

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE,  
PADUR**

**B.Sc. (PERFUSION TECHNOLOGY)**

Proposed by

School of Science and Humanities

Curriculum and Syllabus

2015

**HINDUSTAN UNIVERSITY**  
**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**  
**ACADEMIC REGULATIONS**

## **1. Vision, Mission & Objectives**

**1.1** The Vision of the Institute is to make everyone a success and no one a failure

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

**1.2** Further, the Institute always strives

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the nation and the society.
- To promote research in the field of Science, Humanities, Engineering, Technology and allied branches

**1.3** Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied science and management.
- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

## **2. Admission**

**2.1.** The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.Sc. (Applied Science) programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

**2.2.** The student should have

- A pass in +2 (CBSE, Matriculation, State Board) or an equivalent with 12 years of Schooling from a recognized Board with Physics, Chemistry and Biology/ Botany and Zoology as subjects of study.
- Minimum 35% marks in each subject separately.

**2.3.** The selected candidates will be admitted to the B.Sc. programme after he / she fulfills all the admission requirements set by the Institute after payment of the prescribed fees.

**2.4.** In all matters relating to admission to the B.Sc. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

**2.5.** If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute, the Institute may revoke the admission of the candidate with information to the Academic Council.

### **3. Structure of the programme**

**3.1.** The programme will have the following structure:

- i) A general programme comprising Basic Anatomy, Physiology, Pathology, Biochemistry and basics of Computer.
- ii) A core programme introducing the student to the foundations of Practical field.

**3.2.** The duration of the programme will be a minimum of 3 years. Every branch of the B.Sc. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

**3.3** The academic programmes of the Institute follow the credit system.

**3.4.** For the award of degree, a student has to earn certain minimum total number of credits specified in the

curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 120

**3.5.** The medium of instruction, examination and the language of the project reports will be English.

### **4. Faculty Advisor**

**4.1.** To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

### **5. Class Committee**

**5.1** A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

- (i) A Chairman, who is not teaching the class.
- (ii) All subject teachers of the class.
- (iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than six times during a year.

The functions of the Class Committee will include:

- (i) Addressing problems experienced by students in the classroom and the laboratories.

- (ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.
- (iii) During the meetings, the student members shall express their opinions and suggestions of the class students to improve the teaching / learning process.

## 6. Grading

6.1 A grading system as below will be adhered to.

Range of Marks	Letter Grade	Grade points
90-100	S	10
80 - 89	A	09
70- 79	B	08
60-69	C	07
50-59	D	06
40-49	E	05
< 40	U	00
	I (Incomplete)	

### 6.2 GPA & CGPA

GPA is the ratio of the sum of the product of the number of credits  $C_i$  of course "i" and the grade points  $P_i$

earned for that course taken over all courses "i" registered by the student to the sum of  $C_i$  for all "i". That is,

$$GPA = \frac{\sum C_i P_i}{\sum C_i}$$

CGPA will be calculated in a similar manner, at any year, considering all the courses enrolled from first year onwards.

6.3. For the students with letter grade I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice-Chancellor of the University. The final marks will be graded using absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

## 7. Registration & Enrolment

7.1 Except for the first year, registration and enrollment will be done in the beginning of the year as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel & Library up to the end of the previous Year and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

**7.3.** Students are required to submit registration form duly filled in.

## **8. Registration requirement**

**8.1.** If a student finds his/her load heavy in any year, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the year with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any year should enable him/her to earn the minimum number of credits per year for the completed years.

## **9. Continuation of programme**

**9.1.** For those students who have not earned the minimum required credit prescribed for that particular year examination, a warning letter to the concerned student and also to his parents regarding the shortage of his credit will be sent by the HOD after the announcement of the results of the University examinations

## **10. Maximum duration of the programme**

**10.1.** The normal duration of the programme is 3 years. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 5 years excluding the years withdrawn on medical grounds or other valid reasons.

## **11. Temporary discontinuation**

**11.1.** A student may be permitted by the Dean (Academic) to discontinue temporarily from the programme for six months or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of 6 months.

## **12. Discipline**

**12.1.** Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

**12.2.** Any act of indiscipline of a student reported to the (Academics) will be referred to a Discipline Committee so constituted. The committee will enquire into the charges and decide on suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Academic) to recommend to the Vice-Chancellor the implementation of the decision. The student concerned may appeal to the Vice-Chancellor whose decision will be final. The Dean (Academic) will report the action taken at the next meeting of the Council.

**12.3.** Ragging and harassment of women are strictly prohibited in the University campus and hostels.

## **13. Attendance**

**13.1.** A student whose attendance is less than 75% in a year is not eligible to appear for the end – year examination. The details of all students who have less than 75%

attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and (Academic).

**13.2.** Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However, a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Dean (Academic) who, depending on the merits of the case, may permit the student to appear for the year end examination. A student will be eligible for this concession at most in one year during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the year, whichever is earlier.

**13.3** As an incentive to those students who are involved in extra-curricular activities such as representing the University in Sports & Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer – in-charge. All such applications should be recommended by the concerned HOD and forwarded to Dean (Academic) within seven instructional days after the programme / activity.

## **14. Assessment Procedure**

**14.1.** The Academic Council will decide from time to time the system of tests and examinations in each subject in each year.

**14.2** For each theory course, the assessment will be done as follows:

<b>Internal Tests</b>	<b>End Year Examination</b>	<b>Total</b>
<b>Max</b>	<b>Max</b>	
25	75	100

Computer courses will be evaluated through internal examinations only.

Internal Assessment will be done based on the components below:

1. Written test/term test
2. Record Books
3. Assignments
4. Oral presentations/seminars
5. Skills/practical training acquired in Laboratory
6. Communication skills

**14.3** For practical courses, the assessment will be done by the subject teachers as below:

- (i) Weekly assignment/Observation note book / lab records – weightage 60%.
- (ii) Year- end examination of 3 hours duration including viva – weightage 40%.

**14.4** For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

## **15. Make up Examination/Periodical Test**

**15.1.** Students who miss the year end examinations / periodical test for valid reasons are eligible for makeup examination /periodical test. Those who miss the year-end examination / periodical test should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

**15.2.** Permission to appear for make-up examination/periodical test will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / periodical test and the same should be duly endorsed by parent/guardian and also by a medical officer of the University within 5 days.

**15.3.** The student will be allowed to make up at the most two out of three periodical tests.

## **16. Declaration of results**

**16.1..** A candidate who secures not less than 40% of total marks prescribed for a course with a minimum of 40% of the marks prescribed for the year end examination shall be declared to have passed the course and earned the specified credits for the course.

**16.2** After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG and PG programmes constituted by

the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination / Registrar.

**16.3.** If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the year end examination, he/she shall register and re-appear for the end year examination during the following year. However, the internal marks secured by the candidate will be retained for all such attempts.

**16.4.** If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the year end examination, wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

**16.5.** A candidate can apply for the revaluation of his/her year -end examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the

Registrar/Controller of Examinations through the Head of the Department. The Registrar/Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

## 17. Grade Card

17.1 After results are declared, grade sheet will be issued to each student which will contain the following details:

- (i) Program and branch for which the student has enrolled.
- (ii) Year of registration.
- (iii) List of courses registered during the Year and the grade scored.
- (iv) Year Grade Point Average (GPA)
- (v) Cumulative Grade Point Average (CGPA).

## 18. Class / Division

Classification is based on CGPA and is as follows:

CGPA  $\geq$ 8.0 : **First Class with distinction**

7.0  $\leq$ CGPA < 8.0 : **First Class**

6.0  $\leq$ CGPA < 7.0 : **Second Class**

5.0  $\leq$ CGPA < 6.0 : **Third Class**

## 19. Transfer of credits

19.1 Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the

Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

## 20. Eligibility for the award of B.Sc.

20.1. A student will be declared to be eligible for the award of the B.Sc. Degree if he/she has

- i) Registered and successfully obtained credit for all the core courses;
- ii) Successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;
- iii) Has no dues to all sections of the Institute including Hostels, and
- iv) Has no disciplinary action pending against him/her.

The award of the degree must be recommended by the Academic Council and approved by the Board of Management of the University.

## 21. Power to modify

21.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.



**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE****B.Sc. Perfusion Technology****CURRICULUM & Syllabus****(Annual Pattern) 2015****First Year**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Contact Hours</b>
<b>Theory</b>							
1	<b>PFT101</b>	Anatomy related to Perfusion Technology	8	-	0	8	4
2	<b>PFT102</b>	Physiology related to Perfusion Technology	8	-	0	8	4
3	<b>PFT103</b>	Biochemistry	8	-	0	8	4
4	<b>PFT104</b>	Pathology related to Perfusion Technology	8	-	0	8	4
5	<b>BCS101</b>	Fundamentals of Computer	3	-	0	3	3
<b>Practical</b>							
7	<b>PFT131</b>	PFT- Anatomy Practical	0	0	3	2	3
8	<b>PFT132</b>	PFT- Physiology Practical	0	0	3	2	3
9	<b>PFT133</b>	Biochemistry Practical	0	0	3	2	3
10	<b>PFT134</b>	PFT- Pathology Practical	0	0	3	2	3
11	<b>BCS131</b>	Computer laboratory	0	0	3	2	3
<b>Total</b>						<b>45</b>	<b>34</b>

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE****B.Sc. Perfusion Technology  
CURRICULUM & Syllabus****(Annual Pattern) 2015****Second Year**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Contact Hours</b>
1	<b>PFT201</b>	Pharmacology related to Perfusion Technology	8	0	0	8	4
2	<b>PFT202</b>	Concepts of Disease and Outlines of Clinical Evaluation Related to Perfusion Technology- Part I	8	0	0	8	4
3	<b>PFT203</b>	Instrumentation in Perfusion Technology	8	0	0	8	4
4	<b>EC2905</b>	Biomaterials and Artificial Organs	3	0	0	3	3
<b>Practical</b>							
7	<b>PFT231</b>	PFT- Pharmacology Practical	0	0	3	2	3
8	<b>PFT232</b>	PFT- Disease and Clinical Evaluation Part I Practical	0	0	3	2	3
9	<b>PFT233</b>	PFT- Instrumentation Practical	0	0	3	2	3
<b>Total</b>						<b>33</b>	<b>24</b>

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE****B.Sc. Perfusion Technology  
CURRICULUM & Syllabus****(Annual Pattern) 2015****Third Year**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Contact Hours</b>
1	<b>PFT301</b>	Concepts of Disease and Outlines of Clinical Evaluation Related to Perfusion Technology- Part II	8	0	0	8	4
2	<b>PFT302</b>	Advanced Perfusion Technology I	8	0	0	8	4
3	<b>PFT303</b>	Advanced Perfusion Technology II	8	0	0	8	4
4	<b>PHC103</b>	Hospital and Patient Relation Management	3	0	0	3	3
<b>Practical</b>							
7	<b>PFT331</b>	PFT- Disease and Clinical Evaluation- Part II Practical	0	0	3	2	3
8	<b>PFT332</b>	Advanced Perfusion Technology I Practical	0	0	3	2	3
9	<b>PFT333</b>	Advanced Perfusion Technology II Practical	0	0	3	2	3
<b>Total</b>						<b>33</b>	<b>24</b>

<b>Year</b>	<b>Credits</b>	
	<b>Theory</b>	<b>Practical</b>
<b>I</b>	<b>35</b>	<b>10</b>
<b>II</b>	<b>27</b>	<b>6</b>
<b>III</b>	<b>27</b>	<b>6</b>
<b>TOTAL</b>	<b>89</b>	<b>22</b>
	<b>111</b>	

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE**

**B.Sc. Perfusion Technology  
(Annual Pattern) 2015  
EVALUATION**

S. No.	Subject Code	Subject Name	Marks
<b>I YEAR</b>			
1.	<b>PFT 101</b>	Anatomy related to Perfusion Technology	100
2.	<b>PFT102</b>	Physiology related to Perfusion Technology	100
3.	<b>CVT103/PFT103</b>	Biochemistry	100
4.	<b>PFT104</b>	Pathology related to Perfusion Technology	100
5.	BCS101	Fundamentals of Computers	100
6.	<b>PFT131</b>	PFT-Anatomy Practical	100
7.	<b>PFT132</b>	PFT-Physiology Practical	100
8.	<b>CVT133/PFT133</b>	Biochemistry Practical	100
9.	<b>PFT134</b>	PFT-Pathology Practical	100
10.	<b>BCS131</b>	Computer laboratory	100
<b>II YEAR</b>			
11.	<b>PFT201</b>	Pharmacology related to Perfusion technology	100
12.	<b>PFT202</b>	Concepts of Disease and Outlines of Clinical Evaluation Related to Perfusion Technology-Part I	100
13.	<b>PFT203</b>	Perfusion technology – Instrumentation In Perfusion Technology	100
14.	<b>EC2905</b>	Biomaterials and artificial organs	100
15.	<b>PFT231</b>	PFT-Pharmacology Practical	100
16.	<b>PFT232</b>	PFT- Disease and Clinical Evaluation Part I Practical	100
17.	<b>PFT233</b>	PFT-Instrumentation Practical	100
<b>III YEAR</b>			
18.	<b>PFT301</b>	Concepts of Disease and Outlines of Clinical Evaluation Related to Perfusion Technology-Part II	100
19.	<b>PFT302</b>	Advanced Perfusion Technology I	100
20.	<b>PFT303</b>	Advanced Perfusion Technology II	100
21.	<b>PHC103</b>	Hospital and Patient relation Management	100
22.	<b>PFT331</b>	PFT- Disease and Clinical Evaluation Part II Practical	100
23.	<b>PFT332</b>	Advanced Perfusion Technology I Practical	100
24.	<b>PFT333</b>	Advanced Perfusion Technology II Practical	100

**HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE, PADUR**

**B. Sc. Perfusion Technology Syllabus**

**First Year**

**PFT 101 ANATOMY RELATED PERFUSION TECHNOLOGY**

L	T	P	C
8	0	0	8

**Objective:** To impart knowledge to the students on basics of Human Anatomy

**Outcome:** After completion of the course the students will be able to gain

- (a) a clear picture on the anatomy of Human system
- (b) knowledge on a over view of different systems

**UNIT I ANATOMY** **12 Periods**

Heart and great vessels

**UNIT II GROSS ANATOMY AND STRUCTURAL FEATURES OF CARDIAC CHAMBERS** **12 Periods**

Atrium, Ventricle, AV junction, Heart valves, specialised conduction tissues, Sinus node Internodal tracts, AV node, Bundles.

**UNIT III INNERVATIONS OF THE HEART** **12 Periods**

Sympathetic, Parasympathetic, Sensory

**UNIT IV PERICARDIUM** **12 Periods**

Gross Anatomy Nerve Supply and Blood Supply

**UNIT V SYSTEMIC CIRCULATION** **12 Periods**

Arterial system, venous system, Lymphatic system, Tissue perfusion & microcirculation

**UNIT VI PULMONARY CIRCULATION** **12 Periods**

Pulmonary artery, Pulmonary veins, Bronchial artery

**UNIT VII NERVOUS SYSTEM** **12 Periods**

Anatomy of CNS system and cerebral circulation

**UNIT VIII CIRCULATION** **12 Periods**

Anatomy of Blood

**UNIT IX EXCRETORY SYSTEM**

**12 Periods**

Anatomy of Excretory System and Renal circulation

**UNIT X RESPIRATORY SYSTEM**

**12 Periods**

Anatomy of respiratory system

**L=120 Periods**

**REFERENCE BOOKS:**

1. William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill
2. Chaurasia –A Text book of Anatomy T.S. Ranganathan – A text book of Human Anatomy
3. ESTER. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin  
Cott. Philadelphia

## PFT 102 PHYSIOLOGY RELATED PERFUSION TECHNOLOGY

L	T	P	C
8	0	0	8

**Objective:** To educate the students on the basics of Human Physiology

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

- (a) Gain a wide knowledge on the physiology of cardio vascular system.
- (b) Get a good exposure on cardiac cycle, cardiac output and circulation

### **UNIT I OVER VIEW OF THE CARDIOVASCULAR SYSTEM** **8 Periods**

Function of CVS, Circulation of blood, and Central control of CVS

### **UNIT II CARDIAC CYCLE** **8 Periods**

Mechanical events, Arterial cycle &CVP cycle, Clinical aspects of human cardiac cycle.

### **UNIT III CARDIAC EXCITATION & CONTRACTION** **8 Periods**

Mechanism of contraction, Pacemaker of conduction system, Nervous control of the heart rate

### **UNIT IV BASICS OF ECG** **8 Periods**

Ficks principle, Thermal dilution &indicator dilution methods, Pulse Doppler methods, miscellaneous methods

### **UNIT V CONTROL OF STROKE VOLUME &CARDIAC OUTPUT** **8 Periods**

### **UNIT VI HEMODYNAMIC** **8 Periods**

Relationship between pressure &flow &resistance

### **UNIT VII SOLUTE TRANSPORT BETWEEN BLOOD &TISSUES** **8 Periods**

Circulation of fluids between plasma, intestine & lymph

### **UNIT VIII VASCULAR SMOOTH MUSCLE** **8 Periods**

Mechanism of contraction Pharmacomechanical coupling, automaticity

### **UNIT IX CONTROL OF BLOOD VESSELS** **8 Periods**

Local control mechanism, Nervous control, Hormonal control

### **UNIT X SPECIALIZATION IN INDIVIDUAL CIRCULATION** **8 Periods**

Coronary circulation, Cerebral circulation, Pulmonary circulation, Cutaneous circulation

**UNIT XI CARDIO VASCULAR RECEPTORS, REFLEXES AND CENTRAL CONTROL** **8 Periods**

**UNIT XII COORDINATED CARDIOVASCULAR RESPONSES** **8 Periods**

Posture, Valsalva's maneuver, Exercise, Diving reflex

**UNIT XIII CARDIOVASCULAR RESPONSES IN PATHOLOGICAL SITUATIONS** **8 Periods**

Shock and hemorrhage, Syncope, Essential hypertension, Chronic cardiac failure

**UNIT XIV RESPIRATORY PHYSIOLOGY** **8 Periods**

Mechanism of respiration, Principal of gas exchange regulation of respiration

**UNIT XV HEMATOLOGY AND COAGULATION PHYSIOLOGY OF BLOOD COMPONENTS** **8 Periods**

Blood groups Blood transfusion, Hemostasis.

**L = 120 Periods**

**REFERENCE BOOKS:**

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers
2. Chatterjee(CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,
4. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton



## CVT103/PFT 103 BIOCHEMISTRY

L	T	P	C
8	0	0	8

**OBJECTIVES:** To impart knowledge to the students on principles of Biochemistry

**OUTCOMES:** Completion of the course will enable the students

- To understand and appreciate the structure and functions of Protein, lipids and carbohydrates.
- To know about the composition and biological properties of carbohydrate lipid and protein
- To understand the nutrition aspects of Biomolecules

### **Unit I ACIDS AND BASES**

**12 Periods**

Definition, pH, Henderson – Hasselbalch equation, Buffers, Indicators, Normality, Molarity, Molality, fluid and electrolyte balance

### **Unit II CARBOHYDRATES**

**16 Periods**

Structure, Classification & Functions (Monosaccharides, Disaccharides, Polysaccharides, Homopoly- saccharides, Heteropolysaccharides), glycoproteins

### **Unit III PROTEINS**

**16 Periods**

Amino acids, Classification & Structure of proteins, Physical & Chemical Properties of proteins, Denaturation, Antigen, Antibody Types, Plasma proteins, Blood clotting

### **Unit IV LIPIDS**

**20 Periods**

Chemical structure, functions & Classification of fatty acids (Essential fatty acids & non-essential fatty acids, MUFA, PUFA); Classification of lipids: Triacylglycerols, Phospholipids, Lipoproteins, Steroids, Amphipathic lipids, miscelles, Fluid mosaic model

### **Unit IV NUCLEIC ACIDS**

**12 Periods**

Purines and pyrimidine, Structure of DNA, Watson & Crick model of DNA, Structure of RNA & its types

### **Unit V ENZYMES**

**14 Periods**

Definition, Nomenclature, Classification, Factors affecting enzyme activity, Active site, Coenzyme, Enzyme Inhibition, Mechanism of enzyme action, Units of enzyme, Isoenzymes, Enzyme pattern in diseases.

## **Unit VI VITAMINS & MINERALS**

**16 Periods**

Fat soluble vitamins (A, D, E, K), Water soluble vitamins, B-complex vitamins & C, Essential Macro elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and sulphur) and Trace elements- Calorific value of foods, Basal metabolic rate (BMR), respiratory quotient (RQ) Specific dynamic action (SDA), Balanced diet – Marasmus & Protein Energy Malnutrition – Kwashiorkar

## **Unit VII HORMONES**

**14 Periods**

Classification, Mechanism of action, Hypothalamic hormones, Pituitary, Anterior, posterior, Thyroid, Adrenal cortex, Adrenal medulla, Gonad hormones, Menstrual cycle, GI hormones.

**L=120 Periods**

## **REFERENCE BOOKS**

1. Harold Varley, Practical Clinical Biochemistry, 4<sup>th</sup> Edition, CBS Publishers, New Delhi.
2. Carl A. Burtis, PhD and David E. Bruns TEITZ Fundamentals of Clinical chemistry, 6<sup>th</sup> edition, Saunders, 2008.
3. Lawrence A. Kaplan, and Amadeo J. Pesce, Clinical chemistry 5<sup>th</sup> Edition, Elsevier, 2010.
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students, Latest Ed
6. DAS (Debajyothi) Biochemistry, Latest ED Academic, Publishers, Calcutta – 1992

## PFT 104 PATHOLOGY RELATED TO PERFUSION TECHNOLOGY

L	T	P	C
8	0	0	8

**Objective:** This course will cover common cardiovascular diseases, their related pathology and microbiology and outline of clinical presentation and management of these conditions including medical and surgical interventions.

**Outcome:** Completion of the course will enable the students to understand patho physiology of cardiovascular system.

### UNIT I CARDIOVASCULAR SYSTEM

**30 Periods**

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

### UNIT II HEMATOLOGY

**30 Periods**

Anaemia – definition, morphological types and diagnosis of anemia brief concept about haemolytic anaemia and polycythaemia. Leukocyte disorders – briefly leukaemia, leukocytosis, agranulocytosis etc. Bleeding disorders – definition, classification, causes and effects of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders.

### UNIT III RESPIRATORY SYSTEM

**30 Periods**

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.

### UNIT IV RENAL SYSTEM

**30 Periods**

Clinical manifestation of renal disease Briefly causes, mechanism, effects and laboratory diagnosis of acute renal failure and chronic renal failure. Briefly glomerulonephritis and pyelonephritis . Brief concept about obstructive uropathy

**L= 120 Periods**

### REFERENCE BOOKS

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques

3. Todd & Sanford Clinical Diagnosis by laboratory method
4. Dacie & Lewis – Practical Haematology
5. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi –1996) 9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
6. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, 26 New Delhi-1991.
7. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.

BCS 101	FUNDAMENTALS OF COMPUTERS (Common to B. Sc. Physics (Nano Technology), B. Sc. Analytical Chemistry, B.Sc. (Cardiovascular Technology and B.Sc. (Perfusion Technology))			
	L	T	P	C
	3	0	0	3
<b>Goal</b>	To introduce computer fundamentals.			
OBJECTIVES		OUTCOMES		
The course should enable the students to		The student should be able to		
Learn the major components of a Computer system.		Have understood the interaction between different components of Computer system and number system.		
Learn the computer information Concepts. Understand the basic concepts of computer programming.		Perform conversions from one number system to another.		
Learn the types of software		Design and develop flowcharts, algorithms and pseudo code for the given problem.		
Understand the fundamentals of computer networks		Have understood the fundamental concepts of OS and computer networks		

### UNIT 1: COMPUTER FUNDAMENTALS

9 Periods

Introduction - Evolution of Computers - Generations of Computer - Classification of Computers - Application of computers - Computer Organisation: CPU, Memory, ALU, Control Unit, I/O unit - Secondary Storage Devices – Booting

### UNIT 2: INFORMATION CONCEPTS

9 Periods

**Number System:** Binary, Octal and Hexadecimal and conversion from one number system to another - Data and its representation - Information and its characteristics - Categories of Information - Levels of information - Levels of Information

**Data Storage and retrieval:** Concept of file - record and field

### UNIT 3: COMPUTER PROGRAMMING

9 Periods

**Problem Solving Techniques:** Algorithms, Flowchart, Pseudo code - Program Control Structures - Programming Paradigms - Programming Languages -Generations of Programming Languages - Language translators - Characteristics of Good Programming Language

### UNIT 4: INTRODUCTION TO SOFTWARE

9 Periods

Definition - Types of Software -System software: Operating System, Functions of OS, Overview of DOS, Windows and Linux.

**Application software:** Word Processor, Spread Sheet, Database concepts, Flat file versus Database.

**UNIT 5: COMPUTER NETWORK CONCEPTS**

**9 Periods**

Introduction to Computer Networks - Evolution - Network Architecture - Applications and usage of Internet - Browser and its types - Domain Name System (DNS), WWW, Electronic Mail (e-mail) - Search Engines and Intranets.

**TOTAL: 45 Periods**

**TEXT BOOKS**

1. P.K. Sinha & P. Sinha, “Computer Fundamentals”, BPB Publications, 4th edition, 2004  
ITL Education Solution Limited.
2. Ashok Kamthane, “Computer Programming”, Pearson Education Inc 2007.

**REFERENCE BOOKS**

- 1 .Excel-Missing Manual, Mathew McDonald, O Reilly Press
2. Fundamentals of Computer – V.Rajaramanna ( Prentice Hall )
3. Computers and Commonsense Hunt, J. Shelley, Prentice Hall of India

### PFT 131 PFT-ANATOMY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To impart practical knowledge on the anatomy related to Perfusion Technology.

**List of Exercises:**

1. Surface Anatomy
2. Radiology
3. X-ray Chest PA view
4. Demonstration of surface features and interior of the heart.
5. Demonstration of great vessels and its branches
6. Histology of cardiac muscle and vessels

**P = 45 Periods**

### PFT 132 PFT- PHYSIOLOGY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To impart practical exposure and training in physiology related to Perfusion Technology.

**List of Exercises:**

1. The compound Microscope
2. White Blood Cell count and Red Blood Cell count Determination
3. Determination of ESR-By Westergren's method
4. Determination of Blood Groups.
5. Calculation of Blood indices
6. Measurement of human blood pressure
7. Examination of Respiratory system to count respiratory rate and measure inspiration and respiration

**P = 45 Periods**

### CVT133/ PFT 133 BIOCHEMISTRY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To expose and train the students with laboratory experiments / tests related to the identification of biomolecules

**List of Exercises:**

**Qualitative Tests:**

- a. Carbohydrates: Molisch's test, Fehling's test, Benedict's test, Seliwanoff's test
- b. Lipids: Solubility test, Emulsification Test, Saponification test
- c. Proteins: Heat Coagulation test, Isoelectric precipitation test

**P = 45 Periods**

## PFT 134 PFT-PATHOLOGY PRACTICAL

**L T P C**  
**0 0 3 2**

**Objective:** To impart practical knowledge in pathology related to Perfusion Technology.

**List of Exercises:**

1. Urine Examination - Physical - Chemical – Microscopic
2. Blood Grouping Rh typing
3. Hb Estimation
4. Packed Cell Volume [PCV]
5. Erythrocyte Sedimentation rate (ESR)
6. Bleeding Time, Clotting Time

**P = 45 Periods**

<b>BCS 131</b>	<b>COMPUTER LABORATORY</b> (Common to B. Sc. Physics (Nano Technology), B. Sc. Analytical Chemistry, B.Sc. (Cardiovascular Technology and B.Sc. (Perfusion Technology))	<b>L T P C</b> <b>0 0 3 2</b>
<b>Goal</b>	<b>To impart computational skills using computer software</b>	
<b>OBJECTIVES</b>		<b>OUTCOMES</b>
The course should enable the students to  Gain an exposure to work with OS commands  Gain knowledge about word processing, Spreadsheet and Databases.		The students should be able to  Work with DOS and Linux commands in command mode.  Use word processors to create document, table, text formatting and Mail merge options.  Use spreadsheet for calculations using formula editor, creating different types of charts and including pictures etc.,  Use database software to create databases, design queries and generate forms and reports.

**LIST OF EXPERIMENTS**

- a) **DOS Commands**
- b) **Basic Linux Commands**
- c) **Word Processing**
  1. Document creation, Text manipulation with Scientific notations.
  2. Table creation, Table formatting and Conversion.
  3. Mail merge and Letter preparation.
  4. Drawing - flow Chart
- d) **Spread Sheet**



5. Chart - Line, XY, Bar and Pie.
  6. Formula - formula editor.
  7. Spread sheet - inclusion of object, Picture and graphics, protecting the document
- e) Database**
8. Creation of Database
  9. Forms
  10. Queries
  11. Reports

**P= 45 Periods**

**Hindustan Institute of Technology and Science, Padur**  
**B.Sc. (Perfusion Technology)**  
**Second Year Syllabus**

**PFT 201 PHARMACOLOGY RELATED PERFUSION TECHNOLOGY**

L	T	P	C
8	0	0	8

**Objective:** This course will cover about various drugs used commonly and their actions.

**Outcome:** Completion of the course will enable the students to gain in depth knowledge in the mechanism of Pharmacological agents

**UNIT I ANTI ANGINAL AGENTS 24 Periods**

Beta Blocking agents – Propranolol, Atenolol, Metoprolol, Labetolol, Pindolol. Nitrates – NTG, Isosorbide dinitrate, Isosorbide mononitrate, transdermal nitrate patch. Calcium channel blockers- nifedipine, verapamil, diltiazem, new calcium channel blockers.

**UNIT II ANTI FAILURE AGENTS 28 Periods**

Diuretics - frusemide, thiazide diuretics, others thiazide like agents, potassium combination diuretics, special diuretic problems. Angiotension converting enzyme (ACE) inhibitors - Types of ACE inhibitors – caotopril, enalapril, Ace inhibitors for diabetics & hypertensive. Digitalis & acute ionotropes – Digoxin , Digitoxin , Dopamin , Dobutamin , Adrenalin, Nor adrenaline , Isoprenaline , Mixed inotropic vasodilators amrinon.

**UNIT III ANTIHYPERTENSIVE DRUGS 16 Periods**

Diuretics, Beta blockers, ACE inhibitors, Calcium antagonists, Direct vasodilators, Centrally active and peripherally active vasodilators

**UNIT IV ANTIARRHYTHMIC AGENTS 16 Periods**

Quinidine and related compounds , Procainamide , lidocaine , Mixllitine , Phenytoin , Flecainide , Amiodarone , Bretyllium, Combination therapy

**UNIT V ANTITHROMBOTIC AGENTS 12 Periods**

- a. Platelets inhibitors-** 1. Aspirin, 2. Persantine
- b. Anticoagulants-** 1. Heparin, 2. Warfarin
- c. Fibrinolytics-** 1. Streptokinase, 2. Wrokinase, 3. Combination therapy

**UNIT VI LIPID LOWERING AND ANTI ATHEROSCLEROTIC DRUGS 12 Periods**

**UNIT VII MISCELLANEOUS DRUGS 12 Periods**

Protamine, Emergency drugs, narcotics, sedatives, steroids, Antihistamines, antibiotics/

**L=120 Periods**

**PFT 202 CONCEPTS OF DISEASE AND OUTLINES OF CLINICAL EVALUATION  
RELATED TO PERFUSION TECHNOLOGY-PART I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>

**Objective:** This course will cover about the basics of various diseases and their clinical evaluations

**Outcome:** The course should enable the students to learn how to diagnose a disease based on various clinical parameters.

**UNIT I** **24 Periods**

Myocardial diseases -Dilated cardiomyopathy -Hypertrophic cardiomyopathy -Restrictive cardiomyopathy -Myocarditis

**UNIT II** **24 Periods**

Pericardial diseases - Pericardial effusion -Constrictive pericarditis -Cardiac tamponade -  
Electrical disturbances of the heart

**UNIT III** **24 Periods**

Sinus node dysfunction - Arrhythmias & conduction disturbances -Surgical treatment of arrhythmias - Pulmonary hypertension - Tumours of the heart - Congenital heart disease in infancy and childhood

**UNIT IV** **24 Periods**

**Cyanotic congenital heart disease:** Tetralogy of Fallot - Atrial septal defect with pulmonary stenosis - Transposition of great arteries - Double outlet right ventricle - Pulmonary atresia - Total anomalous pulmonary venous connection

**UNIT V** **24 Periods**

**Acyanotic heart disease:** Atrial septal defect - Ventricular septal defects - Congenital valvular disease - Patent ductus arteriosus - Coarctation of aorta

**L = 120 Periods**

## PFT 203 INSTRUMENTATION IN PERFUSION TECHNOLOGY

L	T	P	C
8	0	0	8

**Objective:** The subject will cover about various instruments used in perfusion procedures.

**Outcome:** The students will gain knowledge on various instrumentation and their operative procedures in detail.

### UNIT I HISTORY AND DEVELOPMENT OF CARDIO PULMONARY BYPASS

**15 Periods**

Origin of CPB, Scientific discoveries and techniques that permit the development of total extracorporeal circulation. The advent of Heart Lung Machine And Membrane Materials, Controlled cross circulation for CPB. Azygon vein principle Hypothermia.

### UNIT II BASIC PRINCIPLE

**10 Periods**

Extra corporeal circulation, Materials used, extra corporeal gas exchange

### UNIT III OXYGENATORS

**15 Periods**

History of oxygenators, The Ideal Oxygenator Design and Function of Bubble Oxygenators, Design and function of Membrane Oxygenators, Rated blood flow, blood gas interface, Blood – artificial surface interactions: The effects of membrane and bubble oxygenators on protein and formed elements of the blood.

### UNIT IV PUMPS

**15 Periods**

History of pumps, Ideal characteristics of pumps Design and function of roller pumps, Design and function of centrifugal pumps, History of pumps, Blood pumps used for primarily for partial CPB support.

### UNIT V CARDIO PULMONARY BYPASS CIRCUITRY

**20 Periods**

**Tubings.** Tubing materials, Durometer , resiliences and biocompatibility Heparin – coated circuits

**Filters.** Desirable characteristic of arterial line filter, Arterial line filters design and function. Design and function of cardiomy filters , prebypass filter , transfusion filter. Gas filters and cardioplegia solution filters

**Cannulas – Design And Functions .** Arterio venous cannula, Vent cannulas, Cardioplegia cannula, Femoral arterio venous cannula.

### UNIT VI AORTOATRIO CANNULATION FOR CARDIO PULMONARY BYPASS

**15 Periods**

Aorto artrio caval cannulation techniques, Femoral Cannulation Indications and Complications Complications of Aorto atrial Cannulation. Left Ventricular Decompression, Alternative Thoracic Incision for cardio vascular Operation.

**UNIT VII HEAT EXCHANGE IN EXTRA CORPOREAL SYSTEM 15 Periods**

Modes of Heat transfer, Heat Transfer theory, Materials in heat exchange devices, Heat exchanger Performance evaluation, Heat Exchange devices design, Patient cooling and Rewarming times.

**UNIT VIII INTRA AORTIC BALLOON COUNTER PULSATION 15 Periods**

History, Physiologic consideration of IABP, Indication and contraindications of IABP placement Placement of IABP, IABP management during CPB General management principles during Intra-aortic counter pulsation. Risk Factors, Weaning from IABP support.

**L=120 Periods**

## EC2905-BIOMATERIALS AND ARTIFICIAL ORGANS

L T P C  
3 0 0 3

### Objectives:

1. To understand the properties of the Bio-compatible materials
2. To study the different types of Biomaterials
3. To study artificial organs made using tissue materials.

### Outcomes: Completion of the course will enable the students:

1. To study the characteristics and classification of Biomaterials
2. To study the artificial organ developed using these materials
3. To learn about polymeric materials and combinations that could be used as a tissue replacement implants

### UNIT I INTRODUCTION TO MATERIALS

9 Periods

Definition and classification of biomaterials - Mechanical Properties, Surface and Physical Properties of Biomaterials, Classes of materials used: Polymers, metals, ceramics and composite as biomaterials for implantation

### UNIT II BIOCOMPATIBILITY

9 Periods

Introduction-Wound Healing and foreign Body response, Biomaterials testing, In-Vitro and In-Vivo assessment of tissue compatibility, Methods of test for biological performance, Degradation effects on Metals.

### UNIT III POLYMERIC IMPLANT MATERIALS

9 Periods

Polymerisation- Synthesis, Mechanical & Thermal properties, Polymeric Biomaterials- polyacrylic acid, Polyacrylamide, Biodegradable Polymers, Medical fibers and Biotextiles- In vitro Applications. Polymers- Medical applications

### UNIT IV ARTIFICIAL ORGANS

9 Periods

Cardiovascular medical devices, Implantable Cardiac Assist devices(artificial heart, cardiac valves), Orthopedic applications- Internal fracture fixation, Joint replacements, Dental Implantation, Bio—electrodes.

### UNIT V APPLICATIONS OF MATERIALS IN MEDICINE

9 Periods

Skin Substitutes and Burn Dressings, Soft Tissue replacements, Sutures, Bio-medical Sensors and Biosensors

L = 45 Periods

### TEXT BOOKS

1. J B Park , Biomaterials Science and Engineering , Plenum Press , 1984

2. Buddy D. Ratner, Allan S. Hoffman, , Biomaterials Science - Introduction to Materials in Medicine.

### **REFERENCE BOOKS**

1. Jonathan Black, Biological Performance of materials, Marcel Decker, 1981.
2. Piskin and A S Hoffmann, Polymeric Biomaterials (Eds), Martinus, Nijhoff Publishers. (Dordrecht) 1986.
3. Eugene D. Goldberg, Biomedical Polymers, Akio Nakajima.
4. A.Rembaum & M. Shen, Biomedical Polymers, Mercer Dekkar Inc. 1971.
5. Lawrence Stark & GyanAgarwal, Biomaterials.
6. L.Hench & E. C. Ethridge, Biomaterials – An Interfacial approach.

## PFT 231 PFT - PHARMACOLOGY PRACTICAL

L T P C  
0 0 3 2

**Objective:** To impart practical knowledge on pharmacology related to Perfusion Technology.

### List of Exercises:

1. Clinical Pharmacy and drug formulation: Nomenclature of drugs – Code name, chemical name, Nonproprietary name & trade name
2. Sources of drug information: Pharmacopoeia, Text book, journals
3. Sources of drugs:
  - a) Plant source- Alkaloids, glycoside, oils, gum, mucilage & carbohydrates
  - b) Animal source
  - c) Mineral source
  - d) Synthetic source
  - e) Genetic engineering
4. Packing: vial, ampoule, strip packaging, blister packaging tube cylinder & Drug information sheet.
5. Variations in drug response
6. Drug dosage forms
7. Dosage calculation
8. Prescription Writing

**P=45 Periods**

## PFT 232 PFT- DISEASE AND CLINICAL EVALUATION PART I PRACTICAL

L T P C  
0 0 3 2

**Objective:** To impart practical exposure on identification of diseases and clinical evaluation related to Perfusion Technology.

### List of Exercises:

1. Demonstration of different parts of respiratory system with special emphasis on lungs
2. Histology of lungs
3. Demonstration of brain and spinal cord
4. Demonstration of organs of renal system
5. Recording of blood pressure and pulses rare (Normal & following exercise)
6. Electro Cardio Gram tracings on a normal person
7. Auscultation of heart sounds and interpretation Spirometry
8. Description of Normal Findings
9. Demonstration of various blood groups

**P=45 Periods**



## PFT 233 PFT –INSTRUMENTATION PRACTICAL

L T P C  
0 0 3 2

**Objective:** To impart practical exposure on instrumentation related to Perfusion Technology.

### List of Exercises:

1. Technology Monitoring and instrumentation
2. Concepts of monitoring- instrumentation technology of ECG machine
3. pressure transducers, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters
4. temperature probes and thermo regulatory monitoring
5. defibrillators and fibrillators
6. Piped and non-piped gas delivery systems and connections
7. Basic physics related to medically used gases
8. Haemodynamic monitoring
9. Haemostatic monitoring
10. Haemotologic monitoring
11. Maintenance of oxygen, carbon dioxide and acid base status and their monitoring
12. Neurological monitoring (SSPE, EEG and cerebral function monitor)
13. Aseptic technique
14. Physiology of extra-corporeal circulation Materials used in extracorporeal circuit Principles of extracorporeal gas exchange.
15. Various types of oxygenators Bubble oxygenators rotating spiral / cylinder / disc oxygenators Membrane oxygenators.
16. Theory of blood pump, 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=45 Periods**

**Hindustan Institute of Technology and Science, Padur**

**B.Sc. (Perfusion Technology)**

**Third Year**

**PFT 301 CONCEPTS OF DISEASE AND OUTLINES OF CLINICAL EVALUATION  
RELATED TO PERFUSION TECHNOLOGY-PART II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>

**Objective:** This course will cover about the diseases and their clinical evaluations in details and advanced procedures of evaluation.

**Outcome:** Completion of the course will enable the students to learn advanced evaluation procedures for complicated diseases.

**UNIT I**

**30 Periods**

Congenital heart disease in the adults  
Obstruction  
Valvular regurgitation  
Abnormal communication between chambers  
Abnormal connection, surgical treatment

**UNIT II**

**30 Periods**

Valvular heart disease  
Congenital valvular heart disease  
Rheumatic valvulities  
Aortic valve disease  
Mitral valve disease  
Coronary artery disease

**UNIT III**

**30 Periods**

Pathophysiology and clinical symptoms  
Angina Pectoris  
Symptomatic and asymptomatic myocardial ischemia  
Types and locations of myocardial infarction

**UNIT IV**

**30 Periods**

Thrombolytic therapy  
Medical treatment, other treatment modalities  
Surgical treatment  
Hypertension  
Heart failure - Surgical and medical treatment

**L=120 Periods**

## PFT 302 Advanced Perfusion Technology I

L	T	P	C
8	0	0	8

**Objective:** This course will cover about basics of perfusion technology.

**Outcome:** After completion of the course, the students will gain a strong understanding on the basics of various perfusion techniques involved in a cardiac surgery.

### **UNIT I MYOCARDIAL PROTECTION DURING CARDIAC SURGERY 10 Periods**

Basic Concepts in myocardial Protection, Clinical systems for Myocardial Protection, Adaptations of Myocardial Protection technique to cardiac pathology Myocardial Protection in the Neonatal and infant.

### **UNIT II HYPOTHERMIA – PHYSIOLOGY AND CLINICAL USES 15 Periods**

History of the development of clinical Hypothermia, Physiology of Hypothermia Techniques to Induce hypothermia for cardiac surgery Re warming during Extra corporeal circulation Temperature Monitoring sites

### **UNIT III PHARMACOKINETICS AND PHARMACODYNAMICS DURING CARDIAC SURGERY AND CPB 15 Periods**

Basic principle of pharmacokinetics and pharmacodynamics, Effects of hypothermia on pharmacokinetics and pharmacodynamics, Theoretical effects of CPB on pharmacokinetics.

### **UNIT IV HEMOSTASIS AND CARDIO PULMONARY BYPASS 15 Periods**

Heparin pharmacokinetics and pharmacodynamics, Anticoagulation during bypass, Reversal of heparin anticoagulation, Effects of CPB on Hemostasis, Potential alternatives to heparin and protamine.

### **UNIT V THE RESPIRATORY , RENAL AND HEPATIC SYSTEMS,EFFECTS OF CARDIAC SURGERY AND CARDIOPULMONARY BYPASS 15 Periods**

Expected respiratory changes after cardiac surgery, The post perfusion lung syndrome (pump lung), ARDS - Mediators of lung injury associated with CPB, Effects of Gastrointestinal system during CPB, Renal consequences during and after CPB.

### **UNIT VI THE CENTRAL NERVOUS SYSTEM : RESPONSE TO CARDIO PULMONARY BYPASS 15 Periods**

CNS monitoring Factors affecting cerebral blood flow during CPB. Mechanisms of cerebral injury Factors increasing risk of neurologic dysfunction following Cardiac surgery Pharmacologic strategies for cerebral protection during Cardiac surgery and CPB

**UNIT VII THE IMMUNE RESPONSE AND CPB** **10 Periods**

Pathophysiologic changes in the immune system and inflammatory response during CPB. Infection in cardiac surgery: risk factors and prevention

**UNIT VIII THE ENDOCRINE SYSTEM** **5 Periods**

Effects of Cardiopulmonary bypass

**UNIT IX HEMODILUTION AND PRIMING SOLUTIONS FOR CPB 1** **10 Periods**

Physiological consequences of hemodilution. Hemodilution and complication of CPB Priming solution - crystalloid primes and Colloidal primes

**UNIT X PERFUSION SEMINARS** **10 Periods**

Topics will be allotted in the classroom

**L = 120 Periods**

## PFT 303 Advanced Perfusion Technology II

L	T	P	C
8	0	0	8

**Objective:** This course will cover about advanced perfusion techniques.

**Outcome:** Completion of the course will enable the students to acquire knowledge

1. On the basics of various perfusion techniques during a cardiac surgery.
2. About various techniques for maintenance after a cardiac surgery.

### **UNIT I INITIATION AND MAINTENANCE OF CPB** **8 Periods**

Initiation of CPB Patient physiologic monitoring during CPB. Equipment monitoring during CPB Pre bypass check list

### **UNIT II MAINTENANCE OF BYPASS** **8 Periods**

Blood gas analysis Adequacy of perfusion Anticoagulation Oxygenation Blood pressure management Glucose management Valsalvas manure.

### **UNIT III DISCONTINUATION OF CARDIOPULMONARY BYPASS** **8 Periods**

### **UNIT IV PULSATILE AND NON PULSATILE PERFUSION** **8 Periods**

Physiologic effects of pulsatile flow and non-pulsatile flow, Nature of pulsatile flow

### **UNIT V SAFETY AND MANAGEMENT OF PERTURBATIONS DURING CPB** **8 Periods**

Prevention of perfusion accidents, Management of perfusion complications

### **UNIT VI CPB IN INFANTS AND CHILDREN** **18 Periods**

Preparation of CPB: The equipments Preparation of CPB: The patient Cannulation Conduct and maintenance of CPB Neonatal and infant myocardial protection. Management of CPB in cyanotic patient Safety devices. Ultra filtration – PUF, CUF, MUF ZUF Separation from CPB.

### **UNIT VII MANAGEMENT OF UNUSUAL PROBLEMS DURING CPB** **8 Periods**

Cold agglutinins Pregnancy and CPB Hemoglobinopathy and erythrocyte disorders malignant hyperthermia

### **UNIT VIII THORACIC AORTIC SURGERY AND CPB** **8 Periods**

### **UNIT IX NON CARDIO VASCULAR APPLICATION OF CPB** **10 Periods**

Intra cranial surgery with CPB, Chest trauma and emergency CPB, Closed Chest Bypass for Liver Transplantation.

**UNIT X VENTRICULAR ASSIST DEVICES** **8 Periods**

**UNIT XI EXTRA CORPOREAL MEMBRANE OXYGENATOR** **12 Periods**

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

**UNIT XII BLOOD CONSERVATION IN CARDIAC SURGERY** **8 Periods**

Religious Objections to Blood Transfusions and Management of CPB. Blood Conservation Techniques

**UNIT XIII** **8 Periods**

Minimally invasive surgery and the perfusionist - recent advances in perfusion techniques

**L=120 Periods**

#### **REFERENCE BOOKS**

1. Cardio Pulmonary Bypass and Perfusion technology – Gravlee
2. Text book of cardiac surgery – Kirkleen
3. Text book of cardiology – Braunwold
4. Text book of cardiac Anaesthesia – J. Kaplan
5. Text book of Paediatric Cardiac Anaesthesia – Casoe Lake
6. Drugs for Heart – L.H. Otrie

## PHC103 HOSPITAL AND PATIENT RELATION MANAGEMENT

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>Objectives</b>	<b>Outcomes</b>
The objectives of the course are as follows:	After completion of the course, the students would have
To provide the introduction to the patient centric management.	Understood the concept of patient centric management.
To provide the concepts of quality and its relation to patient care	Understood the concept of quality, its tools, relation and application to patient care.
To provide the understanding of patient classification system	Understood the patient classification system
To provide importance of medical ethics and auditory procedures in hospitals	Gained knowledge on the importance of medical ethics and auditory procedures in hospitals
To provide the information about patient medical records, its management and disaster preparedness procedures in hospitals	Gained clear picture on patient medical records, its management and disaster preparedness procedures in hospitals

### **UNIT I PATIENT CETRIC MANAGEMENT**

**9 Periods**

Concept of patient care, patient-centric management, organization of hospital departments, roles of departments/managers in enhancing care, patient counselling and practical examples of patient centric management in hospitals; patient safety and patient risk management.

### **UNIT II QUALITY IN PATIENT CARE MANAGEMENT**

**9 Periods**

Defining quality, systems approach towards quality, towards a quality framework, key theories and concepts, models for quality improvement and variations in practice.

### **UNIT III PATIENT CLASSIFICATION SYSTEMS AND THE ROLE OF CASE MIX**

**9 Periods**

Why do we need to classify patients, types of patients classification systems, ICD 9 (CM, PM), case mix classification systems, DRG, HBG, ARDRG, case mix innovations and patient empowering classification systems.

### **UNIT IV MEDICAL ETHICS AUDITORY PROCEDURES**

**9 Periods**

Ethical principles, civic rights, consumer protection act, CPA, patient complaints powers and procedures of the district forum, state and national commission, role of supreme court, patient appeals, autopsy, tort liability, vicarious liability, medical negligence, central and state laws, use of investigational drugs, introduction / need and procedures for medical audit, audit administration and regulating committees. Confidentiality and professional secrecy, ethics of trust and ethics of rights-autonomy and informant consent, under trading of patient rights-universal accessibility-equity and social justice, human dignity.

## **UNIT V PATIENT MEDICAL RECORDS AND DISASTER PREPAREDNESS 9**

### **Periods**

Policies & procedures for maintaining medical records E-records, legal aspects of medical records, its safety, preservation and storage, policies & procedures for general safety; fire safety procedure for evacuation; disaster plan and crisis management.

**L=45 Periods**

### **REFERENCES:**

1. Goel S L & Kumar R, 2004, Hospital Core Services: Hospital Administration of the 21<sup>st</sup> century, Deep Deep Publications Pvt. Ltd. New Delhi.
2. Gupta S & Kant S. 1998, Hospital & Health Care Administration: Appraisal and Referral Treatise, Jaypee: New Delhi.
3. Harris M G & Assoc. 2003, Managing Health Service: Concepts & Practices. Maclellan+Petty:Sydney.
4. Kelly D L. 2006, Encyclopaedia of Quality Management in Hospitals & Health Care Administration, Vol.1-6, Pentagon Press: Chicago.

### **PFT331 PFT- DISEASES AND CLINICAL EVALUATION PART II PRACTICAL**

**L T P C**  
**0 0 3 2**

**Objective:** To impart practical exposure on identification of diseases and clinical evaluation related to Perfusion Technology.

### **List of Exercises:**

#### **GROSS ANATOMY AND STRUCTURAL FEATURES OF HEART**

1. Location, size, surface features, venous area, septum and atrial appendage.
2. Right atrium- structural features, venous area, septum and appendage.
3. Left atrium- structural features venous area, septum and appendage.
4. Right ventricle- structural features inflow and outflow characteristics.
5. Left ventricle- structural features inflow and outflow characteristics.
6. Valves-location, structure and functions of each valve.
7. Blood supply of Heart in brief: Coronary arteries.
8. Innovation: Sympathetic and parasympathetic sensory.

#### **GREAT VESSELS:**

1. Structure of blood vessels and its organization.
2. Example: Aorta, pulmonary artery, pulmonary veins.



## PFT 332 Advanced Perfusion Technology I Practical

L T P C  
0 0 3 2

**Objective:** To impart practical exposure on various techniques related to Perfusion Technology.

### List of Exercises:

1. Calculation of PCV on CPB and amount of blood to be added to bring the PCV on CPB to particular level
2. Interpretation and correction of a given arterial blood gas
3. Interpretation and correction of a given electrolyte abnormally
4. Calculation of body surface area
5. Performing an ACT estimation and interpretation of results
6. Setting of a dummy CPB circuit
7. 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,
8. Identification of various CPB circuit components and their uses, method of sterilization and complications related to them
9. Identification of drugs and their pharmacology
10. Calculating vascular resistance on CPB and management of increased perfusion pressure on bypass

**P = 45 Periods**

## PFT333 Advanced Perfusion Technology II Practical

L T P C  
0 0 3 2

**Objective:** To impart practical exposure on various techniques related to Perfusion Technology.

### List of Exercises:

1. Adult perfusion,
2. Paediatric perfusion,
3. Assessment of patient (via history) before bypass,
4. Assessment of patient post bypass,
5. Calculation of primecomponents,
6. Selection of cannulae,
7. Assembly of equipment,
8. Priming of oxygenator,
9. Going on and coming off bypass,
10. Adverse effects of CPB;
11. Assisting open heart surgeries and maintenance of log book minimum of 15 cases

**P = 45 Periods**