none"> ▪ Functions of circulatory system ▪ Composition of Blood and their Functions ▪ Conductive system of heart & Cardiac cycle ▪ Physiology of Blood Pressure 	10	05	10

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
4	Respiratory system : <ul style="list-style-type: none"> ▪ Functions of respiratory system ▪ Mechanism of breathing 	05	05	10
5	Digestive and hepatobiliary system: <ul style="list-style-type: none"> ▪ Definition of digestion, absorption, metabolism ▪ Digestion, absorption & metabolism of carbohydrate, fat & protein ▪ Nutritional deficiency disorders : anaemia, iodine deficiency, vitamin deficiencies ▪ Functions of liver, pancreas and gall bladder ▪ Composition & functions of different digestive juices & bile 	10	10	10
6	Genitourinary system: <ul style="list-style-type: none"> ▪ Functions of Kidney ▪ Formation, appearance and composition of urine ▪ Functions of reproductive organs of both sexes: uterus/ovary/fallopian tube/vagina/penis/testes/scrotum/vas deferens/prostate 	10	10	10
7	Nervous system, organs of special sense: <ul style="list-style-type: none"> ▪ Functions of motor, sympathetic & parasympathetic nervous system ▪ Functions of cranial nerves ▪ Cerebrospinal fluid formation, composition & function ▪ Functions of special sense organs-eye, ear, nose, tongue and skin ▪ Functions of the endocrine glands & hormones secreted by them: Pituitary / thyroid / parathyroid / adrenal /gonads/pancreas/placenta 	12	10	10
8	Immune System : <ul style="list-style-type: none"> ▪ Definition/classification and components of immune system ▪ Cells and tissues of immune system & their functions 	05	05	
9	Lymphatic System : <ol style="list-style-type: none"> 2. Structure & functions of lymph nodes and vessels 	03 05	01	
	Total=	75	60	65

Teaching Methods: Lecture, Tutorial, Practical/ Demonstration

Media:

Multimedia, Laptop, OHP, White Board/Marker, Black board/chalk, Wall chart, Lab. Reagent & Apparatus, Microscope

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, formative-20 marks

Paper IV: Subject – Basic Community Medicine & Behavioural Science

Total hours: 200 hour
Lecture: 150 hour
Practical / Tutorial: 50 hours

Total marks-200
Written-100
Oral-40
Practical- 40
Formative- 20

Objectives

At the end of the course the students will be able to: -

- describe the general aspects of community medicine
- describe the basic concepts of epidemiology
- explain the concept of primary health care
- define organizations of health services and major health program in Bangladesh
- carry on elementary bio-statistics
- describe the concept of Demography and Family Planning
- define Maternal and Child Health (MCH), describe its objectives and explain the importance of ante-natal and post-natal care for mother and children
- define food and nutrition and be aware of nutritional problems in Bangladesh
- acquaint themselves with occupational health hazards and their preventive and protective measures
- describe the principles of health education and their application in the community
- acquaint themselves with environmental pollution and methods of prevention and control of pollution
- explain the basic concept of Essential Service Package (ESP)

List of Competencies:

Ability to --

- describe the general aspects of community medicine
- describe the basic concepts of epidemiology
- explain the concept of primary health care
- define organizations of health services and major health program in Bangladesh
- carry on elementary bio-statistics
- describe the concept of Demography and Family Planning
- define Maternal and Child Health (MCH), describe its objectives and explain the importance of ante-natal and post-natal care for mother and children
- define food and nutrition and be aware of nutritional problems in Bangladesh
- acquaint themselves with occupational health hazards and their preventive and protective measures
- describe the principles of health education and their application in the community
- acquaint themselves with environmental pollution and methods of prevention and control of pollution
- explain the basic concept of Essential Service Package (ESP)

Course Contents of Basic Community Medicine

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
1.	Introductory community medicine: <ul style="list-style-type: none"> • Definition of Community Medicine • Concept of health : Definition / Dimensions / Spectrum / Determinants / Indicators • Concept of general principles for prevention and control of communicable and Non-communicable diseases • Concept of health promotion: Definition / Interventions 	16	10
2.	Primary health care: <ul style="list-style-type: none"> ▪ Definition/Elements/ Principles/Scope 	05	02
3.	Health care services and organization: <ul style="list-style-type: none"> ▪ Primary/Secondary/Tertiary Health Care services ▪ WHO/UNDP/UNICEF/CARE/ International Red Crescent / BIRDEM / ICDDR,B 	06	02
4.	Basic Epidemiology: <ul style="list-style-type: none"> ▪ Definition /Aims/Methods/Scope ▪ Definition of epidemiological terms eg. Epidemic/Endemic/Pandemic/Sporadic/ Zoonotic disease/ Incubation period/ period of communicability/ Epidemiological Triad/ Infection/ Contamination/ Infestation etc. ▪ Major health programs in Bangladesh ▪ Medical Information system (MIS) 	12	06
5.	Basic Bio-statistics : <ul style="list-style-type: none"> ▪ Definition /Scope/Functions/Importance and uses of Biostatistics, Medical statistics, Health statistics, Vital statistics ▪ Definition of vital events ▪ Definition/types/characteristics/functions/importance/sources/collection and presentation of data ▪ Morbidity/Mortality/Fertility statistics 	17	04

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
6.	Demography and family planning. <ul style="list-style-type: none"> ▪ Demography: Definition/Focus/Process/Stages/Cycle and how to conduct census ▪ Family Planning: Definition/ Objectives/ Scope/Health aspects/Benefits ▪ Contraceptive methods: Short description /Advantages/Disadvantages/Indications/ Contraindications/ Complications 	12	04
7.	Maternal and Child Health Care (MCH): <ul style="list-style-type: none"> ▪ Introduction/Definition/Aims & Objectives / Components of MCH ▪ Maternal health care: Antenatal/Intra natal/Postnatal ▪ Care of the New-born/Under 5 children ▪ Indicators of MCH care: MMR, IMR etc 	10	
8.	Food and nutrition: <ul style="list-style-type: none"> ▪ Food: Definition/Functions/Classification ▪ Sources/types/functions/daily requirements and deficiency of protein, fat, carbohydrate, vitamins and minerals ▪ Definition of nutrition /Balanced Diet ▪ Malnutrition: Definition/Forms/Causes and prevention ▪ Common nutritional problems of Bangladesh: low Birth Weight/Protein Energy Malnutrition/ Nutritional Blindness/ Nutritional Anemia/ Lathyrism 	15	06
9.	Occupational Health : <ul style="list-style-type: none"> ▪ Occupational health : Definition /Objectives ▪ Occupational Hazards: Introduction /Types ▪ Occupational diseases: Definition/Classification/Prevention and control 	08	02
10.	Health education behavioral science and Ethics: <ul style="list-style-type: none"> ▪ Health Education: Definition/Importance / Objectives / Components/ Principles/Methods /Media ▪ Communication Skills: Definition/Key elements /Barriers ▪ Behavioral Science : Introduction & concept ▪ Ethics: Introduction and concept 	12	04

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Practical/ Demonstration
11.	Environment and sanitation: <ul style="list-style-type: none"> ▪ Definition of environment, pollution, sanitation and environmental sanitation ▪ Water: Safe wholesome water/Source of water/water pollution/Hazards of water pollution /water borne diseases/Hardness of water/Purification of water ▪ Air : Definition/Composition ▪ Air pollution : Sources, pollutants, indicators, health & other effects, prevention & control ▪ Ventilation: Definition/Standards/ Types/ Criteria of good ventilation / effects of good ventilation ▪ Solid waste: Definition/Types/Sources/Health hazards ▪ Disposal of solid waste: Dumping/Controlled tipping or sanitary land fill/ incineration/ composting/Manure pits/Burial ▪ Excreta or night soil: Public health importance/Health hazards/how disease occurs from it/Sanitation Barrier/ Methods of excreta disposal (Unsewered area/Sewered area) 	25	04
12.	First Aid : <ul style="list-style-type: none"> ▪ Definition / Principles of First Aid ▪ First Aid Box-List of contents and their uses ▪ First Aid of : Cuts, bleeding, burn, shock, dog bite, snake bite 	12	06
	Total	150	50

Teaching Methods:

Lecture
Tutorial
Practical/ Demonstration

Media:

Multimedia, Laptop, OHP, White Board/Marker,
Black board/chalk
Wall chart
Models & Samples

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper V: Subject - Basic Computer Science

Total hours: 100 hour

Lecture: 25 hour

Practical / Tutorial: 75hours

Total marks-100

Written-50

Practical- 40

Formative-10

Objectives:

At the end of the course the students will be able to: -

- acquaint with the modern computer technology
- start, shutdown and restore the windows
- open, close & edit the file
- develop skills in MS word, MS-excel, power point, internet
- create chart, graph, tables etc.
- install different programs & software
- prepare reports of various investigations
- do internet browsing & other applications of internet

List of Competencies

Ability to--

- deal with the modern computer technology
- show skills in MS word, MS-excel, power point
- prepare reports of various investigations
- internet browsing & other applications of internet

Course Contents of Basic Computer Science

Sl No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
1.	<p>Detailed Contents :</p> <p>Relevant Instruction for Practical :</p> <ul style="list-style-type: none"> ▪ Information Technology -its concept and scope ▪ Computers for information storage, information seeking, information processing and information transmission ▪ Elements of computer system - computer hardware and software: data -numeric data, numeric data; contents of program, processing ▪ Computer organization, block diagram of a computer, CPU, memory ▪ Input devices; keyboard, mouse etc.; output devices; VDU and Printer, scanner, Plotter ▪ Electrical requirements, inter-connections between units, connectors and cables ▪ Secondary storage; magnetic disks-tracks and sectors, optical disk (CD and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc. ▪ Capacity; device controllers, serial port, parallel port system bus 47 ▪ Exercises on file opening and closing; memory management; device management; device management and input-output (I/O) management with respect of windows ▪ Installation concept and precautions to be observed while installing the system and software ▪ Introduction about Operating systems such as and Windows ▪ Special features, various commands of MS word and MS- Excel, Power -point ▪ About the internet-server types, connectivity (TCOP/IP, shell); applications of internet like: e-mail and browsing ▪ Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol) ▪ Basic of Networking -LAN, WAN, Topologies 	25	
	<ul style="list-style-type: none"> ▪ Give a PC, name its various components and list their functions ▪ Identification of various parts of a computer and peripherals ▪ Practice in installing a computer system by giving connection and loading the system software and application software ▪ Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands ▪ Exercises on entering text and data (Typing Practice) ▪ Installation of Windows 98 or 2000 etc. ▪ Features of windows as an operating system ▪ Start ▪ Shutdown and restore ▪ Creating and operating on the icons ▪ Opening, closing and sizing the windows ▪ Using elementary job commands like-creating, saving, modifying, finding and deleting a file ▪ Creating and operating on a folder ▪ Changing setting like, date, time color (back ground and fore ground) ▪ Using short cuts ▪ Using on line help 		

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
	<ul style="list-style-type: none"> ▪ MS-WORD ▪ File Management Opening, creating and saving a document, locating files, copying contents in some different file (s), protecting files, Giving password protection for a file ▪ Page set up : Setting margins, tab setting, ruler, indenting ▪ Editing a document : Entering text, Cut, copy, paste using tool-bars ▪ Formatting a document : Using different fonts, changing font size and color, changing the appearance through bold/italic/underlines, highlighting a text, changing case, using subscript and superscript using different underline methods ▪ Aligning of text in document, justification of document, Inserting bullets and numbering : ▪ Formatting paragraph, inserting page breaks and column breaks ▪ Use of headers, footers: Inserting footnote, end note, use of comments ▪ Inserting date, time, special symbols, importing graphic images, drawing tools ▪ Tables and Borders Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting row in a table ▪ Print preview, zoom, page set up, printing options ▪ Using Find, Replace options ▪ Using Tools like: Spell checker, help, use of macros, mail merge, word content and statistics, printing envelopes ▪ Using shapes and drawing toolbar ▪ Working with more than one window in MS Word, ▪ How to change the version of the document from one window OS to another ▪ Conversion between different text editors, software and MS word 		30

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture	Tutorial/ Practical
	<p>MS -Excel :</p> <ul style="list-style-type: none"> ▪ Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save worksheet, switching from another spread sheet ▪ Menu Commands : Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS Excel, getting information while working ▪ Work Books : Managing workbooks (create, open, close, save) working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays ▪ Editing a worksheet, copying, moving cells, pasting, inserting, deleting cells, rows, columns, find and replace text, numbers of cells, formatting worksheet : ▪ Creating a chart : Working with chart types, changing data in chart, formatting a chart, use chart to analyze data ▪ Using a list to organize data, sorting and filtering data in list ▪ Retrieve data with MS -Query: Create a pivot table, customizing a pivot table. Statistical analysis of data. ▪ Customize MS-Excel: How to change view of worksheet, outlining a worksheet, customize workspace, using templates to create default workbooks, protecting work ▪ Exchange data with other application: linking and embedding, embedding objects, linking to other applications, import, export document 		20
	<p>Power Point :</p> <ul style="list-style-type: none"> ▪ Making Slide following the rules & principles ▪ Slide Projection 		10
	<p>Internet and its Applications :</p> <ul style="list-style-type: none"> ▪ Log -in to internet ▪ Navigation for information seeking on internet ▪ Browsing and down loading of information from internet ▪ Sending and receiving e-mail ▪ Creating a message ▪ Creating and address book ▪ Attaching a file with e-mail message ▪ Receiving a message ▪ Deleting message 		15
	Total=	25	75

Teaching Methods:

Lecture
Practical

Media:

Computer
Multi media
Computer lab.
Internet connection
White Board
Marker

Assessment:

Written – SAQ- 50 marks
Oral/SOE and Practical – 40 marks
Formative – 10 marks

2nd Year

Paper I : Subject - Physics

Total hours: 70 hour
Lecture : 40hour
Practical/Tutorial: 30 hours

Total marks -100
Written – 75
Oral -10
Practical - 15

Objectives:

At the end of the course, the students will be able to-

- define Physics and state the importance of Physics in the Health Care System.
- describe the different systems of measurement and weights.
- demonstrate basic knowledge on the measurement of density and specific gravity of a substance.
- demonstrate basic knowledge on fundamental aspects of heat and temperature, sound, light, electricity and magnetism.

List of Competencies:

Ability to

- define Physics and state the importance of Physics in the Health Care System.
- describe the different systems of measurement and weights.
- demonstrate basic knowledge on the measurement of density and specific gravity of a substance.
- demonstrate basic knowledge on fundamental aspects of heat and temperature, sound, light, electricity and magnetism.

Course Contents of Physics

Sl.No	Topic/Lessons তত্ত্বীয়	Teaching/Learning Hours	
		Lecture	Practical
১।	বলবিদ্যা ও পদার্থের ধর্ম : ➤ সরল রেখার গতি, গতির সমীকরণ, নিউটনের গতির সূত্র ত্বরণ ও বল, খাত বল, ভেকটর ও সেলের রাশি। ➤ কৌণিক গতি, কৌণিক বেগ ও ত্বরণ বৃত্তাকার পথে গতি, কেন্দ্রভিগ বল। ➤ কাজ, ক্ষমতা ও শক্তি, শক্তির সংরক্ষণ নীতি। ➤ সরল দোল গতি, সরল দোলক ➤ আর্কিমিডিসের সূত্র ও তার প্রয়োগ আপেক্ষিক গুরুত্ব নির্ণয়।	০৮ ঘন্টা	
২।	তাপ : তাপমিতি, তাপের একক, আপেক্ষিক তাপ, তাপীয় ক্ষমতা পানিসম ও সুগুতাপ এবং হাঁহাদের নির্ণয় পদ্ধতিঃ সরলীয় পদ্ধতিতে তাপের পরিবাহিতা নির্ণয়।	৫ ঘন্টা	
৩।	শব্দ : ➤ শব্দের উৎপত্তি ও শব্দ সালন, আড় তরঙ্গ ও দীঘল তরঙ্গ শব্দের ব্যভিচার ও বীট। বীটের সাহায্যে কম্পন সংখ্যা নির্ণয়। ➤ শব্দের বেগ নির্ণয়। ➤ টানা তারের আড় কম্পন, সূত্রের প্রমাণ।	৫ ঘন্টা	

৪।	আলোক : <ul style="list-style-type: none"> গোলীয় পৃষ্ঠে প্রতিফলন। সমতল ও গোলীয় পৃষ্ঠে প্রতিফলন। সম্পূর্ণ প্রতিফলন, প্রতিসরাংক, প্রিজম প্রতিসারণ। লেসঃ উত্তল ও অবতল লেস। লেসের শক্তি ও বিবর্ধন লেস সংযোজন। চোখের ত্রুটি সমূহ ও প্রতিকার। আলোক যন্ত্র-মাইক্রোস্কোপ। 	৫ ঘন্টা	
৫।	চুম্বক : <ul style="list-style-type: none"> চুম্বকনের বিভিন্ন পদ্ধতিঃ চুম্বকের মতবাদ, চুম্বকের ক্ষেত্র ও প্রবাল্য। বিপরীত বর্গীয় সূত্র প্রান্তমুখী ও প্রস্থমুখী অবস্থানে চুম্বকের প্রাবল্য। বিক্ষেপী চুম্বকমান যন্ত্র ও ইহার ব্যবহার। ভূচুম্বকত্ব। 	৪ ঘন্টা	
৬।	তড়িৎ : <ul style="list-style-type: none"> স্থির তরিৎ, চার্জের অন্তিত্ব ও প্রকৃতি নির্ণয়। বৈদ্যুতিক আবেশ, কুলম্বের সূত্র, ধারকত্ব, তড়িৎ বিভব। সমান্তরাল পাত ধারক। বিদ্যুৎ কোষ, তাদের কেন্দ্রে উৎপন্ন চুম্বকক্ষেত্র। বিদ্যুৎ প্রবাহ ও চার্জের একক। ওহমের সূত্র, বিভব বৈষম্যের একক। রোধ ও আপেক্ষিক রোধ, রোধের একক, রোধ সংযোজন, এমিটার, ভোল্ট মিটার। বৈদ্যুতিক পরিমাপ, হুইট স্টেম ব্রিজ, মিটার ব্রিজ, পোস্ট অফিস বক্স ও পাটেন শিও মিটার। তড়িৎ প্রবাহ ও উত্তাপ, জুলের সূত্র, বৈদ্যুতিক পদ্ধতিতে নির্ণয়। তড়িৎ প্রবাহে রাসায়নিক ক্রিয়া, তড়িৎ বিশেষণ, সূত্র ও ইহাদের প্রমাণ। তড়িৎ চুম্বকীয় আবেশ। 	১৩ ঘন্টা	
	ব্যবহারিক	৪০	

Sl.No	Topic/Lessons	Teaching/Learning Hours	
		Lecture	Practical
৭।	১। শাইড ক্যালিপার্স, স্ক্রজ ও লেপেরোমিটারের ব্যবহার শিক্ষা। ২। পানি অপেক্ষা হালকা/ভারি তরল ও কঠিন পদার্থের হাইড্রো-স্টেটিক ব্যালেন্স, নিকলসন হাইড্রোমিটার ও আঃ হাইড্রো বোতলের সাহায্যে আপেক্ষিক গুরুত্ব নির্ণয়। ৩। সরল দোলকের সাহায্যে জি এর মান নির্ণয়। ৪। একটি ক্যালরিমিটারের সাহায্যে পানিসম নির্ণয়। ৫। কঠিন ও তরলের আপেক্ষিক তাপ নির্ণয়। ৬। অবতল দর্পনের ফোকাস দূরত্ব নির্ণয়। ৭। প্যারালাক্স পদ্ধতিতে উত্তল লেস ফোকাস দূরত্ব নির্ণয়। ৮। একখানা কাচ ফলকের প্রতিসরাংক নির্ণয়। ৯। ওহমের সূত্রের সত্যতা নির্ণয়। ১০। যে কোন দৈর্ঘ্যের তারে আপেক্ষিক রোধ নির্ণয়। ১১। নাল পদ্ধতিতে দুইখানা দ ^১ চুম্বকের চৌম্বক ভ্রামকের তুলনা।		৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ২ ঘন্টা ৩ ঘন্টা ২ ঘন্টা ২ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা ৩ ঘন্টা
	মোটঃ ৭০ ঘন্টা	৪০	৩০

মান বন্টনঃ তৃতীয় = ৬০

১। পদার্থের সাধারণ ধর্ম, আলোক ও তড়িৎ প্রতিটি শাখা থেকে ৮ নম্বরের দুটি ও ৪ নম্বরের ২টি করে মোট (৬টি + ৬টি) = ১২টি প্রশ্ন আকারে। তন্মধ্যে ৮ নম্বরের ১টি করে ৩ শাখায় ৩টি ও ৪ নম্বরের ১টি করে ৩ শাখার ৩ টি অর্থাৎ মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

$$8 \times 1 \times 3 = 24$$

$$4 \times 1 \times 3 = 12$$

২। শব্দ ও তাপ ও চুম্বকতত্ত্বঃ প্রতিটি শাখা থেকে ৪ নম্বরের ৪টি করে মোট ১২টি প্রশ্ন থাকবে। সেগুলোর মধ্যে থেকে ২টি করে মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

$$4 \times 2 \times 3 = 24$$

দ্রষ্টব্যঃ বলবিদ্যা ও পদার্থের ধর্ম থেকে ও অন্য যে কোন শাখা থেকে ১টি পরীক্ষণ করতে হবে।

ব্যবহারিকঃ ক্লাস রেকর্ড ৯+১ নং ও ২নং পরীক্ষণ ৮ করে = ১৫ মার্কস

মৌখিক ও ফরমেটিভ = ১০, লিখিত = ৭৫ মার্কস

মোটঃ তৃতীয়+ব্যবহারিক+মৌখিক = ১০০ মার্কস

Paper II: Subject - Chemistry

Total hours: 100 hour
Lecture : 80 hour
Practical/Tutorial: 20 hours

Total marks -100
Written – 75
Oral - 10
Practical - 15

Objectives:

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

- describe fundamentals in physical chemistry.
- explain common laboratory processes.
- identify organic and inorganic chemical compounds.
- describe the different aspects of metals, non-metal and gaseous substances.

List of Competencies:

Ability to--

- describe fundamentals in physical chemistry.
- explain common laboratory processes.
- identify organic and inorganic chemical compounds.
- describe the different aspects of metals, non-metal and gaseous substances.

Course contents of Chemistry

Sl.No	Topic/Lessons	Teaching/Learning Hours	
		Lecture	Practical
	গ্রুপ- ক ভৌত রসায়ন		
১।	ভৌত ও রাসায়নিক পরিবর্তন ও এদের মধ্যে পার্থক্য।	১ ঘন্টা	
২।	পদার্থের গঠনঃ অণু ও পরমাণু-অণুর সংজ্ঞা, আন্তঃআণবিক দূরত্ব, আন্তঃআণবিক, কঠিন, তরল, গ্যাস, পরমাণু, পারমাণবিক ও আনবিক ওজন।	৫ ঘন্টা	
৩।	সাধারণ পরীক্ষাগার প্রণালীঃ দ্রবণ, অভিস্রবণ, পরিস্রাবণ ও অতিপূজ দ্রবণ, দ্রাব্যতা, বাষ্পীভবন, পাতন, আংশিক পাতন, উর্ধ্বপাতন, কেলাসন।	৪ ঘন্টা	
৪।	প্রতীক, সংকেতঃ প্রতীক, আনবিক সংকেত, যোজ্যতা, রেডিক্যাল এবং তাদের যোজনী, যোজনী থেকে আনবিক সংকেত নির্ণয়, গাঠনিক সংকেত।		
৫।	রাসায়নিক বিক্রিয়াঃ বিভিন্ন প্রকারের রাসায়নিক বিক্রিয়া, রাসায়নিক বিক্রিয়া ঘটানোর উপায় সমূহ।	৪ ঘন্টা	
৬।	অম্ল, ক্ষারক ও লবন।		
৭।	গ্যাসের ধর্ম-বয়েলের সূত্র, চার্লসের সূত্র।	৪ ঘন্টা	
৮।	মৌলের রাসায়নিক তুল্যাংক বা যোজন ভার।	২ ঘন্টা	
৯।	পরমানুর গঠন এবং যোজ্যতার ইলেকট্রনীয় মতবাদ। বিভিন্ন রাসায়নিক বন্ধন।	২ ঘন্টা ২ ঘন্টা	
১০।	ক) এভোগ্যাড্রে সূত্র খ) ভরক্রিয়া সূত্র।		
১১।	রাসায়নিক সংযোগ বিধিঃ ক) ভরের নিত্যতা সূত্র। খ) নির্দিষ্ট অনুপাত সূত্র। গ) গুণানুপাত বিধি। ঘ) বিপরীত অনুপাত সূত্র। ঙ) গ্যাস আয়তন সূত্র।	৪ ঘন্টা ২ ঘন্টা ৫ ঘন্টা	
	গ্রুপ-খ অধাতু :		

Sl.No	Topic/Lessons	Teaching/Learning Hours	
		Lecture	Practical
১।	নিম্নোক্ত পদার্থ গুলোর উৎস, প্রস্তুতি, ধর্ম এবং ব্যবহারঃ	৭ ঘন্টা	
ক)	অক্সিজেন, ওজোন, পানি ও হাইড্রোজেন পার অক্সাইড।		
খ)	হোলাজেন সমূহঃ ক্লোরিন, রোমিন, আয়োডিন ও হাইড্রো ক্লোরিক এসিড।		
গ)	নাইট্রোজেন, হাইড্রোজেন সালফাইট, সালফার ডাইঅক্সাইড।		
ঘ)	সালফার, হাইড্রোজেন সালফাইট, সালফার ডাইঅক্সাইড, সালফিউরিক এসিড।		
ঙ)	ফসফরাস চ) জারন-বিজারনঃ জারক ও বিজারক পদার্থ		
২।	ধাতুঃ নিম্নোক্ত পদার্থ গুলোর উৎস, প্রস্তুতি, ধর্ম এবং ব্যবহারঃ	৬ ঘন্টা	
ক)	সোডিয়াম-সোডিয়াম হাইড্রোঅক্সাইড, সোডিয়াম কার্বনেট, সোডিয়াম ক্লোরাইড।		
খ)	ক্যালসিয়াম-ক্যালসিয়াম কার্বনেট, ক্যালসিয়াম ফ্লোরাইড, ক্যালসিয়াম সালফেট, বিচিং পাউডার।	১ ঘন্টা	
৩।	কপার -কপার অক্সাইড, কপার সালফেট, কপার ফ্লোরাইড	১ ঘন্টা	
৪।	জিংক - জিংক অক্সাইড, জিংক ফ্লোরাইড, জিংক সালফেট।		
৫।	এলুমিনিয়াম - এলুমিনিয়াম ফ্লোরাইড, এলুমিনিয়াম সালফেট।	১ ঘন্টা	
৬।	আয়রন - আয়রন সালফেট।	১ ঘন্টা	
৭।	লেড - লেড অক্সাইড।	১ ঘন্টা	
৮।	সিলভার - সিলভার নাইট্রেট।	১ ঘন্টা	
	গ্রুপ- গ জৈব রসায়ন		
১।	জৈব রসায়নের সংজ্ঞা, জৈব ও অজৈব যৌগের মধ্যে পার্থক্য জৈব যৌগের গঠন, শ্রেণী বিভাগ, কার্যকরী বা ত্রিাশীল মূলক।	৪ ঘন্টা	
২।	জৈব যৌগের নিষ্কাশন ও বিশুদ্ধকরণ	১ ঘন্টা	
৩।	সম্পৃক্ত ও অসম্পৃক্ত হাইড্রোকার্বনঃ প্রস্তুত প্রণালী, ধর্ম এবং ব্যবহার -মিথেন, ইথেন, ইথিলিন, এসিটাইলিন।	২ ঘন্টা	
৪।	এলকোহল হ্যালাজেন জাতকঃ মিথাইল ফ্লোরাইড, ক্লোরোফর্ম এর প্রস্তুতি, ধর্ম ও ব্যবহার।	৪ ঘন্টা	
৫।	এলকোহলঃ শ্রেণী বিভাগ, মিথাইল এলকোহল, ইথানল এলকোহল ও গিসারিনের প্রস্তুতি, ধর্ম ও ব্যবহার।	২ ঘন্টা	
৬।	ডাই-ইথাইল ইথারঃ প্রস্তুতি, ধর্ম ও ব্যবহার।	১ ঘন্টা	
৭।	এলডিহাইড ও কিটোল সমূহঃ নিম্নলিখিত যৌগসমূহের প্রস্তুতি, ধর্ম ও ব্যবহার, ফরমালডিহাইড, এসিটালডিহাইড ও এসিটোন।	৩ ঘন্টা	
৮।	কার্বিলিক এসিডঃ এসেটিক এসিড ও সাইট্রিক এসিডের প্রস্তুতি, ধর্ম ও ব্যবহার।	৩ ঘন্টা	
৯।	এলকোহল এ্যামাইনঃ এ্যামাইনের শ্রেণী বিভাগ, মিথাইল এ্যামাইন ও ইথাইল এ্যামাইনের প্রস্তুতি, ধর্ম ও ব্যবহার।	২ ঘন্টা	
১০।	এ্যারোমেটিক যৌগঃ নিম্নলিখিত যৌগসমূহের প্রস্তুতি, ধর্ম ও ব্যবহার। বেনজিন, টলুইন, ফ্লোরোবেজিন নাইট্রোবেজিন, অ্যানিলিন, কার্বিলিক এসিড, বেনজালডিহাইড, বেনজোয়িক এসিড ও স্যালিসাইলিক এসিড।	৪ ঘন্টা	
	ব্যবহারিক :		
১।	অম্ল ও ক্ষারের মাত্রা নির্ণয়।		২০ ঘন্টা
২।	হাইড্রোজেন ও অক্সিজেনের প্রস্তুতি।		
৩।	সহজ জৈব ও অজৈব যৌগের আঙ্গিক বিশেষণ।		
	মোট : ১০০ ঘন্টা	৮০ ঘন্টা	২০ ঘন্টা

মান বন্টনঃ লিখিত পরীক্ষা=৭৫ মার্কস, ব্যবহারিক = ১৫মার্কস, মৌখিক/ফরমেটিভ =১০ মার্কস

গ্রুপ - ক- ২০ নম্বর

গ্রুপ - খ - ২০ নম্বর

গ্রুপ - গ - ২০ নম্বর

গ্রুপ -ক থেকে ৩টি, গ্রুপ -খ থেকে ৩টি এবং গ্রুপ -গ থেকে ৩টি মোট ৯টি প্রশ্ন থাকবে। তন্মধ্যে প্রত্যেক গ্রুপ থেকে অন্ততঃপক্ষে ২ টি করে মোট ৬টি প্রশ্নের উত্তর দিতে হবে।

Paper III: Subject –Basic Microbiology & Parasitology

Total hours: 100-hour
Lecture: 80 hour
Practical: 20 hours

Total marks-200
Written-100
Oral-40
Practical- 40
Formative- 20

Learning objectives:

At the end of the course the students will be able to –

- define and classify microorganisms, define and explain microbiological terminologies.
- identify, use and maintain microbiological articles, equipment, apparatus including microscope and mention parts when applicable.
- clean, wash, decontaminate, disinfect & sterilization microbiological articles, instruments, glass wares etc.
- define, classify, and mention morphology of bacteria, virus, fungus, parasite and helminth.
- name medically important bacteria, virus, fungus, parasite, helminth and diseases caused by them.
- explain anatomy bacteria and bacterial spores: pathogenicity of medically important bacteria, growth & multiplication of bacteria.
- identify, staining and culture medically important bacteria.
- mention knowledge about PPE
- demonstrate basic knowledge of immunity.

List of Competencies:

Ability to:-

1. demonstrate basic knowledge on common microbiological and parasitological issues.
2. perform identification of different microorganisms particularly bacteria & fungus of medical importance ensuring laboratory safety using microbiological, reagents, equipment and apparatus.
3. provide best services to the stakeholders using the knowledge and skills.

Course Contents of Basic Microbiology& Parasitology

Sl. No	Topics/Lessons	Teaching/learning Hours	
		Lecture / Tutorial on Theories	Practical/ Demonstration/Field visit
1.	Introduction to microorganisms: <ul style="list-style-type: none"> ▪ Definition and classification of microorganisms ▪ Microbiological terminology ▪ Characteristics of Eukaryotic prokaryotic & sub cellular groups of microorganisms ▪ Microbiological articles, equipment's apparatus ▪ Microscope: Different parts of microscope, & maintenance of microscope 	08	03
2.	Destruction of microorganism: <ul style="list-style-type: none"> ▪ Cleaning, Washing, decontamination disinfection & procedures ▪ Sterilization of different laboratory articles, instruments, glass wares etc. 	07	03

3.	Bacteria: <ul style="list-style-type: none"> ▪ Anatomy of Bacteria, chemical composition of different structures of bacteria ▪ Bacterial Spore: Definition & function spores, Spores bearing bacteria of medical importance ▪ Bacterial toxin: Definition & types of bacterial toxin, characteristics of endotoxin & exotoxin, Toxin producing organism of medical importance, use of bacterial toxins in diseases prevention ▪ Biology of bacteria: Growth & multiplication of bacteria, bacteria growth curve, bacteria growth requirements. Definition & classification of culture media ▪ Classifying bacteria in terms of morphology, staining, spore, flagella, capsule & Pathogenicity. ▪ Staining bacteria: Gram's staining, AFB staining, Albert staining 	15	04
	Virus: <ul style="list-style-type: none"> ▪ General characters of virus ▪ Morphology & classification of virus ▪ List of viruses of medical importance & diseases produced by them 	10	01
	Fungus: <ul style="list-style-type: none"> ▪ General character, Morphology and classification of fungus ▪ List of fungus list medical important and the diseases produced by them 	10	02
	Parasite: <ul style="list-style-type: none"> ▪ Definition /Classification of parasite 	03	01
	Helminth: <ul style="list-style-type: none"> ▪ General characteristics of helminths ▪ Classification /Morphology of helminths 	08	02
	Protozoa: <ul style="list-style-type: none"> ▪ General characteristics of protozoa ▪ Definition /Classification of protozoa 	10	02
	PPE: <i>Personal protective equipment (PPE)</i> for different healthcare activities	04	01
	Immunity: Basic Concept of immunity and immunization Schedule.	05	01
	Total	80	20

Teaching Methods:

- Lecture, Tutorial, Practical/ Demonstration & Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Laboratory: (Microscope, Autoclave, Hot Air Oven, Incubator, Haemocytometer, Haemoglobin meter, Analytical balance, Centrifuge machine, Rotator, Refrigerator, Photometer, Electrolyte analyzer, Electrophoresis apparatus, ELISA reader, PCR machine, Cell counter etc.)
- Hospital/ Health complex

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper IV: Subject- Pharmacology & Bio-chemistry

Total hours: 250 hours
Lecture: 100 hours
Practical: 150 hours

Total marks: 200
Written: 100
Oral: 40
Practical: 40
Formative: 20

1. Pharmacology

Objectives: At the end of the learning period of this paper, the students will be able to

- Describe the pharmacological effects, mechanisms of action, and adverse reactions of drugs in order to be able to use safely and effectively in cardiac perfusion.
- recognize, and report the adverse drug reactions (ADRs) and drug interactions
- demonstrate skills in using the modern biochemical appliances
- measure blood gases and electrolytes
- demonstrate acid-base & electrolytes disorders

List of Competencies:

Ability to-

- demonstrate basic knowledge on common issues of Pharmacology
- describe the pharmacological effects, mechanisms of action, and adverse reactions of drugs
- ability to measure blood gases and electrolytes
- demonstrate acid-base & electrolytes imbalance

Course Contents of Pharmacology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	Terminology – Classification of drugs, Principles of drug administration and routes of administration, absorption, distribution, metabolism, excretion of drugs, factors influencing drug action, dosage, and factors modifying it. Drug allergy and toxicity, mechanism of drug action (various ways in which they act)	10		

2.	<p>Cardiovascular drugs- the mode of action, side effects and Therapeutic uses of the following drugs.</p> <ul style="list-style-type: none"> • Antihypertensives example: beta adrenergic antagonists, alpha adrenergic antagonists, peripheral vasodilators • Antiarrhythmic drugs • Inotropic agents • Coronary vasodilators • Antianginal and anti-failure agents • Drugs used in hemostasis –Anticoagulants, Thrombolytic and anti-thrombolytic • Cardioplasia drugs – history, principles and types of cardioplasia • Primary solutions – history, principles and types • Drugs used in the treatment of shock 	10		
3.	<p>Antihistamines– Classification, mechanism of action, adverse effects, Analgesics</p> <ul style="list-style-type: none"> • Definition, classification • Side effects <p>Narcotic and sedative therapy CNS stimulants</p>	10		
4.	<p>Anesthetic agents</p> <ul style="list-style-type: none"> • Definition and classification of general anesthetic <p>Pharmacokinetics and pharmacodynamics of general anesthetic, inhaled anesthetic agents etc.</p>	10		
5.	<p>Diuretics Classification, mechanism of action, adverse effects and complication. Endocrine Pharmacology: Thyroid hormones, glucocorticoids, insulin.</p>	10		
6.	<p>Corticosteroids – classification, mechanism of action, adverse effects and complication preparation, dose and routes of administration. Pharmacological protection of organs during cardio pulmonary by pass Chemotherapy of infections – Definition, classification and mechanism of action of antimicrobial agents. Miscellaneous.</p> <ul style="list-style-type: none"> • IV fluids – various preparations and their usages. • Newer drugs included in perfusion technology <p>Drugs used in metabolic and electrolyte imbalance</p>	10		

2. Biochemistry

Objectives: At the end of the learning period of this paper, the students will be able to

- demonstrate skills in using the modern biochemical appliances
- measure blood gases and electrolytes
- demonstrate acid-base & electrolytes disorders

List of Competencies:

Ability to-

- demonstrate basic knowledge on common issues of Bio-Chemistry
- measure blood gases and electrolytes
- demonstrate acid-base & electrolytes disorders

Course Contents of Biochemistry

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<p>General Biochemistry</p> <ul style="list-style-type: none"> • Introduction to General Biochemistry • Carbohydrates : Definition, Classification, example for each class and function • Amino acid and Protein Chemistry <ul style="list-style-type: none"> • Definition, Classification of amino acid with example and function • Protein: Definition, Classification with example and function • Lipids: Definition and Classification and function in the body • Definition and Classification of fatty acid • Nucleotide and Nucleic acid chemistry <ul style="list-style-type: none"> • Nucleic acid: Definition and types • Function of DNA & RNA • Difference between DNA & RNA 	07		30
2.	<p>Digestion and absorption of</p> <ul style="list-style-type: none"> • Carbohydrates • Proteins • Lipid 	05		30
3.	<p>Carbohydrate Metabolism</p> <ul style="list-style-type: none"> • Glycolysis: Aerobic and Anaerobic • Hyperglycemic and Hypoglycemic hormones • Blood glucose regulation <p>Lipid Metabolism</p> <ul style="list-style-type: none"> • Introduction • Beta oxidation of fatty acid • Ketone bodies <p>Amino acid & Protein Metabolism</p> <ul style="list-style-type: none"> • Introduction, Fate of ammonia and transport of ammonia • Urea cycle 	08		
4.	<p>Vitamins: Definition, Classification, function and deficiency disorders</p> <p>Minerals: Name the Macro and Micro Minerals</p> <ul style="list-style-type: none"> • Iron: Sources, function and disorder of deficiency <p>Nutrition</p> <ul style="list-style-type: none"> • Nutrient requirements, Nutrition support with special emphasis on parenteral • BMR: Definition 	04		

5.	Clinical Biochemistry Acid-Base balance <ul style="list-style-type: none"> • Definition of acid, base, pH and PKa • Buffers: Definition • Henderson-Hasselbalch equation • Principal buffer systems in the ECF, ICF and Urine • Bicarbonate and phosphate buffer systems • Acidosis and alkalosis: Definition, classification, causes and biochemical findings • Norma serum level and condition where they are altered: <ul style="list-style-type: none"> • Glucose, protein, urea , Creatinine • Bilirubin and cholesterol 	08		
6.	Blood gas & electrolytes <ul style="list-style-type: none"> ▪ Basic principle and estimation of Blood Gases ▪ Interpretation of ABG ▪ Serum Electrolytes: Normal serum levels and Condition where the altered 	06		45
7.	Enzymes – Definition, General classification, clinical and therapeutic significance of enzymes	02		45

Practical / Demonstration	
Contents	Hours
Biochemistry Practicals: <ul style="list-style-type: none"> • Urine examination for the detection of normal and abnormal constituents. • Interpretation and diagnosis <ul style="list-style-type: none"> • Liver function test • Lipid profile • Cardiac markers • Blood gas and electrolytes • Estimation of blood sugar (Glucometer) • Blood urea, serum, Creatinine, Creatinine clearance test 	50

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Laboratory: (Microscope, Autoclave, Hot Air Oven, Incubator, Haemocytometer, Haemoglobin meter, Analytical balance, Centrifuge machine, Rotator, Refrigerator, Photometer, Electrolyte analyzer, Electrophoresis apparatus, ELISA reader, PCR machine, Cell counter etc.)
- Hospital/ Health complex

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper V: Subject- Introduction to Perfusion Technology

Total hours: 300 hours
Lecture: 100 hours
Practical: 200 hours

Total marks: 200
Written: 100
Oral: 40
Practical: 40
Formative: 20

Objectives:

At the end of the learning period of this paper, the students will be able to

- describe the concepts of monitoring in cardiac perfusion
- identify the parts of heart lung machine
- explain the concept of extracorporeal circulation
- explain Principles of extracorporeal gas exchange
- describe various types of oxygenators, and Blood pumps
- describe the element of extracorporeal circulation
- explain hazards of extracorporeal circulation
- perform calculation of body surface area, blood flow rate and dilution and priming volume
- select priming fluids
- assemble of CPB circuit
- demonstrate use of Heart lung machine, hemotherm ,gas blender etc
- test Blood gas analysis and ACT

List of Competencies:

Ability to-

- demonstrate basic knowledge on common issues of Perfusion Technology.
- describe the concept of extracorporeal circulation
- describe the concepts of monitoring in cardiac perfusion
- describe the hazards of extracorporeal circulation
- perform calculation of body surface area, blood flow rate and dilution and priming volume

Course Contents of Introduction to Perfusion Technology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/Demonstration
1.	Cardiopulmonary bypass and perfusion technology History of CPB other techniques of performing Open Heart Surgery. History of Cardiac surgery and perfusion <ul style="list-style-type: none"> • Specific reference of Gibbon Lillehei, carrel • Pre CPB surgery • Azygous Flow principle. • Hypothermic/nonhypothermic non-CPB surgery including gross's Well technique and controlled cross circulation 	20		30

2.	<p>Monitoring and instrumentation</p> <p>Concepts of monitoring – instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring, defibrillators and fibrillators. Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases.</p> <ul style="list-style-type: none"> ▪ Haemodynamic monitoring ▪ Haemostatic monitoring ▪ Haematologic monitoring ▪ Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring ▪ Neurological monitoring (SSPE, EEG and cerebral function monitor) ▪ Aseptic technique. ▪ Cardiac surgery team, profession and terminology, scope of perfusion technolo 	20		30
3.	<p>Physiology of Extracorporeal circulation</p> <ul style="list-style-type: none"> • Heart – Lung machine <ul style="list-style-type: none"> ▪ Principles of extracorporeal circulation ▪ Materials used in EC circuit ▪ Principles of extracorporeal gas exchange • Various types of oxygenators (Design, Structure & Types of Oxygenator) <ul style="list-style-type: none"> ▪ Bubble, oxygenators ▪ Rotating spiral/cylinder/disc oxygenators ▪ Membrane oxygenators ▪ Mechanism of action components defoaming, rated flow. • Blood pumps (Design & Structures of pump & type of Pumps) <p>Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellow, sigmamotor, diaphragm, ventricular and centrifugal pumps.</p>	20		30
4.	<ul style="list-style-type: none"> • Element of extracorporeal circulation/hazards of: <ul style="list-style-type: none"> • Blood filter • Bubble trap • Flow meters • Temperatures • Heat exchanger • Regulating devices 	20		30

5.	<ul style="list-style-type: none"> • Connection of the vascular system with extracorporeal circulation: <ul style="list-style-type: none"> ▪ Arterial and venous cannulae. ▪ Connecting tubes and connectors ▪ Vents ▪ Suckers ▪ Cardioplegia delivery system ▪ Venous drainage. • Haemodynamic of arterial return, venous drainage, cardioplegia delivery and venting. • Blood banking, handling of blood products and their management. Blood components and their use. • Filters in CPB circuits. • Assembling of circuit, calculation prior to CPB • Priming fluids and haemodilution • Monitoring and instrumentation 	20		30
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Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> • Calculation of PCV/Hct on CPB and amount of blood to be added to bring the PCV/Hct on CPB to particular level • Calculation of body surface area • Calculation of blood flow rate • Calculation of dilution and priming volume • Selection of priming fluids • Assembling of CPB circuit • Demonstrate use of Heart lung machine, hemotherm, gas blender etc. • Blood gas analysis and ACT • Identification of various CPB circuit component and their uses, method of sterilization and complications related to them 	

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Laboratory: (Microscope, Autoclave, Hot Air Oven, Incubator, Haemocytometer, Haemoglobin meter, Analytical balance, Centrifuge machine, Rotator, Refrigerator, Photometer, Electrolyte analyzer, Electrophoresis apparatus, ELISA reader, PCR machine, Cell counter etc.)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks
Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

3rd Year

Paper I: Subject– Pathology, Haematology & Transfusion Medicine

Total hours: 250 hours

Lecture : 100 hours

Practical: 150 hours

Total marks: 200

Written: 100

Oral & Practical: 40+40

Formative: 20

1. Pathology

Objectives:

At the end of the learning period of this paper, the students will be able to

- demonstrate knowledge and understanding about cell injury and inflammation , Shock, thrombosis and embolism
- describe cardiovascular , renal and respiratory pathology
- relate these knowledge and understanding in relation to cardiac perfusion
- demonstrate knowledge and understanding about structure of bacteria, types of bacteria, pathogenicity of bacteria, diseases caused by bacteria
- demonstrate knowledge and understanding about structure of virus, types of virus, parts, diseases caused by virus
- define and classify disinfection and sterilization, describe methods of sterilizations
- define and classify immunity

List of Competencies:

Ability to-

- demonstrate basic knowledge on common issues of Pathology
- demonstrate disinfection and sterilization and describe methods of sterilizations

Course Contents of Pathology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	General Pathology Cellular Pathology: Cell injury, Cell death. <ul style="list-style-type: none">• Cause of cell injury• Reversible and irreversible injury: mechanism• Mechanism of hypoxic injury• Name of free radical , target of free radical and scavenging system (name of the anti-oxidant), definition of reperfusion injury• Definition of necrosis and apoptosis, types of necrosis and feature with examples	10		

2.	<p>Acute and Chronic inflammation</p> <p>Acute inflammation</p> <ul style="list-style-type: none"> • Causes and cardinal signs or features of acute inflammation • Outcome of acute inflammation • Local and systemic effect of acute inflammation <p>Chronic inflammation</p> <ul style="list-style-type: none"> • Cause • Difference with acute inflammation 	10		
3.	<p>Hemodynamic Disorders, Thrombosis, and Shock</p> <p>Edema and electrolyte disorder</p> <ul style="list-style-type: none"> • Oedema • Electrolyte disorder: causes of metabolic acidosis, metabolic alkalosis, respiratory acidosis & respiratory alkalosis <p>Shock</p> <ul style="list-style-type: none"> • Shock: type, pathogenesis of septic shock, stages <p>Thrombosis and embolism:</p> <ul style="list-style-type: none"> • Mechanism of thrombosis • fate of thrombus, • Clinical consequence of venous thrombosis, arterial and cardiac • thrombosis • DIC <p>Embolism and infarction</p> <ul style="list-style-type: none"> • Definition of embolism • Pulmonary embolism: source and consequence • Systemic thromboembolism: source and consequence • Air embolism, fat embolism, source and consequence <p>Infarct: definition, types, factors influencing the formation of infarct</p>	10		
4.	<p>Immunology:</p> <ul style="list-style-type: none"> • Anatomy and cells of immune system • Innate immunity – physical & Humoral protection, Cellular Immunity • Acquired immunity – antigen receptors, • Immune response: Humoral and Cellular immunity. Definition and classification of Immune response. Difference between primary and secondary immune responses. <p>Hypersensitivity response: Hypersensitivity: Definition, classification & clinical /diagnostic implications</p>	10		

5.	<p><u>Applied Pathology</u></p> <p>Cardiovascular System</p> <ul style="list-style-type: none"> • Atherosclerosis – Definition, risk factors, briefly pathogenesis and morphology, clinical significance and prevention. • Hypertension – Definition, types and briefly pathogenesis and effects of hypertension • Pathophysiology of heart failure • Ischaemic heart diseases – definition, types. Briefly pathophysiology, pathology and complication • Valvular heart diseases – cause, pathology and complication • Congenital heart diseases briefly about pathogenesis and basic effects <p>Respiratory System:</p> <ul style="list-style-type: none"> • Chronic obstructive airway disease – definition and types Briefly concept about obstructive versus restrictive pulmonary disease • Pulmonary congestion and edema • Pleural effusion – causes, effects and diagnosis <p>Renal System: Clinical manifestation of renal disease, briefly causes, mechanism, effects and laboratory diagnosis of acute kidney injury (AKI) and chronic kidney disease (CKD)</p>	10		
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6.	<p><u>Clinical Pathology</u></p> <ul style="list-style-type: none"> • Important serum levels in clinical pathology <ul style="list-style-type: none"> • Blood glucose(Fasting/random/2hrs after glucose load) • Glycosylated hemoglobin(HbA1C) • Bilirubin • Urea • BUN • Creatinine • Uric acid • Electrolytes • Lipid profile • Plasma proteins • Renal clearance value <ul style="list-style-type: none"> • Creatinine clearance test • Urea clearance test Enzymes <ul style="list-style-type: none"> • SGOT • SGPT • LDH • Cardiac markers-Normal value & enzymatic changes in MI <ul style="list-style-type: none"> • CK-MB • LDH • Troponin I & Troponin T • AST/SGOT • Liver function tests: <ul style="list-style-type: none"> • Name and indication • Kidney function tests <ul style="list-style-type: none"> • R/E of urine • Blood analysis • Creatinine clearance test 	10		
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2. Hematology

Objectives:

At the end of the learning period of this paper, the students will be able to

- define hemopoietic system, blood & its components with functional implications
- describe erythropoiesis, granulopoiesis & thrombopoiesis, different types of haemoglobins & their diagnostic significance, iron & folate metabolism and different types of anaemias, their causes & laboratory diagnosis
- describe BT, CT, PT, APTT, coagulation profile, factor assays, fibrinogen assays
- describe the blood group antigens, antibody, blood grouping, cross matching and screening of blood

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Hematology

Course Contents of Hematology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<ul style="list-style-type: none"> • Introduction to the hemopoietic system, haemopoiesis/ erythropoiesis, granulopoiesis and thrombopoiesis: erythropoietin & hemopoietic factors • Blood: composition, function and clinical significance • Red blood corpuscles: origin, function, indices & clinical significance • Haemoglobin: types, function and clinical significance, Haemoglobin E trait, Thalassaemia • Iron & Folic acid: source, daily requirement & metabolism; factors & clinical significance; Estimation of Iron profile, vitamin B₁₂ and folic acid • Anaemia: types, microcytic hypochromic, macrocytic and normocytic normochromic anaemias • White blood cells: origin, function, indices ; Leukaemias: types, causes, diagnostic techniques, Multiple Myeloma • Platelets: origin, function, indices & clinical significance; • Blood coagulation: process, factors, bleeding disorders: types, causes, diagnostic techniques & clinical significance 	30		100

3. Transfusion Medicine

Objectives:

At the end of the learning period of this paper, the students will be able to

- select blood donors appropriately
- prepare & preserve different components of blood
- explain hazards of blood transfusion & relevant initial management
- describe the quality control of blood bank as well as preservation of blood and blood component
- transfuse blood to patient

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Transfusion Medicine
- select blood donors appropriately
- describe the hazards of blood transfusion & relevant initial management

Course Contents of Transfusion Medicine

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<ul style="list-style-type: none"> • Introduction: blood transfusion as therapeutic modality; • Blood donors: types, selection process and related issues • Collection of blood: Phlebotomy and collection, post donation care, care of the donated blood bag • Blood group immunology: Blood group antigen, antibody, types of blood group system; clinical significance • Precautions for blood transfusion: Screening for transfusion transmitted diseases: HIV 1 +2, HBsAg, VDRL, TPHA, Anti HCV and malarial parasites; Cross matching and Coombs test • Blood components- Packed red blood cells(PRBC), Fresh Frozen Plasma (FFP), PC, Cryoprecipitate, Cryo-poor plasma, Platelet rich plasma (PRP) • Hazards of blood transfusion: immediate, late and their management • Protocol for issuing of blood unit and transfusion practice • Therapeutic plasma exchange • Plasma substitutes- Colloid, Crystalloid etc. 	10		50

Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> • Hb estimation, packed cell volume (PCV), ESR • Methods of blood grouping (ABO & Rh group) & compatibility test, • Cross match • Bleeding time and clotting time • Blood screening tests for HIV, HBV, HCV, MP, Syphilis by ELISA , (Observation and interpretation) • Donor selection process and donor questionnaire • Methods of blood collection for transfusion, care of the donor and donated blood bag • Methods of blood component separation: RCC, Platelets concentrate , Plasma-Platelet rich Plasma, Fresh Frozen Plasma, Frozen Plasma, Cryoprecipitate, Granulocytes, Immunoglobulin, Plasma Protein; washing cells and making red cells suspension (Observation) 	50

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Laboratory: (Microscope, Autoclave, Hot Air Oven, Incubator, Haemocytometer, Haemoglobin meter, Analytical balance, Centrifuge machine, Rotator, Refrigerator, Photometer, Electrolyte analyzer, Electrophoresis apparatus, ELISA reader, PCR machine, Cell counter etc.)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper II: Subject- Clinical Cardiovascular Technology

Total hours: 250 hours

Lecture: 100 hours

Practical: 150 hours

Total marks: 200

Written: 100

Oral & Practical: 80

Formative: 20

Objectives:

At the end of the learning period of this paper, the students should be able to

- name the cardiovascular and non-cardiovascular diseases in relation to cardiac perfusion
- describe the risk factors, sign symptoms, and complications and management outline of these diseases
- take history and Perform physical examination of patients
- demonstrate knowledge and understanding of Medical ethics & the relevant medico legal aspects and apply these in their professional practice
- interpret reports of relevant investigations
- perform preoperative patient assessment
- perform monitoring of post-operative cardiac surgical patients for perfusion related complication
- perform CPR

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Cardio-vascular Technology
- perform preoperative patient assessment
- perform monitoring of post-operative cardiac surgical patients for perfusion related complication
- perform CPR

Course Contents of Clinical Cardiovascular Technology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<p>Clinical Methodology</p> <ul style="list-style-type: none"> a. Introduction to patient care, confidentiality ,social & professional ethics b. Preoperative patient assessment c. Monitoring post-operative cardiac surgical patients for perfusion related complications 	15		30
2.	<p>Cardiovascular diseases and comorbidities</p> <ul style="list-style-type: none"> a. Ischaemic heart diseases b. Rheumatic heart disease c. Congenital heart disease d. Hypertension e. Aortic Aneurysms f. Cardiomyopathy g. Peripheral vascular disease h. Heart failure i. AKI & CKD j. Diabetes mellitus k. Obesity l. Chronic obstructive airway diseases(COPD) 	15		
3.	<p>Critical care</p> <ul style="list-style-type: none"> • CPR • Management and use of pacemakers • Management and use of IABP • Ultra filtration and dialysis • Care of ICU patients 	15		50
4.	<p>Applied technology—interpretation of Reports</p> <ul style="list-style-type: none"> • Chest X Ray • ECG • Echo • Angiography/ Cardiac Cath • Nuclear Cardiology • Laboratory Investigations 	15		50
5.	Biomedical waste & its management	10		20

Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> • Interpretation of Reports <ul style="list-style-type: none"> • Chest X Ray • ECG • Echo • Angiography/ Cardiac Cath • Nuclear Cardiology • Laboratory Investigations • CPR • Different patients in ward (history taking, clinical examination, etc.) • Preoperative patient assessment • Monitoring post-operative cardiac surgical patients for perfusion related complications 	

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Cardiac OT: (Heart Lung Machine, IABP, ECMO, De-Fibrelator, ABG Machine, TPM, ACT Machine, Hemoconcentrator, ECG Machine, Ventilator Machine)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper III: Subject – Clinical Perfusion Technology

Total hours: 250 hours

Lecture: 100 hours

Practical: 150 hours

Total marks: 200

Written: 100

Oral & Practical: 40+40

Formative: 20

Objectives:

At the end of the learning period of this paper, the students should be able to

- describe the Pharmacokinetics of drugs in relation to cardiac pulmonary bypass
- explain Hemodynamic and metabolic aspects of total heart – lung bypass
- describe pulsatile perfusion, Priming of fluids and hemodilution, Cannulation technique during cardiopulmonary bypass
- prepare for CPB conduction
- conduct and monitoring of Cardiopulmonary bypass
- control of adequacy of perfusion
- perform termination of CPB
- perform myocardial protection and preservation
- perform blood gas analysis
- assemble CPB circuit ,and priming ,
- perform Anticoagulation monitoring and test
- demonstrate the knowledge and understanding of technique of canulation
- prepare of cardioplagia solution ,
- perform assembling of cardioplagia delivery system and ultra-filtration
- describe the complications and safety during cardiopulmonary bypass

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Clinical Perfusion Technology.
- set, organize, operate and perform cardiopulmonary bypass
- describe pulsatile perfusion, Priming of fluids and hemodilution, Cannulation technique during cardiopulmonary bypass
- perform conduction and monitoring of Cardiopulmonary Bypass
- perform termination of CPB
- perform myocardial protection and preservation
- perform blood gas analysis
- describe the complications and safety during cardiopulmonary bypass

Course Contents of Clinical Perfusion Technology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<ul style="list-style-type: none"> • Pharmacokinetics and Pharmacodynamics of Cardiopulmonary Bypass: Haemodilution, hypothermia, acid base status, sequestration, temperature, anaesthetic agents, specific drugs with CPB influence, properties, vasodilators, nitrates, beta- blockers in pulmonary bypass surgery. • Drugs used in cardiopulmonary bypass. • Conduct and monitoring of Cardiopulmonary bypass. • Adequacy of perfusion – General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy. 	20		30
2.	<ul style="list-style-type: none"> • Cannulation technique during cardiopulmonary bypass: Venous cannulation-principles of venous drainage, types and sizes of cannula, connection to the patient, the venous drainage, Arterial cannulation, cannulas, connection to a patient, Cardioplegiacannulae, serts • Priming fluids and hemodilution: Crystalloids, 5% Dextrose, Balanced salt 50m, Mannitol, colloidal osmoter pressure, plasma expander, plasma preparation, dexatroms, gelatins, hetastarch hemodilution: Historical perspective, advantages – physiological effects, complications during bypass, safety during cardiopulmonary bypass, bypass safety, organizational aspects, accidents & its management (perfusion relative), coagulopathies, mechanical and electrical failure, perfusion management, perfusion systems, safety and performist surgical teams. 	20		30

3.	<ul style="list-style-type: none"> • Anticoagulation on bypass: its monitoring, its reversal and complications. • Haemodynamic aspects of total heart – lung bypass: Perfusion flow pressure and resistance and distribution of blood flow among various vascular beds • Metabolic aspects of total heart- lung bypass: <ul style="list-style-type: none"> • Oxygen need and perfusion flow requirements, Perfusion flow and oxygen uptake • Acid base balance • Electrolyte and water balance • Oxygen toxicity 	20		30
4.	<ul style="list-style-type: none"> • Pulsatile perfusion – introduction, theory & physiology of pulsatile flow, haemodynamic, metabolic effects, clinical use, hematological effects • Blood conservation hemofiltration –during cardiopulmonary bypass including modified ultra-filtration reverse autologous priming and other methods 	20		30
5.	<ul style="list-style-type: none"> • Myocardial protection and cardioplegia – pretreatment of the myocardium, cardioplegia, hypothermia, controlled reperfusion, cycocardial protection for specific clinical problems, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass • Termination of cardiopulmonary bypass – principles and methodologies • Hypothermia during CPB : advantages and disadvantages • Perfusion problems during cardio pulmonary bypass, high arterial line press, air and arterial line, poor venous return, air lock in a venous line. • Micro emboli gaseous and particulate, filters used in cardiopulmonary bypass circuit • Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function) <p>Heat exchangers-principles function of heat exchangers & their assessment. Complications related to heat exchange and their management</p>	20		30

Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> • Blood gas analysis • Serum Electrolyte, Blood sugar lactate • Assembling CPB circuit , priming • Anticoagulation monitoring and test • Technique of canulation • Preparation of cardioplegia solution • Assembling of cardioplegia delivery system and ultra-filtration • Managing a simulated perfusion accident on a dummy CPB circuit including changing oxygenators when on CPB, managing falling/leaking reservoir levels, venous airlocks, air in the arterial line, cardioplegia delivery failure, increased arterial line pressure, recognition of a possible dissection, run a way pump head, recognition of heat exchanger water leak into the CPB circuit, components and their uses, method of sterilization and complications related to them • Observation of CPB of 100 cases 	

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Cardiac OT : (Heart Lung Machine, NIRS, IABP, ECMO, Heat Exchanger, Gas Blender, Doppler, VAVD, Fibrelator, De-Fibrelator, ABG Machine, TPM, ACT Machine, Cell Saver, Hemoconcentrator, Oxygenator, Heart Lung Pack, CP Delivery System, Cannulae)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

4thYear
Paper I: Subject - Applied Perfusion Technology

Total hours: 400 hours
Lecture: 100 hours
Practical: 150 hours
Special Lab Attachment: 150

Total marks: 200
Written: 100
Oral & Practical: 80
Formative: 20

Objectives:

At the end of the learning period of this paper, the students will be able to

- describe blood cell trauma
- demonstrate knowledge and understanding on pathophysiology of CPB
- monitor use of anticoagulant on by pass
- perform blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra-filtration reverse autologous priming and other methods. and cell savers, auto transfusion
- perform Micro pore filtration during cardiopulmonary bypass
- perform Counter pulsation techniques and assist devices\
- describe the complications and safety during cardiopulmonary bypass

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Applied Perfusion Technology.
- set, organize, operate and perform cardiopulmonary bypass.
- describe pathophysiology of CPB
- perform blood conservation hemofiltration during cardiopulmonary bypass including modified ultra-filtration and cell savers
- perform Counter pulsation techniques and assist devices
- describe the complications and safety during cardiopulmonary bypass

Course Contents of Applied Perfusion Technology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<ul style="list-style-type: none"> Blood cell trauma – analysis of forces of fluid motion, effects of physical forces of blood cell, clinical effect. Complications of blood transfusion. 	20		30
2.	<ul style="list-style-type: none"> Anticoagulation on bypass, its monitoring, its reversal and complications. Heparinless bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management. 	20		30
3.	<ul style="list-style-type: none"> Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimise the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass 	20		30
4.	<ul style="list-style-type: none"> Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra-filtration reverse autologous priming and other methods. and cell savers, auto transfusion 	20		30
5.	<ul style="list-style-type: none"> Effects of perfusion on organs : Brain, heart, lungs , kidney liver and other organs Micro pore filtration during cardiopulmonary bypass Counter pulsation techniques and assist devices 	20		30

Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> Blood gas analysis Serum Electrolyte, Blood sugar lactate Assembling CPB circuit , priming Anticoagulation monitoring and test Technique of canulation Preparation of cardioplegia solution Assembling of cardioplegia delivery system and ultra-filtration Managing a simulated perfusion accident on a dummy CPB circuit including changing oxygenators when on CPB, managing falling/leaking reservoir levels, venous airlocks, air in the arterial line, cardioplegia delivery failure, increased arterial line pressure, recognition of a possible dissection, run a way 	

<p>pump head, recognition of heat exchanger water leak into the CPB circuit, components and their uses, method of sterilization and complications related to them</p> <ul style="list-style-type: none"> • IABP, ECMO • Observation of CPB of 100 cases 	
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Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Cardiac OT: (Heart Lung Machine, NIRS, IABP, ECMO, Heat Exchanger, Gas Blender, Doppler, VAVD, Fibrelator, De-Fibrelator, ABG Machine, TPM, ACT Machine, Cell Saver, Hemoconcentrator, Oxygenator, Heart Lung Pack, CP Delivery System, Cannulae)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Paper II: Subject - Advanced Perfusion Technology

Total hours: 400 hours
Lecture: 100 hours
Practical: 100 hours
Special Lab Attachment: 200

Total marks: 200
Written: 100
Oral & Practical: 80
Formative: 20

Objectives:

At the end of the learning period of this paper, the students should be able to:

- demonstrate knowledge and understanding about Minimally Invasive Cardiac surgery (MICS)
- describe the complications and safety during cardiopulmonary bypass
- perform Blood gas analysis
- assemble paediatric CPB circuit , priming ,
- perform Anticoagulation monitoring and test
- preparation of cardioplasia solution in case of Paediatric cardiac surgery,
- assist in the process of canulation in case of Paediatric cardiac surgery
- perform perfusion of Minimally Invasive Cardiac surgery (MICS)

List of Competencies:

Ability to -

- demonstrate basic knowledge on common issues of Applied Perfusion Technology.
- set, organize, operate and perform cardiopulmonary bypass.
- demonstrate Minimally Invasive Cardiac surgery (MICS)
- perform paediatric perfusion and myocardial preservation during cardiac surgery
- perform perfusion of Minimally Invasive Cardiac surgery (MICS)
- perform techniques that support circulation such as IABP, ECMO, LVAD, RVAD

Course Contents of Advanced Perfusion Technology

Sl. No	Topics/Lessons	Teaching/learning Hours		
		Lecture	Tutorial	Practical/ Demonstration
1.	<ul style="list-style-type: none"> ● Perfusion techniques for Paediatric cardiac surgery <ul style="list-style-type: none"> a. Challenges of Cardiopulmonary Bypass in the Pediatric perfusion. b. Technique for Cardiopulmonary Bypass in the Pediatric perfusion. c. Use of Hypothermia in Congenital Heart Surgery. d. Myocardial preservation 	20		60
2.	<ul style="list-style-type: none"> ● Minimally Invasive Cardiac surgery (MICS) ● ECMO – special perfusion techniques for special cardiac surgeries and medical conditions (including thoracic aortic surgeries deep hypothermia and circulatory arrest). ● Perfusion for non-cardiac surgery, invasive cardiology and outside the operation suite. 	20		60
3.	<ul style="list-style-type: none"> ● Perfusion as a method of cardiopulmonary bypass ● Complications and safety during cardiopulmonary bypass – bypass safety, organizational aspects, accidents, coagulopathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents. ● Recent advanced in perfusion techniques. ● Experimental perfusion ● Assisted circulation: LV assisted device – LVAD, RVAD, BIVAD 	20		60
4.	<ul style="list-style-type: none"> ● Circulatory support, metabolic support by heart lung Bypass. Effect of partial heart lung bypass on organs ● Biomedical pump 	20		60

5.	<ul style="list-style-type: none"> The various long-term circulatory assists devices currently used in perfusion care and various extra corporeal circuit designs used in perfusion care other than the traditional heart-lung circuit(for example: liver transplant circuits, left heart bypass, isolated lung/organ/limb perfusion circuits, etc.) Techniques for perfusion care that are particular to various patient populations (for example, pregnant patients, patients with pathologies such as sickle cell anemia or other chronic and acute blood component pathologies, organ transplant recipient patients, patients with religious beliefs that affect blood product usage, etc.) 	20		60
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Practical / Demonstration	
Contents	Hours
<ul style="list-style-type: none"> Observation of at least 5 cases of pediatric perfusion Blood gas analysis Assembling paediatric CPB circuit , priming , Anticoagulation monitoring and test Technique of canulation Preparation of cardioplagia solution , Assembling of cardioplagia delivery system and ultra-filtration (CUF ,MUF) Preparation for MICS 	

Teaching Methods:

- Lecture
- Tutorial
- Practical/ Demonstration
- Field visit

Media:

- Multimedia and Laptop
- OHP and transparencies
- White Board and markers
- Blackboards and chalk
- Online and computer based teaching learning materials
- Cardiac OT: (Heart Lung Machine, NIRS, IABP, ECMO, Heat Exchanger, Gas Blender, Doppler, VAVD, Fibrelator, De-Fibrelator, ABG Machine, TPM, ACT Machine, Cell Saver, Hemoconcentrator, Oxygenator, Heart Lung Pack, CP Delivery System, Cannulae)
- Hospital

Assessment:

Written – SAQ= 80 marks, MCQ=20 marks

Practical or OSPE 40 marks, Oral/SOE-40 marks, Formative-20 marks

Outline of Institutional Cardiac OT Equipments

As per Cardiothoracic Units of the Accredited Hospital

- Diagnostic equipments such as ECGS, EMGS etc.
- Suction units
- Diathermy equipment
- Anesthesia machines
- Infusion pumps
- Cardiac catheterization procedure tray
- Cardiac Monitor Defibrillator and Resuscitators
- Cardiopulmonary bypass circuit
- Extracorporeal circulation circuit
- Series of tubes made of PVC or silicone rubber.
- Pump console
- Pumps, Flow pump, roller pump and centrifugal pump
- Oxygenators
- Bubble oxygenators
- Membrane oxygenators
- Extra corporeal oxygenators
- Cannula
- Venous cannula: Dual stage and flat venous cannula
- Arterial cannula
- Cardioplegia cannula
- Multiple perfusion adaptor
- Pericardial sump with ¼” connector
- Stainless steel line clamps
- Stainless steel intra cardiac suckers
- Remote control module for temperature control monitor
- Instrument tray with mounting arm
- Cell saver
- Temporary pacemaker
- Other accessories required in the operation theaters

Outline of Special Equipments

- NIRS
- IABP
- ECMO
- LVAD
- RVAD
- Cell Savers

Job description at *Teaching Institutes*

At the Teaching Institutes:

At the teaching Institutes the Cardiac Perfusion Technologists personnel are positioned at three levels:

- a. Lecturer
- b. Instructor
- c. Technologist

a. *Lecturers:*

- They shall perform tutorial, demonstration, and lecture classes.
- Facilitate practical demonstration and work of the students in the laboratory as a 'facilitator' of practical 'teaching group'
- They will perform large group teaching and supervise the junior colleagues.

b. *Instructors:*

- They will perform tutorial and demonstration classes relevant to practical items.
- Ensure and guide the students to prepare practical note books.
- Demonstrate elaborately procedures of CPB.
- Supervise practical classes as a 'Team leader'.

c. *Technologists:*

- They shall run the procedures and examinations in all practical classes.
- Run practical demonstration and works for the students.
- Perform small group demonstration relevant to practical.