



**YENEPOYA UNIVERSITY**

**Deralakatte, Mangaluru - 575018**

**REGULATIONS AND CURRICULUM GOVERNING**

**UNDERGRADUATE PROGRAM**

**B.Sc PERFUSION TECHNOLOGY**

**(CURRICULUM - EFFECTIVE FROM 2015-16)**

**ATTESTED**  
  
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Recognized under Sec 3(A) of the UGC Act 1956 as per Notification No. F.9-11/2007-U.3 (A) dated 27<sup>th</sup> February 2008

No. YU/REG/ACA/A. Council/19/2015

11.08.2015

**NOTIFICATION**

Sub: Starting of B.Sc. Course in Perfusion Technology from the academic year 2015-16 – Regulations & Syllabus – approval of

Ref: Agenda 19 of the meeting of the Academic Council held on 31-07-2015.

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The Faculty of Medicine at its meeting held on 6-04-2015 recommended starting of 3 year + (6 months internship) B.Sc. course in Perfusion Technology from the academic year 2015-16, vide agenda 7. Subsequently, the Faculty of Medicine at its meeting held on 14-07-2015 (Agenda 4) discussed and finalised the draft Regulations & Syllabus for the course.

The Academic Council at its meeting held on 31-07-2014, after examining the proposal and the draft Regulations & Syllabus for the course unanimously approved it. It was decided that the annual intake for the course shall be 10. The Board of Management which met on the same date ratified the decision of the Academic Council.

This notification is issued for implementation of the course from the academic year 2015-16. A copy of the Regulations and Syllabus duly approved is enclosed herewith.

  
REGISTRAR

# **B.Sc. PERFUSION TECHNOLOGY**

## **AIM**

The course in Bachelor in Perfusion Technology imparts comprehensive training to candidates in various aspects of perfusion to enable him/her to function as an independent perfusionist.

## **OBJECTIVES**

At the end of the course the students shall be able to:

- Assisting competently the Anesthetists and Surgeons during normal to high tech anesthesia and surgical operations in hospitals and large healthcare multispecialty clinics.
- To know all about preparation, operation, and maintenance of heart and lung machines, ventricular assist devices, artificial hearts, and other sophisticated instruments and equipment's as directed by healthcare physicians/ surgeons/anesthetists.
- Monitor the patient's blood flow and other vital signs during open heart surgery and are also responsible for administering intravenous fluids, blood products and anesthetic drugs.
- Experts of other life support equipment such as ventricular assist devices and intra-aortic balloon pumps.
- Developing a strong knowledge base in cardiothoracic anatomy, physiology and pathophysiology, as well as pharmacology, fetal and neonatal cardiac development and perfusion science.
- Utilizes the technology such as heart/lung machines, ventricular assist devices and artificial hearts, as well as pharmacological interventions to maintain the patient during the period of circulatory support.
- Measures various blood and other parameters to identify appropriate mechanical, pharmacological and thermal manipulation to maintain tissue viability.
- Understand both respiratory and circulatory systems and be able to operate complex equipment.
- To know skills regarding to operate extracorporeal circulation equipment during any medical situation where it is necessary to support or replace the patients cardiopulmonary/circulatory function and ensure the proper management of physiologic functions by monitoring the necessary variables.
- capable of handling stressful situations, pay great attention to detail, communicate effectively, and be willing to stay abreast of new developments in the profession.

**Regulations and Course Curriculum for  
Bachelor of Science in Perfusion Technology - B.Sc. PT**

**Title of the Course: Bachelor of Science in Perfusion Technology**

**Eligibility for admission:**

- Two year Pre-University examination or equivalent as recognized by Yenepoya University with, Physics, Chemistry and Biology as principal subjects of study and English as one of the subject of study with not less than 40% of marks.
- Pre-degree course from a recognized university considered as equivalent by Yenepoya University, (two years after ten years of schooling) with Physics, Chemistry and Biology as principal subjects of study.
- Any equivalent examination recognized by the Yenepoya University for the above purpose, with Physics, Chemistry and Biology as principal subjects of study.
- Vocational higher secondary education course conducted by Vocational Higher Secondary Education, with five subjects including Physics, Chemistry, Biology and English in addition to vocational subjects conducted, is considered equivalent to 'plus – two' [10+2] examinations of Government of Karnataka Pre University Course.
- **Lateral entry:** Candidates with 3 years Diploma from recognized Paramedical board are eligible to take admission to the second year B.Sc.PT.(If applicable)

**Note:**

*Candidates who have completed diploma or vocational course through Correspondence shall not be eligible for any of the courses mentioned above.*

**Duration of the course:**

Duration shall be for a period of three years followed by six months of internship.

**Medium of instruction:**

The medium of instruction and examination shall be in English.

## **Attendance**

Candidates should have attended at least 75% of the total number of classes conducted in an academic year, from the date of commencement of the term to the last working day, as notified by the University, in each of the subjects prescribed for that year, separately in theory and practical, to be eligible to appear for the university examinations. Candidates lacking in prescribed percentage of attendance in any subject, either in theory or practical, in the first appearance, will not be eligible to appear for the University examination in that subject, unless they put in the required attendance, to appear in the subsequent examinations.

## **Internal assessment (IA):**

There shall be minimum of three periodical Internal Assessment (IA) tests in theory and practical for each subject spread over evenly in an academic year. The average marks of the best two tests will be calculated and after reducing the marks suitably as specified.

Due to certain reasons if the department/college conducts fourth Internal Assessment the same shall be conducted at least one month before the University Examination. The average marks of the best two tests will be calculated and after reducing the marks suitably as specified.

The marks of IA shall be communicated to the university at least 15 days before the commencement of the University examination. Candidates have to secure 35% marks in the IA in each subject to become eligible to appear in the university examination. The marks of the Internal Assessment must be displayed on the notice board of the respective department/college within a fortnight from the date test is held.

If a candidate is absent for any of the tests due to genuine and satisfactory reasons, such a candidate may be given a re – test, within a fortnight of the test.

**\*There shall be no University Practical Examination in First year.**

## **Conduct and discipline:**

- 1) Candidates shall conduct themselves within and outside the premises of the Institute in a manner befitting the student of an Institution of national importance.
- 2) As per the order of Honorable Supreme Court of India, **ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.**
- 3) The following act of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:
  - a) Ragging as defined and described by the Supreme Court/Government

- b) Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.
  - c) Willful damage or stealthy removal of any property/belongings of the Institute/Hostel or of fellow students/citizens.
  - d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
  - e) Mutilation or unauthorized possession of library books.
  - f) Noisy or unseemly behavior, disturbing studies of fellow students.
  - g) Hacking in computer systems (such as entering into other person's domain without prior permission, manipulation and/or damage to the computer hardware and software or any other cyber-crime etc.)
  - h) Plagiarism of any nature.
  - i) Any other act of gross indiscipline as decided by the Board of Management from time to time.
- 4) Commensurate with the gravity of offense, the punishment may be: reprimand, fine, expulsion from the hostel, debarment from an examination, disallowing the use of certain facilities of the Institute, rustication for a specific period or even outright expulsion from the institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

### **Course of instructions:**

#### **Subject and hours of teaching for Theory and Practical's**

The number of hours of teaching theory and practical, subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Main and Subsidiary subjects are common in first year for all the courses in Allied Health Science. The number of hours for teaching theory and practical for main subjects in first, Second and Third year are shown in Table-I, II and III.

**Table - I Distribution of Teaching Hours in First Year Subjects**

<b>Main Subjects</b>				
<b>Sl.No</b>	<b>Subject</b>	<b>Theory</b>	<b>Practical</b>	<b>Total</b>
		<b>No. of hours</b>	<b>No. of hours</b>	<b>No. of hours</b>
<b>1.</b>	<b>Human Anatomy</b>	<b>70</b>	<b>20</b>	<b>90</b>
<b>2.</b>	<b>Physiology</b>	<b>70</b>	<b>20</b>	<b>90</b>
<b>3.</b>	<b>Biochemistry I</b>	<b>70</b>	<b>20</b>	<b>90</b>
<b>4.</b>	<b>Pathology I</b>	<b>70</b>	<b>20</b>	<b>90</b>
<b>5.</b>	<b>Microbiology I</b>	<b>70</b>	<b>20</b>	<b>90</b>
	<b>Total</b>	<b>350</b>	<b>100</b>	<b>450</b>
<b>Sl.No</b>	<b>Subsidiary Subject</b>	<b>Theory</b>		
		<b>No. of hours</b>		
<b>1.</b>	<b>English</b>	<b>25</b>		
<b>2.</b>	<b>Kannada</b>	<b>25</b>		
<b>3.</b>	<b>Healthcare</b>	<b>40</b>		
	<b>Clinical /Lab Postings</b>	<b>470</b>		

**Table - II Distribution of Teaching Hours in Second Year Subjects**

<b>Sl. No.</b>	<b>Subject</b>	<b>Theory No. of Hours</b>	<b>Practical No. of Hours</b>	<b>Clinical posting</b>	<b>Total No. of Hours</b>
<b>A</b>	<b>Main Subjects</b>				
1	Section A: Applied pathology	30	30	--	120
	Section B: Applied	30	30		
2	Introduction to perfusion technology	80	100	650	830
3	Pharmacology	50	--	--	50
4	Medicine relevant to perfusion technology	50	--	--	50
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>650</b>	<b>1050</b>
<b>B</b>	<b>Subsidiary subjects</b>				
1	Sociology	20			
2	Constitution of India	10			
3	Environmental Science &	10			

**Table - III Distribution of Teaching Hours in Third Year Subjects**

<b>Sl. No.</b>	<b>Subjects</b>	<b>Theory No. of Hours</b>	<b>Practical No. of Hours</b>	<b>Clinical posting</b>	<b>Total No. of Hours</b>
<b>A</b>	<b>Main Subjects</b>				
1	Perfusion Technology clinical	50	50	250	350
2	Perfusion Technology – Applied	50	50	250	350
3	Perfusion technology – Advanced	50	50	250	350
	<b>Total</b>	<b>150</b>	<b>150</b>	<b>750</b>	<b>1050</b>
<b>Sl. No.</b>	<b>Subsidiary Subject</b>	<b>Theory No. of hours</b>			
<b>1.</b>	<b>Ethics &amp; Database Management</b>	<b>50</b>			
<b>2.</b>	<b>Research &amp; Biostatistics</b>	<b>20</b>			
<b>3.</b>	<b>Computer Application</b>	<b>10</b>			

**Scheme of Examination:**

There shall be a University Examination at the end of each academic year.

**First Year Examination:**

The examination for both main and subsidiary subjects for all courses in Allied Health Sciences shall be common in the first year.

The University examination for 1<sup>st</sup> year shall consist of theory examinations **ONLY**.

**Second and Third year Examination:**

The University examination for II and III year shall consist of written Examination & Practical.

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

**For I year**

**Main Subjects: Anatomy, Physiology, Pathology, Microbiology, Biochemistry.**

**Subsidiary subjects: English, Kannada, Healthcare**



**TABLE- IV**

**Distribution of Subjects and marks for First Year University theory Examination of B.Sc. PT**

A	Main Subjects*	Written Paper		IA Theory	Total
		Duration	Marks	Marks	Marks
1	Basic Anatomy [Including Histology]	3 hours	80	20	100
2	Physiology	3 hours	80	20	100
3	Biochemistry –I	3 hours	80	20	100
4	Pathology-I	3 hours	80	20	100
5	Microbiology-I	3 hours	80	20	100

B	Subsidiary Subjects**	Written Paper		IA Theory	Total
		Duration	Marks	Marks	Marks
1	English	3 hours	80	20	100
2	Kannada	3 hours	80	20	100
3	Healthcare	3 hours	80	20	100

**Note: The University Examination for first year shall consist of only theory examination and there shall be no university practical examination.**

IA = Internal Assessment

Main Subjects shall have University Examination.

\*\*Subsidiary subjects: Examination for subsidiary subjects shall be conducted by respective colleges.

**TABLE – V**

**Distribution of Subjects and marks for Second Year Examination of B.Sc. PT**

Paper	Subjects	Theory				Practical			Grand Total
		Theory	Viva Voce	IA	Sub Total	practical	IA	Sub Total	
<b>A</b>	<b>Main Subjects</b>								
1	Section A: Applied pathology Section B: Applied microbiology	50	30	20	150	40	10	50	250
2	Introduction to perfusion technology	100	30	20	150	40	10	50	200
3	Pharmacology	80	--	20	100	No practical			100
4	Medicine relevant to perfusion technology	80	--	20	100	No practical			100

**Distribution of Subsidiary Subjects and marks for Second Year Examination of B.Sc. PT**

B	Subsidiary Subjects**	Duration	Marks	IA Theory	Total
				Marks	
1	Sociology	3 hours	80	20	100
2	Constitution of India	3 hours	80	20	100
3	Environmental Science & Health	3 hours	80	20	100

**TABLE – VI**

**Distribution of Subjects and marks for Third Year Examination of B.Sc. PT**

Paper	Subjects	Theory				Practical			Grand Total
		Theory	Viva Voce	IA	Sub Total	practical	IA	Sub Total	
A	<b>Main Subjects</b>								
1	Paper-1 perfusion technology Clinical	100	30	20	150	120 (40+40+40)	30 (10+10+10)	150	600
2	Paper-II perfusion Technology - Applied	100	30	20	150				
3	Paper- III, perfusion technology advanced	100	30	20	150				

**Distribution of Subsidiary Subjects and marks for Third Year Examination of B.Sc.PT**

B	Subsidiary Subjects**	Duration	Marks	IA Theory	Total
				Marks	
1	Ethics & Database Management	3 hours	80	20	100
2	Research & Biostatistics	3 hours	80	20	100
3	Computer application	3 hours	80	20	100

Note: Practical – One common practical for all the three papers with equal weightage of marks i.e 40 practical marks and 10 IA marks each paper.

**Distribution of Type of Questions and Marks for Theory papers of Main subjects:**

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION	TOTAL
ESSAY TYPE	3 (To attempt 2)	2 * 10	20
SHORT ESSAY TYPE	8 (To attempt 6)	6 * 5	30
SHORT ANSWER TYPE	12 (To attempt 10)	10 * 3	30
<b>TOTAL MARKS</b>			<b>80</b>

**Question paper pattern:**

<b>SUBJECTS HAVING MAXIMUM MARKS = 100</b>			
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION	TOTAL
ESSAY TYPE	3 (2 * 10)	10	20
SHORT ESSAY TYPE	12 (10 * 5)	5	50
SHORT ANSWER TYPE	12 (10 * 3)	3	30

<b>SUBJECTS HAVING MAXIMUM MARKS = 80</b>			
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION	TOTAL
ESSAY TYPE	3 (2 * 10)	10	20
SHORT ESSAY TYPE	8 (6 * 5)	5	30
SHORT ANSWER TYPE	12 (10 * 3)	3	30

<b>SUBJECTS HAVING MAXIMUM MARKS = 50</b>			
TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS FOR EACH QUESTION	TOTAL
ESSAY TYPE	3 (2 * 10)	10	20
SHORT ESSAY TYPE	5 (3 * 5)	5	15
SHORT ANSWER TYPE	7 (5 * 3)	3	15

**Board of Examiners:**

*Practical examination will be conducted by two examiners out of which one will be external examiner recognized by the University.*

**Criteria for pass:****First year examination.**

**Main Subjects:** A candidate is declared to have passed in a subject, if he/she secures, 50% of marks in University Theory exam and internal assessment added together.

**Second and Third year Examination****Main Subjects:**

For a pass in theory/ practical, a candidate has to secure a minimum of 40% marks in the University conducted written examination, and 50% in aggregate in the University conducted written examination and internal assessment added together.

**Declaration of Class:**

Class will be awarded only to those candidates who pass the entire examination in the first attempt. Class shall be declared on the basis of the aggregate of marks scored in individual year.

70% and above - First Class with Distinction

60% and above but less than 70% - First class

50% and above but less than 60% - Second class

**Carry over benefit:**

**First year examination:**

A candidate who fails in any two of the five main subjects of first year shall be permitted to carry over those subjects to second year. However, he/she must pass the carry over subjects before proceeding to the third year.

**Second year examination:**

A candidate is permitted to carry over any one main subject of second year to the third year but shall pass this subject before appearing for the third year examination.

**Supplementary Examination:**

For the failed candidates or candidates promoted to II year but having carryover subject(s) shall be given a chance of supplementary exam after minimum two months from the date of University exam.

**Internship**

Six months internship shall be mandatory after successful completion of third year examination. The respective department shall issue “Internship Completion Certificate”.

**Rules for grace marks:**

Grace marks up to a maximum of 5 marks may be awarded at the discretion of the university to a student who has failed only in one subject to enable him to pass in the examination in the first attempt.

**Re-totaling:**

Re-totaling of marks is permitted only for theory papers. The University, on application within the stipulated time and remittance of a prescribed fee, shall permit a re-totaling of marks, for the subject(s) applied. The marks obtained after re-totaling will be the final marks awarded and communicated to the students.

**Eligibility for the award of Degree:**

A candidate shall have passed in all the subjects of first, second and third year to be eligible for award of degree.

### **Award of Ranks:**

Ranks will be awarded on the basis of aggregate marks of I to III year examinations.

Only those candidates who have completed the course in the minimum number of years prescribed (3 years) and who have passed all the 3 years in the first attempt is eligible for the award of ranks.

### **Maximum period for completion of course:**

A candidate shall complete the course within six years from the date of admission, failing which re-registration shall be mandatory.

## **SYLLABUS FOR FIRST YEAR B.Sc PERFUSION TECHNOLOGY PROGRAMME**

### **ANATOMY**

No. of theory classes: 70 hours

No. of practical classes: 20 hours

#### **1. Introduction: human body as a whole Theory:**

Definition of anatomy and its divisions

Terms of location, positions and planes, Cell and its organelles

- Epithelium-definition, classification, describe with examples, function
- Glands- classification, describe serous & mucous glands with examples
- Basic tissues – classification with examples

**Practical:** Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

#### **2. Locomotion and support Theory:**

- **Cartilage** – types with example & histology
- **Bone** – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull
- **Joints** – Classification of joints with examples, synovial joint (in detail for radiology)
- **Muscular system:** Classification of muscular tissue & histology Names of muscles of the body

**Practical:** Histology of the 3 types of cartilage

Demo of all bones showing parts, radiographs of normal bones & joints

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

Histology of skeletal (TS & LS), smooth & cardiac muscle

### 3. Cardiovascular System Theory:

- Heart-size, location, chambers, exterior & interior Blood supply of heart
- Systemic & pulmonary circulation
- Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse
- Inferior venacava, Portal vein, Porto systemic Anastomosis, Great Saphenous vein, Dural venous sinuses
- Lymphatic system- cisterna chyli & thoracic duct, Histology of lymphatic tissues
- Names of regional lymphatic's, axillary and inguinal lymph nodes in brief

#### **Practical:**

Demonstration of heart and vessels in the body

Histology of large artery & large vein, medium sized artery & vein

Microscopic appearance of large artery, medium sized artery & vein, large vein, pericardium

Histology of lymph node, spleen, tonsil & thymus

Normal chest radiograph showing heart shadows, Normal angiograms

### 4. Gastro-intestinal system Theory:

- Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)
- Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen

### 5. Respiratory system Theory

- Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments
- Histology of trachea, lung and pleura
- Names of paranasal air sinuses

**Practical:** Demonstration of parts of respiratory system.

Normal radiographs of chest

Histology of lung and trachea

### 6. Peritoneum

**Theory:** Description in brief

**Practical:** Demonstration of reflections

### 7. Urinary system Theory:

- Kidney, ureter, urinary bladder, male and female urethra
- Histology of kidney, ureter and urinary bladder

**Practical:** demonstration of parts of urinary system

Histology of kidney, ureter, urinary bladder

Radiographs of abdomen-IVP, retrograde cystogram

## 8. Reproductive system Theory:

- Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology)
- Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology), Mammary gland – gross

**Practical:** demonstration of section of male and female pelvis with organs in situ. Histology of testis, vas deferens, epididymis, prostate

Histology of uterus, fallopian tubes, ovary

Radiographs of pelvis – hysterosalpingogram

## 9. Endocrine glands Theory:

- Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal gland – (gross & histology)

**Practical:** Demonstration of the glands

Histology of pituitary, thyroid, parathyroid, suprarenal glands

## 10. Nervous system Theory:

- Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology)
- Meninges, Ventricles & cerebrospinal fluid,
- Names of basal nuclei
- Blood supply of brain,
- Cranial nerves, Sympathetic trunk
- Names of parasympathetic ganglia

**Practical:** Histology of peripheral nerve & optic nerve

Demonstration of all plexuses and nerves in the body

Demonstration of all part of brain

Histology of cerebrum, cerebellum, spinal cord

## 11. Sensory organs Theory:

**Skin:** Skin-histology, Appendages of skin

**Eye:** Parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply

**Ear:** Parts of ear- external, middle and inner ear, contents

**Practical:** Histology of thin and thick skin

Demonstration and histology of eyeball

Histology of cornea & retina

## 12. Embryology Theory:

- Spermatogenesis & Oogenesis, Ovulation, fertilization
- Fetal circulation
- Placenta

### Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work\* 10

\* There shall be no University Practical Examination

Internal assessment marks secured in Practical's need not be sent to the University.

### Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under.

Type of Questions	No. of Questions	Marks	Total
Long Essay (LE)	3(To attempt 2)	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

### REFERENCE BOOKS

#### Anatomy

- 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. Fattana, Human anatomy (Description and applied) Saunder's& C P Prism Publishers, Bangalore – 1991
4. ESTER . M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
5. Bhatnagar Essentials of Human embryology – Revised Edition Orient Blackswan Pvt. Ltd.

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## PHYSIOLOGY

Theory 70 hours

Practical 20 hours

### 1. Introduction – General Physiology

- Introduction to physiology
- Homeostasis: Definition, Positive feedback, negative feedback.
- Body Fluid Compartments

### 2. Blood

- Introduction: Composition and function of blood, Blood Cells: types, Normal Count
- Red blood cells – Definition of Erythropoiesis, stages of differentiation, factors affecting, physiological variation, function.
- Haemoglobin –function, concentration, physiological variation Methods of Estimation, Structure
- White blood cells – different types, function, normal count, differential count, Immunity (in brief)
- Platelets – Origin, normal count, functions, morphology.
- Haemostasis – Definition, steps, clotting factors, mechanism of clotting, disorders of clotting factors.
- Blood groups – ABO system, Rh system-Rh factor, Rh incompatibility., Blood grouping & typing, Cross matching
- Blood transfusion – Indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions, Anticoagulants – Classification, examples and uses
- Anaemias : Definition, Symptoms and signs (brief), Blood indices – Colour index, MCH, MCV, MCHC (definition and normal values), Erythrocyte sedimentation Rate (ESR) and Packed cell volume (PCV) – Normal values, Definition, Determination (methods), Classification – morphological and etiological.
- Plasma Proteins –types & concentration, functions of albumin, globulin, Fibrinogen, Prothrombin
- Blood Volume -Normal value, determination of blood volume, regulation of blood volume(brief), functions of lymph

### 3. Cardiovascular system

- Heart – Physiological Anatomy, Nerve supply, Properties of Cardiac muscle
- Cardiac cycle- definition, systole, diastole, phases, JVP(brief)
- Cardiac Output, stroke volume, EDV (only definitions)
- Heart sounds, Normal heart sounds, Mechanism and features, Areas of auscultation, Intraventricular pressure curves, Significance of heart sounds.
- Blood Pressure – Definition, normal value, clinical measurement of blood pressure, hypotension, hypertension.
- Heart rate - Physiological variations, regulation in brief, radial pulse.
- Electrocardiogram (ECG) –Definition, Normal ECG, Causes of ECG waves, Uses of ECG.
- Cardiac shock – Definition, types, Triple response

#### **4. Digestive System**

- Introduction- Physiological anatomy of Gastro-intestinal tract (all structures in brief), Functions of digestive system, Functions of Saliva.
- Deglutination –definition and stages
- Stomach – functions
- Gastric secretion – Composition, function, phases of secretion
- Pancreas – functions (exocrine), composition
- Pancreatic juice - composition and regulation, Secretin and CCK-PZ
- Liver – functions, Bile secretion, Composition, function of bile, Bilirubin metabolism, types of bilirubin, Vandenberg reaction,
- Jaundice- types, significance.
- Gall bladder – functions
- Small intestine –Functions, Digestion, absorption, movements (in brief).
- Large intestine – Functions, Defecation reflex

#### **5. Respiratory system**

- Introduction - Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract
- Respiratory organs - lungs, alveoli, respiratory membrane
- Mechanism of breathing – Inspiration, Expiration, muscles involved, mechanism
- Surfactant- Composition, functions, Intra pulmonary pleural pressure, surface tension
- Transportation of Oxygen: Forms of transport, Oxygen Hemoglobin curve.
- Lung volumes and capacities – Spirogram, Definitions and Normal Volumes
- Regulation of respiration - nervous and chemical regulation, Respiratory center. Herring Breur reflexes.
- Hypoxia – Definition, Classification, Description (in brief)
- Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnea (Definition only)

#### **6. Endocrine System**

- Introduction - Definition, Classification of Endocrine glands & their hormones
- Hypothalamus-pituitary Axis
- Pituitary hormones – Anterior and posterior pituitary hormones, functions of Growth hormone
- Thyroid gland – Thyroid hormones, Physiological function, regulation of secretion, Physiological Anatomy.
- Disorders – hypo and hyper secretion of hormone
- Adrenal cortex – functions of cortisol and Aldosterone, physiological anatomy
- Adrenal medulla – Functions of Adrenaline and nor adrenaline
- Pancreas (endocrine) – Hormones of pancreas, abnormalities(brief)
- Insulin – functions, Regulation of blood glucose level, Diabetes mellitus
- Regulation of calcium metabolism, hormones involved, actions of PTH, Calcitonin, Vit.D3, Tetany

## 7. Special senses

- Vision – Function of different parts (brief), Optic pathway, Dark adaptation, Colour vision, structure of eye, structure of retina.
- Hearing - functions of middle ear, functions of inner ear, mechanism of hearing (brief)
- Chemical senses: Taste – types, receptors.
- Smell - physiology, receptors.

## 8. Nervous system

- Introduction – Parts of CNS and PNS, Functions of Nervous system
- Neuron - definition, structure, Neuroglia
- Nerve fibre - classification, conduction of impulses, continuous and salutatory
- Synapse – definition, structure, types, properties (brief)
- Receptors – Definition, classification, properties (brief)
- Reflex action – Definition, reflex arc, examples
- Babinski's sign, Tone, Posture (definition)
- Spinal Cord nerve tracts – Diagram and functions, Lateral spino thalamic tract, Dorsal column pyramidal tract
- UMN and LMN lesion, Hemiplegia, Stroke (brief)
- Functions of - Cerebral cortex, Cerebellum, Hypothalamus, Basal ganglia
- EEG, Parkinsonism
- Cerebro Spinal Fluid(CSF) – site of formation, circulation (brief), functions, lumbar puncture
- Autonomic Nervous System - Sympathetic and parasympathetic distribution and functions (brief)

## 9. Excretory System

- Introduction-Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons – Comparison, vasa recta,
- Juxta Glomerular Apparatus – Structure and function.
- Mechanism of Urine formation
- GFR-Definition, Normal Values, factors affecting GFR, Measurement (Creatinine, Inulin Clearance)
- Tubular reabsorption, TMG, Tubular secretion (brief)
- Mechanism of urine concentration - Counter – Current Mechanisms, Role of ADH, Diuresis, Diuretics
- Micturition, Innervation of Bladder, Cystometrogram.

## 10. Reproductive system

- Introduction- Function of Reproductive system, changes during Puberty, sex differentiation
- **Male reproductive system**- Functions of testes
- Spermatogenesis –definition, site, stages, factors influencing, Endocrine functions of testes
- Androgens – Testosterone functions.
- **Female reproductive system**- menstrual cycle-definition, changes, ovulation
- Functions of progesterone and estrogen, Hormonal regulation
- Physiological changes during pregnancy, Lactation (brief), milk ejection reflex.

## 11. Muscle nerve physiology

- Introduction, Classification and structure of muscle, Sarcomere
- Neuromuscular junction, Transmission across Neuromuscular junction.
- Excitation contraction coupling. Mechanism of muscle contraction, Rigor mortis
- Contractile proteins, fatigue

## 12. Skin and Body temperature

- Structure and function of skin, Sweat glands
- Body temperature - Physiological variation,
- Regulatory mechanisms – Mechanisms activated by heat and cold
- Role of hypothalamus, Fever, Body temperature measurement, Hypothermia

### Internal Assessment

Theory: Average of two exams conducted. 20

\* There shall be no University Practical Examination and internal assessment marks secured in practical need not be sent to the University.

### Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	3 (To attempt 2)	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

## NO PRACTICAL EXAMINATION

### REFERENCE BOOKS

#### Physiology

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

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## **BIOCHEMISTRY I**

No. Theory classes: 70 hours

No. of practical classes: 20 hours

Theory:

### **1. Introduction and scope of Biochemistry**

### **2. Specimen collection:**

- Pre-analytical variables
- Collection of blood
- Collection of CSF & other fluids
- Urine collection
- Use of preservatives
- Anticoagulants

### **3. Introduction to Laboratory apparatus**

- Pipettes- different types (Graduated, volumetric, Pasteur, Automatic etc.,)
- Calibration of glass pipettes
- Burettes, Beakers, Petri dishes, depression plates
- Flasks - different types (Volumetric, round bottomed, Erle-meyer conical etc.,)
- Funnels – different types (Conical, Buchner etc.,)
- Bottles – Reagent bottles – graduated and common, Wash bottles – different types, Specimen bottles etc.,

### **4. Measuring cylinders, Porcelain dish**

- Tubes – Test tubes, centrifuge tubes, test tube draining rack
- Tripod stand, Wire gauze, Bunsen burner
- Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range, Cuvette holders Racks
- Bottle, Test tube, Pipette, Dessicator, Stop watch, timers, scissors
- Dispensers – reagent and sample
- Maintenance of lab glass ware and apparatus, Glass and plastic ware in Laboratory
- Use of glass - significance of boro silicate glass, care and cleaning of glass ware, different cleaning solutions of glass
- care and cleaning of plastic ware, different cleaning solution

### **5. Instruments (Theory and demonstration) Diagrams to be drawn**

- Use, care and maintenance of – water bath, Oven & Incubators, Water Distillation plant, water deionisers, refrigerators, cold box, deep freezers, reflux condenser, centrifuge, balances, colorimeter, spectrophotometer, pH meter and electrodes
- Centrifuge - Definition, Principle, Svedberg unit, centrifugal force, centrifugal field, RPM, Conversion of G to RPM and vice versa, Different types of centrifuges
- Manual balances: Single pan, double pan, triple balance, Direct read out electrical balances. Guideline to be followed and precautions to be taken while weighing

- Weighing different types of chemicals, liquids, hygroscopic compounds etc
- Colorimeter and spectrophotometer, pH meter, electrodes, salt bridge solution – Principles, parts, types, guidelines to be followed and precautions to be taken while using.

## 6. Safety of measurements

## 4. Conventional and SI units

## 5. Atomic structure

- Dalton's theory, Properties of electrons, protons, neutrons, and nucleus
- Rutherford's model of atomic structure
- Bohr's model of atomic structure, orbit and orbital, Quantum numbers, Heisenberg's uncertainly principle
- Electronic configuration – Aufbau principle, Pauli's exclusion principle, etc.
- Valency and bonds – different types of strong and weak bonds in detail with examples
- Theory & Practicals for all the following under this section -  
Molecular weight, equivalent weight of elements and compounds, normality, molarity
- Preparation of molar solutions (mole/litre solution) eg: 1 M NaCl, 0.15 M NaCl, 1 M NaOH, 0.1 M HCl, 0.1 M H<sub>2</sub>SO<sub>4</sub> etc.,
- Preparation of normal solutions. eg., 1N Na<sub>2</sub>CO<sub>3</sub>, 0.1N Oxalic acid, 0.1 N HCl, 0.1N H<sub>2</sub> SO<sub>4</sub>, 0.66 N H<sub>2</sub> SO<sub>4</sub> etc.,
- Percent solutions. Preparation of different solutions – v/v, w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution

## 7. Dilutions

- Diluting solutions: eg. Preparation of 0.1 N NaCl from 1 N NaCl and from 2 NaCl etc.,
- Preparing working standard from stock standard
- Body fluid dilutions, Reagent dilution techniques, calculating the dilution of a solution, body fluid, reagent etc.,
- Saturated and supersaturated solutions.
- Standard solutions. Technique for preparation of standard solutions eg: Glucose, urea, etc., Significance of volumetric flask in preparing standard solutions.
- Volumetric flasks of different sizes, Preparation of standard solutions of deliquescent compounds (CaCl<sub>2</sub>, K<sub>2</sub>CO<sub>3</sub>, NaOH etc.,)
- Preparation of standards using conventional and SI units, Acids, bases, salts and indicators.

## 7. Acids and Bases

- Definition, physical and chemical properties with examples.
- Arrhenius concept of acids and bases
- Lowery – Bronsted theory of acids and bases, classification of acids and bases
- Differences between acid and alkali, acidity and basicity, monoprotic and polyprotic

acids and bases.

- Concepts of acid base reaction, hydrogen ion concentration, Ionisation of water, buffer, pH value of a solution
- Preparation of buffer solutions using pH meter
- Salts - Definition, classification; Water of crystallization – definition and different types, deliquescent and hygroscopic salts

#### 8. Acid- base indicators:

- **Theory** – Definition, concept, mechanism of dissociation of an indicator, colour change of an indicator in acidic and basic conditions, use of standard buffer solution and indicators for pH determinations, preparation and its application, list of commonly used indicators and their pH range, suitable pH indicators used in different titrations, universal indicators
- **Practical**– Titration of a simple acid and a base (Preparation of standard solution of oxalic acid, using this solution finding out the normality of a sodium hydroxide solution. Acid to be titrated using this base) Calculation of normality of an acid or a base after titration, measurement of hydrogen ion concentration

#### 9. Quality control

- Accuracy
- Precision
- Specificity
- Sensitivity
- Limits of error allowable in laboratory
- Percentage error
- Normal values and Interpretations

#### 10. Special Investigations:

- Serum Electrophoresis - Immunoglobulins, Drugs: Digitoxin, Theophyllines
- Regulation of Acid Base status , Henderson Hasselback Equations, Buffers of the fluid, pH Regulation, Disturbance in acid Base Balance Anion Gap,
- Metabolic acidosis, Metabolic alkalosis, Respiratory acidosis, Respiratory alkalosis
- Basic Principles and estimation of Blood Gases and pH, Basic principles and estimation of Electrolytes, Water Balance, Sodium regulation, Bicarbonate buffers
- Nutrition, Nutritional support with special emphasis on parental nutrition, Calorific Value, Nitrogen Balance, Respiratory Quotient, Basal metabolic rate, Dietary Fibres, Nutritional importance of lipids, carbohydrates and proteins Vitamins

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#### • PRACTICALS

Analysis of Normal Urine

Composition of urine

Procedure for routine screening

Urinary screening for inborn errors of metabolism

Common renal disease

Urinary calculus  
 Urine examination for detection of abnormal constituents  
 Interpretation and Diagnosis through charts  
 Liver Function tests  
 Lipid Profile  
 Renal Function test  
 Cardiac markers  
 Blood gas and Electrolytes  
 Estimation of Blood sugar, Blood Urea and electrolytes  
 Demonstration of Strips  
 Demonstration of Glucometer

**Internal Assessment**

**Theory** - Average of two exams conducted. 20

**Practical's:** Record & Lab work\* 10

\* There shall be no University Practical Examination and internal assessment marks secured in Practical need not be sent to the University.

**Scheme of Examination Theory**

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	3 (To attempt 2)	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

**NO PRACTICAL EXAMINATION**

REFERENCE BOOKS

**Biochemistry**

1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna (KG), Rajna ® Textbook 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, Culcutta – 1992.
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.

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# **PATHOLOGY I**

Theory – 70 hours

Practical – 20 hours

## **HistoPathology, Clinical Pathology, Hematology and Blood Banking**

### **1. Histopathology - Theory**

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques – various Mountants
- Maintenance of records and filing of the slides
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Bio-Medical waste management
- Section Cutting
- Tissue processing for routine paraffin sections
- Decalcification of Tissues.
- Staining of tissues - H& E Staining
- Bio-Medical waste management

### **1. Clinical Pathology -Theory**

- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical Specimens
- Urine Examination – Collection and Preservation of urine.  
Physical, chemical, Microscopic Examination
- Examination of body fluids.
- Examination of cerebrospinal fluid (CSF)
- Sputum Examination.
- Examination of feces

### **2. Haematology – Theory**

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV, ESR

- Normal Haemostasis
- Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time

### 3. Blood Bank

- Introduction
- Blood grouping and Rh Types
- Cross matching

### PRACTICALS

- Urine Examination.
  - Physical
  - Chemical
  - Microscopic
- Blood Grouping, Rh typing.
- Hb Estimation, Packed Cell Volume [PCV], Erythrocyte Sedimentation rate[ESR]
- Bleeding Time, Clotting Time.
- Histopathology – Section cutting and H &E Staining. [For BSc MLT only ]

### Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work\* 10

\* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

### Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	3(To attempt 2)	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

### NO PRACTICAL EXAMINATION

## **REFERENCE BOOKS**

### **Pathology –**

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie& Lewis – Practical Haematology
8. RamanicSood, Laboratory Technology (Methods and interpretation) 4<sup>th</sup> Ed. J.P. Bros, New Delhi – 1996)
9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8<sup>th</sup> Ed, J.P. Bros, New Delhi-1991.
11. Krishna - Text book of Pathology, Orient Longman PVT Ltd.

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## **MICROBIOLOGY I**

**Objective:** - This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas Principles & practice of sterilization methods.

Collection and dispatch of specimens for routine microbiological investigations.  
Interpretation of commonly done bacteriological and serological investigations. Control of Hospital infections

Biomedical waste management

Immunization schedule

Theory - 70 hours

Practical -20 hours

### **1. Morphology**

Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

### **2. Growth and nutrition**

Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

### **3. Sterilization and Disinfection**

Principles and use of equipments of sterilization namely Hot Air oven, Autoclave and serum inspissator. Pasteurization, Antiseptic and disinfectants. Antimicrobial sensitivity test

#### **4. Immunology**

Immunity Vaccines, Types of Vaccine and immunization schedule

Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg (Technical details to be avoided)

#### **5. Systematic Bacteriology**

Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (*the classification, antigenic structure and pathogenicity are not to be taught*)

Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholera, Pseudomonas & Spirochetes

#### **6. Parasitology**

Morphology, life cycle, laboratory diagnosis of following parasites

E. histolytica, Plasmodium, Tape worms, Intestinal nematodes

#### **7. Mycology**

Morphology, diseases caused and lab diagnosis of following fungi.

Candida, Cryptococcus, Dermatophytes, opportunistic fungi.

#### **8. Virology**

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

#### **9. Hospital infection**

Causative agents, transmission methods, investigation,

Prevention and control Hospital infection.

#### **10. Principles and practice Biomedical waste management**

#### **Practical**

**20 hours**

- Compound Microscope.
- Demonstration and sterilization of equipments – Hot Air oven, Autoclave, Bacterial filters.
- Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium tellurite media with growth, Mac with LF & NLF, NA with staph Antibiotic susceptibility test
- Demonstration of common serological tests – Widal, VDRL, ELISA. Grams stain, Acid Fast staining, Stool exam for Helminthic ova
- Visit to hospital for demonstration of Biomedical waste management. Anaerobic culture methods.

**Internal Assessment**

Theory - Average of two exams conducted. 20

Practicals: Record &amp; Lab work\* 10

\* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

**Scheme of Examination*****Theory***

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	3(To attempt 2)	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

**NO PRACTICAL EXAMINATION****REFERENCE BOOKS****Microbiology**

1. Anathanarayana & Panikar Medical Microbiology – Revised 8<sup>th</sup> Edition University Press
2. Robert Cruickshank – Medical Microbiology – The Practice of Medical Microbiology
3. Chatterjee – Parasitology – Interpretation to Clinical medicine.
4. Rippon – Medical Mycology
5. Emmons – Medical Mycology
6. Basic Laboratory methods in Parasitology, 1<sup>st</sup> Ed, J P Bros, New Delhi – 199
7. Basic laboratory procedures in clinical bacteriology, 1<sup>st</sup> Ed, J P Brothers, New Delhi
8. Medical Parasitology – Ajit Damle

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## **SUBSIDIARY SUBJECTS**

### **1 ENGLISH**

**Theory: 25 Hours**

#### **COURSE OUTLINE**

**COURSE DESCRIPTION:** This course is designed to help the student acquire a good command and comprehension of the English language through individual papers and conferences.

#### **BEHAVIOURAL OBJECTIVES:**

The student at the end of training is able to

1. Read and comprehend English language
2. Speak and write grammatically correct English
3. Appreciates the value of English literature in personal and professional life.

#### **UNIT - I: INTRODUCTION:**

Study Techniques

Organization of effective note taking and logical processes of analysis and synthesis

Use of the dictionary

Enlargement of vocabulary

Effective dictation

#### **UNIT - II: APPLIED GRAMMAR:**

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

#### **UNIT - III: WRITTEN COMPOSITION:**

Precise writing and summarising

Writing of bibliography

Enlargement of Vocabulary

#### **UNIT - IV: READING AND COMPREHENSION:**

Review of selected materials and express oneself in one's words.

Enlargement of Vocabulary.

#### **UNIT - V: THE STUDY OF THE VARIOUS FORMS OF COMPOSITION**

Paragraph, Essay, Letter, Summary, Practice in writing

#### **UNIT - VI: VERBAL COMMUNICATION:**

Discussions and summarization, Debates, Oral reports, use in teaching

### **Scheme of Examination**

Written (Theory): Maximum Marks: 80 marks.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

### **REFERENCE**

1. English Grammar Collins, Birmingham University, International Language Data Base, Rupa& Co. 1993
2. Wren and Martin - Grammar and Composition, 1989, Chanda& Co, Delhi
3. Letters for all Occasions. A S Myers. Pub - Harper Perennial
4. Spoken English V. Shasikumar and P V Dhanija. Pub. By: Tata Mcgraw Hill, New Delhi
5. Journalism Made Simple D Wainwright
6. Writers Basic Bookself Series, Writers Digest series
7. Interviewing by Joan Clayton Platkon
8. Penguin Book of Interviews.

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## **2 HEALTH CARE**

**Theory: 40 Hours**

### **Introduction to Health**

- Definition of Health, Determinants of Health, Health Indicators of India,
- Health Team Concept.
- National Health Policy
- National Health Programmes ( Briefly Objectives and scope)  
Population of India and Family welfare programme in India

### **Introduction to Nursing**

- What is Nursing, Nursing principles.
- Inter-Personnel relationships.
- Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application.
- Nursing Position, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.
- Bed making
- Lifting and Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair, transferring from bed to stretcher.
- Bed Side Management: Giving and taking Bed pan, Urinal: Observation of stools, urine.
- Observation of sputum,
- Understand use and care of catheters, enema giving.
  
- Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion
- Care of Rubber Goods
- Recording of body temperature, respiration and pulse,
- Simple aseptic technique, sterilization and disinfection.
- Surgical Dressing: Observation of dressing procedures

### **First Aid:**

Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

### **Reference Books:**

1. Preventive and Social Medicine by J.Park



## ಕನ್ನಡ : ಒಂದು

### ಪಠ್ಯ ಕ್ರಮದ ರೂಪರೇಖೆ

- ಸ್ಥಾನ : ಬಿ.ಎಸ್.ಸಿ. (ಅಲೈಡ್ ಹೆಲ್ತ್ ಸೈನ್ಸ್ ಕೋರ್ಸ್) ಮೊದಲ ವರ್ಷ  
ಸಮಯ : ೨೫ ಘಂಟೆಗಳು (ಇಪ್ಪತ್ತೈದು ಘಂಟೆಗಳು)  
ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ : ವಿದ್ಯಾರ್ಥಿ / ವಿದ್ಯಾರ್ಥಿನಿಯರು ದಿನ ನಿತ್ಯ ಸಂಪರ್ಕಿಸಬಹುದಾದ ಜನಸಾಮಾನ್ಯರೊಡನೆ ಶುಶ್ರೂಷೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಕನ್ನಡದಲ್ಲಿ ಸಂಭಾಷಣೆ ಮಾಡಲು ಹಾಗೂ ತಿಳುವಳಿಕೆ ನೀಡಲು ಸಹಕಾರವಾಗುವಂತೆ ಪಠ್ಯಕ್ರಮದ ಮಾದರಿಯನ್ನು ಅಳವಡಿಸುವುದು.  
ಉದ್ದೇಶ : ೧) ದಿನ ಬಳಕೆಯ ವ್ಯವಹಾರದಲ್ಲಿ ಶುಶ್ರೂಷಣೆಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಕನ್ನಡ ಭಾಷೆಗೆ ಅಳವಡಿಕೆ.  
೨) ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಭಾಷೆಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

### ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ

- ಘಟಕ ಒಂದು : ೧) ಅಕ್ಷರಮಾಲೆ, ಸ್ವರಗಳು, ವ್ಯಂಜನಗಳು.  
೨) ಪದ, ಪದಪೂಂಜ, ವಾಕ್ಯರಚನೆ, ಪತ್ರಲೇಖನ, ಪ್ರಬಂಧರಚನೆ.  
ಘಟಕ ಎರಡು : ಶುಶ್ರೂಷಣಾ ಪದಗಳು (ಇಂಗ್ಲಿಷ್‌ನಿಂದ ಕನ್ನಡಕ್ಕೆ ಶುಶ್ರೂಷ ಸಾಮಾನ್ಯ ಬಳಕೆಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ).  
ಘಟಕ ಮೂರು : ರೋಗಿ ಹಾಗೂ ಶುಶ್ರೂಷಕರ ಮಧ್ಯೆ ಸಾಮಾನ್ಯವಾಗಿ ನಡೆಯುವ ಸಂಭಾಷಣೆ.  
೧) ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಲಹೆ ಕೊಡುವ ವಾಕ್ಯಗಳು.  
೨) ವೈದ್ಯರೊಂದಿಗೆ ಹಾಗೂ ಇತರೆ ಸಹಚರರೊಂದಿಗೆ ವ್ಯವಹರಿಸಲು, ಸಂಭಾಷಣೆ ನಡೆಸಲು ಬೇಕಾದ ವಾಕ್ಯಗಳು.

### ಅಧ್ಯಯನಕ್ಕೆ ಶಿಫಾರಸ್ಸು ಮಾಡಲಾಗಿರುವ ಗ್ರಂಥಗಳು

೧. ಕನ್ನಡ ವ್ಯಾಕರಣ (೮, ೯ ಮತ್ತು ೧೦ನೇ ತರಗತಿಗಳಿಗೆ ಕರ್ನಾಟಕ ಸರ್ಕಾರ, ಪಠ್ಯಪುಸ್ತಕಗಳ ಇಲಾಖೆ)  
೨. ವ್ಯವಹಾರಿಕ ಕನ್ನಡ : ಎಚ್‌ಸೈ  
೩. ಪತ್ರ ಲೇಖನ : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು  
೪. ಲೇಖನಕಲೆ : ಎನ್. ಪ್ರಹ್ಲಾದ ರಾವ್  
೫. ಆಹಾರ ಮತ್ತು ಇತರೆ ಪ್ರಬಂಧಗಳು : ಡಾ|| ಪಿ ಎಸ್ ಶಂಕರ್  
೬. ವೈದ್ಯ ಪದಗಳ ಹುಟ್ಟು ರಚನೆ : ಡಾ|| ಡಿ ಎಸ್ ಶಿವಪ್ಪ

## SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

### B.Sc in Perfusion Technology

#### Applied Pharmacology

##### Theory: 50Hrs

General concepts about pharmacodynamic and Pharmacokinetic Principles involved in drug activity.

##### I. Autonomic nervous system.

- Anatomy & functional organisation.
- List of drugs acting on ANS including dose, route of administration, indications, contraindications and adverse effects.

II. Cardiovascular drugs-Enumerate the mode of action, side effects and therapeutic uses of the following drugs.

##### a. Antihypertensives

- Beta Adrenergic antagonists
- Alpha Adrenergic antagonists
- Peripheral Vasodilators
- Calcium channel blockers

##### b. Antiarrhythmic drugs

##### c. Cardiac glycosides

##### d. Sympathetic and non-sympathetic inotropic agents.

##### e. Coronary vasodilators.

##### f. Antianginal and anti-failure agents

##### g. Lipid lowering & anti-atherosclerotic drugs.

##### h. Drugs used in Haemostasis - anticoagulants Thrombolytics and antithrombolytics.

##### i. Cardioplegic drugs-History, Principles and types of cardioplegia.

##### j. Primary solutions- History, principles & types.

k. Drugs used in the treatment of shock.

### III. Anaesthetic agents.

- Definition of general and local anaesthetics.
- Classification of general anaesthetics.
- Pharmacokinetics and Pharmacodynamics of inhaled anaesthetic agents.
- Intravenous general anaesthetic agents.
- Local anaesthetics-classification mechanism of action, duration of action and methods to prolong the duration of action. Preparation, dose and routes of administration.

### IV. Analgesics

- Definition and classification
- Routes of administration, dose, frequency of administration, Side effects and management of non-opioid and opioid analgesics

### V. Anti-histamines and antiemetics-

- Classification, Mechanism of action, adverse effects, Preparations, dose and routes and administration.

### VI. CNS stimulants and depressants

- Alcohol
- Sedatives, hypnotics and narcotics
- CNS stimulants
- Neuromuscular blocking agents and muscle relaxants.

### VII. Pharmacological protection of organs during CPB

### VIII. Inhalational gases and emergency drugs.

### IX. Pharmacotherapy of respiratory disorders

- Introduction- Modulators of bronchial smooth muscle tone and pulmonary Vascular smooth muscle tone
- Pharmacotherapy of bronchial asthma

- Pharmacotherapy of cough
- Mucokinetic and mucolytic agents
- Use of bland aerosols in respiratory care.

#### X. Corticosteroids - Classification, mechanism of action, adverse effects, and complications.

Preparation, dose and routes of administration.

#### XI. Diuretics

- Renal physiology
- Side of action of diuretics
- Adverse effects
- Preparations, dose and routes of administration.

#### XII. Chemotherapy of infections

- Definition
- Classification and mechanism of action of antimicrobial agents
- Combination of antimicrobial agents
- Chemoprophylaxis.
- Classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, antitubercular drugs.

#### XIII. Miscellaneous.

- IV fluids-various preparations and their usage.
- Electrolyte supplements
- Immunosuppressive agents
- New drugs included in perfusion technology.
- Drugs used in metabolic and electrolyte imbalance.

## PRACTICALS:

1. Preparation and prescription of drugs of relevance.
2. Experimental pharmacology directed to show the effects of commonly used drugs of relevance and interpretation of few charts.

## Scheme of Examination

### Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for applied Pharmacology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	3 (To attempt 2)	2x10	20
SHORT ESSAY (SE)	8 (To attempt 6)	6x5	30
SHORT ANSWER (SA)	12 (To attempt 10)	10x3	30
TOTAL MARKS			80

## NO PRACTICAL EXAMINATION

### Recommended Books.

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, single Volume, M/S Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, EMCA House, 23/23, Bansari Road, Daryaganj, New Delhi.
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

## **SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM**

### **B.Sc in Perfusion Technology**

#### **Applied Pathology**

#### **Pathology**

Theory: 30 hours

Practical: 30 hours

#### **I. CARDIOVASCULAR SYSTEM**

- Atherosclerosis- Definition, risk factors, briefly Pathogenesis & morphology, clinical significance and prevention.
- Hypertension-Definition, types and briefly Pathogenesis and effects of Hypertension.
- Aneurysms-Definition, classification, Pathology and complications.
- Pathophysiology of Heart failure.
- Cardiac hypertrophy-causes, Pathophysiology & Progression to Heart Failure.
- Ischaemic heart diseases-Definition, Types. Briefly Pathophysiology, Pathology & Complications of various types of IHD.
- Valvular Heart diseases-causes, Pathology & complication. Complications of artificial valves.
- Cardiomyopathy-Definition, Types, causes and significance.
- Pericardial effusion-causes, effects and diagnosis.
- Congenital heart diseases-Basic defect and effects of important types of congenital heart diseases.  
Infective endocarditis. Myocarditis

#### **II. HAEMATOLOGY**

- Anaemia-Definition, morphological types and diagnosis of anaemia.  
Brief concept about Haemolytic anaemia and polycythaemia.

- Leukocyte disorders- Briefly leukaemia, leukocytosis, agranulocytosis etc.,
- Bleeding disorders- Definition, classification, causes & effects of important Types of bleeding disorders. Briefly various laboratory tests used to diagnose Bleeding disorders.

### III. RESPIRATORY SYSTEM

- Chronic obstructive airway diseases-Definition and types. Briefly causes, Pathology and complications of each type of COPD.
- Briefly concept about obstructive versus restrictive pulmonary disease.
- Pneumoconiosis-Definition, types, Pathology and effects in brief.
- Pulmonary congestion and edema.
- Pleural effusion- causes, effects and diagnosis.

### IV. RENAL SYSTEM

- Clinical manifestations of renal diseases. Briefly causes, mechanism, effects And laboratory diagnosis of ARF & CRS. Briefly Glomerulonephritis and Pyelonephritis.
- End stage renal disease -Definition, causes, effects and role of dialysis and renal Transplantation in its management.
- Brief concept about obstructive uropathy.

### PRACTICALS

1. Description & diagnosis of the following gross specimens.

- a. Atherosclerosis.
- b. Aortic aneurysm.
- c. Myocardial infarction.
- d. Emphysema
- e. Chronic glomerulonephritis.
- f. Chronic pyelonephritis.

2. Interpretation & diagnosis of the following charts.
  - a. Hematology Chart-AML, CML, Hemophilia, neutrophilia, eosinophilia.
  - b. Urine Chart-ARF, CRF, Acute glomerulonephritis.
3. Estimation of Hemoglobin.
4. Estimation Bleeding & Clotting time.

### Scheme of Examination

#### Theory

There shall be one theory paper of three hours duration carrying 50marks. Distribution of type of questions and marks for Applied Pathology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3(Toattempt2)	2x10	20
SHORT ESSAY(SE)	5(Toattempt3)	3x5	15
SHORT ANSWER(SA)	7(Toattempt5)	5x2	15
TOTAL MARKS			50

#### PRACTICAL EXAMINATION

40Marks

Sl. No.	Tests	Marks
01	Interpretation of Hematology Chart	05
02	Interpretation of Urine Chart	05
03	Estimation of Hemoglobin	05
04	Estimation of Bleeding time & Clotting time	05
	Total	20



## **REFERENCE BOOKS**

### **Pathology –**

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. RamanicSood, Laboratory Technology (Methods and interpretation) 4<sup>th</sup> Ed.  
J.P. Bros, New Delhi –1996)
9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8<sup>th</sup> Ed, J.P. Bros, New Delhi-1991.
11. Krishna - Text book of Pathology, Orient Longman PVT Ltd

## SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

### B.Sc in Perfusion Technology Applied Microbiology

**Theory: 30 hrs**

**Practical: 30 hrs**

Unit 1: Health care associated infections and antimicrobial resistance.

- Drug resistant pathogens (Source of infection, modes of transmission, disease caused in brief): Methicillin resistant Staphylococcus aureus, Clostridium difficile, Vancomycin resistant enterococci.
- Hospital acquired infections (Definitions, criteria for diagnosis in brief and causative agents): catheter related blood stream infections, ventilator associated pneumonia, catheter related urinary tract infections, surgical site infections.
- Disease communicable to healthcare workers in hospital setup and preventive measures to combat the spread of these infections by monitoring and control: Respiratory route (tuberculosis, varicella-zoster, respiratory syncytial virus etc), Blood borne transmission (HIV, hepatitis B, hepatitis C, cytomegalovirus, Ebolavirus etc), orofaecal route (salmonella, hepatitis A etc), direct contact (Herpes simplex virus etc),
- Microbiological surveillance: To know the hospital flora and to assess the antimicrobial resistance, sampling technique, direct surface agar plating technique
- Discovery of viruses.

**UNIT 2: Sterilization and Disinfection**

- **Sterilization:** Definition, Classification of methods, Principles of Dry heat, moist heat,
- In detail autoclaving Preparation of materials for autoclaving: packing of different types of materials, loading, holding time and unloading.
- Disinfection, antiseptics: Disinfection of instruments used in patient care: classification, different methods, advantages and disadvantages of the various methods, Disinfection of the patient care unit, Infection control measures for ICU's.
- Sterilization –applied aspects: Rooms: gaseous sterilization, one atmosphere uniform glow discharge plasma (OAU-GDP). B) Equipments: classification of the instruments and appropriate methods of sterilization. Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas.

**PRACTICALS (30hours)**

- Principles of autoclaving & quality control of sterilization: Definition, Classification of methods, Principles of Dry heat, moist heat, in detail autoclaving Preparation of materials for autoclaving: packing of different types of materials, loading, holding time and unloading. Dry

heat/Moist heat: Temperature recording charts interpretation, Color change indicators interpretation (10 hours)

- Disinfection of wards, OT and laboratory: Disinfection of instruments used in patient care classification, different methods, advantages and disadvantages of the various methods, Disinfection of the patient care unit, Infection control measures for ICU's.
- Collection of specimens for sterility testing: Collection of specimens from outpatient units, inpatient units, minor operation theatre and major operation theatre for sterility testing, Air sampling culture plates interpretation of colony forming units based on air flow rate and sampling time
- Methods employed for sterility testing & Interpretation of results of sterility testing: Rooms: gaseous sterilization, one atmosphere uniform low discharge plasma (OAUGDP).
- Equipments: classification of the instruments and appropriate methods of sterilization.
- Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas. Interpretation of sterility of haemodialysis water/distilled water/deionized water, based on growth of colonies in BHI Agar to be reported as XCFU/unit.

### Scheme of examination

**Internal Assessment-** There shall be two IA Exams, each one with theory paper of 50 Marks and the marks of the best one (reduced to 10) is taken as final marks.

Internal assessment practicals- There shall be two practical exams of 10 marks each and the marks of the best one (reduced to 5) is taken as final marks

### University Examination

**Theory:** There shall be one theory paper of two hours duration carrying 50 marks. Distribution of type of questions and marks shall be as given under.

Type of Questions	No of Questions	Marks For Each	Total
Long Essay	3(2X10)	10	20
Short Essay	5(3X5)	5	15
Short Answers	7(5X3)	3	15
TOTAL			50

**Practical's:**

Sl. No	Tests	Marks
1	Dry heat/Moist heat: Temperature recording charts interpretation	05
2	Dry heat/Moist heat: Color change indicators interpretation	05
3	Air sampling culture plates interpretation of colony forming units based on air flow rate and sampling time	05
4	Interpretation of sterility of haemodialysis water/distilled water/de ionized water, based on growth of colonies in BHI Agar to be reported as XCFU/unit	05
<b>Total</b>		<b>20</b>

**Distribution of subjects and marks are as follows:**

Subjects	Theory				Practical			Grand Total
	Theory	Viva Voce	IA	Sub Total	Practical's	IA	Sub Total	
Section A: Applied pathology	50	15	10	150	20	05	50	200
Section B: Applied	50	15	10		20	05		

**Reference Books:**

1. Anathanarayana & Panikar Medical Microbiology- University Press
2. Textbook of Medical Microbiology for MLT students – C P Baveja
3. Hospital Infection Control Manual, YMCH

## **SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM**

### **B.Sc in Perfusion Technology**

#### **MEDICINE RELEVANT TO PERFUSION TECHNOLOGY**

**Theory: 50hrs**

#### **Cardiovascular System**

Ischemic heart diseases, Rheumatic heart disease, Congenital heart disease Hypertension

Aortic Aneurysm

Cardiomyopathy

Peripheral vascular disease

Pulmonary edema and LV failure

#### **Hematology**

Anaemia

Bleeding disorders

Laboratory tests used to diagnose bleeding disorders (in brief)

#### **Respiratory System**

Chronic obstructive airway diseases (COPD)

Concept of obstructive versus restrictive pulmonary disease

PFT and its interpretation

ARDS/ Pump Lung Syndrome

#### **Renal System**

ARF&CRF

End stage renal disease

Role of dialysis and renal transplantation in its management

#### **CNS**

Automatic nervous system

(Sympathetic & Parasympathetic system)

Brief mention of CNS disorders & their etiology

**Others**

DM, Difference with respect to anatomy, physiology, pharmacodynamics and pharmacokinetics in a neonate/pediatric, obese, pregnant and elderly patient from normal Adult population

**Scheme of Examination Theory**

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Medicine relevant to Perfusion Technology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3(Toattempt2)	2x10	20
SHORT ESSAY(SE)	10(Toattempt8)	8x5	40
SHORT ANSWER(SA)	12(Toattempt10)	10x2	20
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

# SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

## B.Sc in Perfusion Technology

### INTRODUCTION TO PERFUSION TECHNOLOGY

**Theory: 80hrs**

**Practical: 100hrs**

#### **Basics of diagnostic techniques:**

X-ray of Chest

ECG, Echo, Angiography

Nuclear Cardiology

Laboratory investigations in relation to perfusion technology

#### **Cardiopulmonary bypass and perfusion technology:**

History of Cardiac surgery and perfusion

- Specific reference of Gibbon Lillehei, carrel
- Pre CPB surgery
- Azygous Flow principle.
- Hypothermic/non-hypothermic non-CPB surgery including gross's well technique and controlled cross circulation.

#### **Monitoring and instrumentation**

- Concepts of monitoring- instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermoregulatory monitoring, defibrillators and fibrillators. Piped and non-piped gas delivery systems and connections.

Basic physics related to medically used gases.

- Haemodynamic monitoring
- Haemostatic monitoring
- Haemotologic 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 technology

### **Physiology of Extra corporeal circulation**

Heart – Lung machine

- Principles of extra corporeal circulation
- Materials used in EC circuit
- Principles of extracorporeal gas exchange

### **Various types of oxygenators**

- Bubble oxygenators
- Rotating spiral/cylinder/disc oxygenators
- Membrane oxygenators
- Mechanism of action components defoaming, rated flow

### **Theory of blood pumps**

Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellow, sigma motor, diaphragm, ventricular and centrifugal pumps.

### **Element of extra corporeal circulation**

- . Bubble trap/Arterial filter
- . Flowmeters
- . Temperature probe
- . Heat exchanger
- . Regulating devices

### **Connection of the vascular system with extra corporeal circulation:**

- Venous drainage
- Arterial, venous and cardioplegic cannulae.
- Connecting tubes and connectors



- Cardioplegia delivery system
- Vents
- Suckers

Haemodynamic of arterial flow, venous drainage, cardioplegia delivery and venting.

Blood banking, handling of blood products and their management. Blood components and their use.

### **Physical laws pertaining to perfusion**

Concepts in cardiovascular fluid mechanics

Flow through tubes

The Navier-Stokes equations

- Ohms law
- Transport applications in cardiopulmonary bypass: oxygenation and ultrafiltration
- Mass transfer and the differential component mass balance
- Gas laws, solubility of gases
- Volume, pressure, flow
- Mass, density, viscosity
- Heat units, temperature scales, heat transfer
- Diffusion/osmosis
- Molarity, concentrations
- S.I. units

**Scheme of Examination:****Theory**

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Introduction to Perfusion Technology shall be as given under.

PRACTICAL EXAMINATION

40Marks

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3(Toattempt2)	2x10	20
SHORT ESSAY(SE)	14(Toattempt12)	12x5	60
SHORT ANSWER(SA)	12(Toattempt10)	10x2	20
TOTAL MARKS			100

## SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

### B.Sc in Perfusion Technology

#### SUBSIDIARY SUBJECTS

#### 1 SOCIOLOGY

**Theory: 20 Hours**

##### **Course Description**

This course will introduce student to the basic sociology concepts, principles and social process, social institutions [in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

- **Introduction:**

- Meaning – Definition and scope of sociology

- Its relation to Anthropology, Psychology, Social Psychology

- Methods of Sociological investigations – Case study, social survey, questionnaire, interview and opinion poll methods.

- Importance of its study with special reference to health care professionals

- **Social Factors in Health and Disease:**

- Meaning of social factors

- Role of social factors in health and disease

- **Socialization:**

- Meaning and nature of socialization

- Primary, Secondary and Anticipatory socialization

- Agencies of socialization

- **Social Groups:**

- Concepts of social groups influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup.

- **Family:**

- The family, meaning and definitions, Functions of types of family, Changing family patterns, influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy

- **Community:**

- Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community.

- Urban community – Meaning and features – Health hazards of urbanities

- Culture and Health: Concept of Health Concept of culture Culture and Health

- Culture and Health Disorders

- **Social Change:**

- Meaning of social changes
- Factors of social changes
- Human adaptation and social change Social change and stress
- Social change and deviance
- Social change and health programme
- The role of social planning in the improvement of health and rehabilitation

- **Social Problems of disabled:**

Consequences of the following social problems in relation to sickness and disability remedies to prevent these problems  
Population explosion, Poverty and unemployment Beggary Juvenile delinquency, Prostitution, Alcoholism  
Problems of women in employment

- **Social Security:**

Social Security and social legislation in relation to the disabled

- **Social Work:**

Meaning of Social Work  
The role of a Medical Social Worker

**Reference Books:**

1. Sachdeva & Vidyabhushan, Introduction to the study of sociology
2. Indrani T.K., Text book of sociology for graduates nurses and Physiotherapy students, JP Brothers, New Delhi 10

Scheme of Examination for Sociology

One Written (Theory) paper: Maximum Marks: –80 marks.

No Practical or Viva voce examination

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## 2 CONSTITUTION OF INDIA

### **Theory: 10 Hours**

**Unit-I:** Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.

**Unit-II:** The democratic institutions created by the constitution bicameral system of Legislature at the Centre and in the States.

**Unit-III:** Fundamental Rights and Duties their content and significance.

**Unit-IV:** Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.

**Unit-V:** Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.

**Unit-VI:** Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India.

**Unit-VII:** The Election Commission and State Public Service commissions.

**Unit-VIII:** Method of amending the Constitution.

**Unit-IX:** Enforcing rights through Writs:

**Unit-X:** Constitution and Sustainable Development in India.

### **Books:**

1. J.C. Johari: The Constitution of India- A Politico-Legal Study-Sterling Publication, Pvt. Ltd. New Delhi.
2. J.N. Pandey: Constitution Law of India, Allahabad, Central Law Agency, 1998.
3. Granville Austin: The Indian Constitution – Corner Stone of a Nation-Oxford, New Delhi, 2000.

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### **3 ENVIRONMENTAL SCIENCE AND HEALTH**

**Theory: 10 Hours**

#### **Introduction to Environment and Health**

- Sources, health hazards and control of environmental pollution of Water
- The concept of safe and wholesome water. The requirements of sanitary sources of water.
- Understanding the methods of purification of water on small scale and large scale. Various biological standards, including WHO guidelines for third world countries.
- Concept and methods for assessing quality of water.
- Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.
- Awareness of standards of housing and the effect of poor housing on health.
- Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

#### **Recommended Books.**

1. Text Book of Environmental Studies for under graduate courses By Erach Bharucha Reprinted in 2006, Orient Longman Private Limited /Universities Press India Pvt. Ltd.

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## **SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM**

### **B.Sc in Perfusion Technology**

#### **Paper-I Perfusion Technology Clinical**

**Theory: 50hrs**

**Practical: 50hrs**

1. Pharmacokinetics and Pharmacodynamics of Cardiopulmonary bypass
2. Drugs (including anesthetic drugs) used in cardiopulmonary bypass.
3. Conduct and monitoring of Cardiopulmonary bypass
4. Adequacy of perfusion-General considerations, specific aspects of perfusion, monitoring, other factors which may affect its adequacy
5. Pulsatile perfusion- Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic effects, Clinical use, hematological effects
6. Cannulation techniques during cardiopulmonary bypass
7. Termination of cardiopulmonary bypass- principles and methodology
8. Myocardial protection and cardioplegia- pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non-cardioplegic methods during cardiac surgery on cardiopulmonary bypass
9. Oxygenation - general consideration, bubble & membrane (including assessment and comparison of oxygenator function)
10. Heat exchanger –principles and function of heat exchangers & their assessment. Complications related to heat exchange and their management.
11. Priming fluids and hemodilution

## Scheme of Examination

### Theory

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Paper-I- Perfusion Technology- Clinical shall be as given under

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3 (To attempt 2)	2x10	20
SHORT ESSAY(SE)	14 (To attempt 12)	12x5	60
SHORT ANSWER(SA)	12 (To attempt 10)	10x2	20
TOTAL MARKS			100

### PRACTICAL EXAMINATION

One common practical for all the three papers with equal weightage of marks i.e.40 practical marks for each paper.



## **SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM**

### **B.Sc in Perfusion Technology**

#### **Paper-II Perfusion Technology–Applied**

**Theory: 50 hrs**

**Practical: 50 hrs**

1. Blood cell trauma-analysis of forces of fluid motion, effects of physical forces on blood cell, clinical effect. Complications of blood transfusion.
2. Anticoagulation on bypass, its monitoring, its reversal and complications. Heparin less bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management.
3. Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimize the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass
4. Blood conservation techniques-hemofiltration during cardiopulmonary bypass including ultra-filtration (CUF, MUF), retrograde autologous priming, use of cell saver and other methods.
5. Microemboli- gaseous and particulate filters used in cardiopulmonary bypass circuit.
6. Micropore filtration during cardiopulmonary bypass
7. Counterpulsation techniques and assist devices

## Scheme of Examination

### Theory

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Paper-II- Perfusion Technology Applied shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3 (To attempt 2)	2x10	20
SHORT ESSAY(SE)	14 (To attempt 12)	12x5	60
SHORT ANSWER(SA)	12 (To attempt 10)	10x2	20
TOTAL MARKS			100

### PRACTICAL EXAMINATION

One common practical for all the three papers with equal weightage of marks i.e. 40 practical marks for each paper.

## **SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM**

### **B.Sc in Perfusion Technology**

#### **Paper-III Perfusion Technology–Advanced**

**Theory: 50 hrs**

**Practical: 50 hrs**

1. Perfusion techniques for Pediatric cardiac surgery
2. 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.
3. Perfusion as a method of cardiopulmonary bypass including femoral bypass.
4. 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.
5. Minimally invasive surgery and the perfusionist
6. Recent advances in perfusion techniques
7. Experimental perfusion
8. Role of perfusionist in non-cardiac surgeries.

## Scheme of Examination

### Theory

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Paper-III -Perfusion Technology Advanced shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY(LE)	3 (To attempt 2)	2x10	20
SHORT ESSAY(SE)	14 (To attempt 12)	12x5	60
SHORT ANSWER(SA)	12 (To attempt 10)	10x2	20
TOTAL MARKS			100

### PRACTICAL EXAMINATION

One common practical for all the three papers with equal weightage of marks i.e. 40 practical marks for each paper.

# SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM

## B.Sc in Perfusion Technology

### SUBSIDIARY SUBJECTS FOR III B.Sc PT

#### 1. ETHICS & DATABASE MANAGEMENT

**Theory: 50 hours**

##### 1. Introduction

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

##### 2. Objectives

Identify underlying ethical issues and problems in medical practice.

##### 3. Course contents (Syllabus)

###### a. Introduction to medical ethics

What is ethics, what are values and norms, freedom and personal responsibility?

###### b. Definition of medical ethics

Major principles of medical ethics.

###### c. Perspective of medical ethics

The Hippocratic oath, The Declaration of Helsinki, The WHO Declaration of Geneva, International code of Medical Ethics (1993), Medical Council of India Code of Ethics (2002).

###### d. Ethics of the individual

Truth and confidentiality, the concept of disease, health and healing, the right to health.

###### e. The ethics of human life

Prenatal sex determination.

###### f. The family and society in medical ethics

Euthanasia, cancer and terminal care.

###### g. Death and dying

Use of life-support systems, the right to die with dignity, suicide – the ethical outlook.

###### h. Professional Ethics

Contract and confidentiality, malpractice and negligence.

#### 4. Teaching/Learning Experience

a. Increasing the awareness and knowledge of students of the value.

Dimensions of interactions with the patients, colleagues, relations and public.

b. Fostering the development of skills of analysis, decision making and judgment.

c. Making the students aware of the need to respect the rights of the patient.

d. Duties and responsibilities of the technologists.

Scheme of Examination for Ethics & Database Management

One Written (Theory) paper: Maximum Marks: –80 marks.

No Practical or Viva voce examination

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## **2. BIO STATISTICS & RESEARCH**

### **Theory: 20 Hours**

#### **Course Description:**

Introduction to basic statistical concepts: methods of statistical analysis; and interpretation of data

Behavioral Objectives: Understands statistical terms.

Possesses knowledge and skill in the use of basic statistical and research methodology.

#### **Unit – I: Introduction**

Meaning, definition, characteristics of statistics.

Importance of the study of statistics.

Branches of statistics.

Statistics and health science including nursing.

Parameters and estimates.

Descriptive and inferential statistics.

Variables and their types.

Measurement scales

#### **Unit – II: Tabulation of Data**

Raw data, the array, frequency distribution.

Basic principles of graphical representation.

Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, ogive.

Normal probability curve.

#### **Unit – III : Measure of Central Tendency**

Need for measures of central tendency

Definition and calculation of mean - ungrouped and grouped.

Meaning, interpretation and calculation of median ungrouped and grouped. Meaning and calculation of mode.

Comparison of the mean, and mode.

Guidelines for the use of various measures of central tendency.

#### **Unit – IV: Measure of Variability**

Need for measure of dispersion.

The range, the average deviation.

The variance and standard deviation.

Calculation of variance and standard deviation ungrouped and grouped. Properties and uses of variance and SO

#### **Unit –V: Probability and Standard Distributions.**

Meaning of probability of standard distribution.

The Binominal distribution.

The normal distribution.

Divergence from normality - skewness, kurtosis.

#### **Unit – VI: Sampling Techniques**

Need for sampling - Criteria for good samples.

Application of sampling in Community.

Procedures of sampling and sampling designs errors.

Sampling variation and tests of significance.

#### **Unit - VII : Health Indicator**

Importance of health Indicator.

Indicators of population, morbidity, mortality, health services.

Calculation of rates and rations of health.

Recommended Books.

B.K. Mahajan& M. Gupta (1995) Text Book of Preventive & Social Medicine, 2002, 17<sup>th</sup> Edition Jaypee Brothers.

Scheme of Examination for *MEDICAL ELECTRONICS including COMPUTER APPLICATIONS*

One Written (Theory) paper: Maximum Marks: –80 marks.

No Practical or Viva voce examination

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### 3 BASICS IN COMPUTER APPLICATIONS

Theory: 10 hours

The course enables the students to understand the fundamentals of computer and its applications.

#### **Introduction to Data processing:**

Features of computers, Advantages of using computers. Getting data into / out of computers. Role of computers. What is Data processing? Application areas of computers involved in Data processing. Common activities in processing. Types of Data processing, Characteristics of information. What are Hardware and Software?

#### **Hardware Concepts:**

Architecture of computers, Classification of computers, Concept of damage. Types of storage devices. Characteristics of disks, tapes, Terminals, Printers, Network. Applications of networking concept of PC System care, Floppy care, Data care.

#### **Concept of Software.**

Classification of software: System software. Application of software. Operating system. Computer system. Computer virus. Precautions against viruses. Dealing with viruses. Computers in medical electronics

Basic Anatomy of Computers

#### **Principles of programming**

Computer application - principles in scientific research; work processing, medicine, libraries, museum, education, information system.

#### **Data processing**

Computers in physical therapy - principles in EMG, Exercise testing equipment, Laser.

Scheme of Examination for Bio Statistics & Research

One Written (Theory) paper: Maximum Marks: –80 marks.

No Practical or Viva voce examination

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