Baba Farid University of Health Sciences

Ordinances & Syllabus

Bachelor of Science in Perfusion Technology
B.Sc.(PT)
(3 Years Degree Programme)

(Applicable w.e.f. academic session 2019-20)

Faridkot -151203

Ordinances
Bachelor of Science in Perfusion Technology
B.Sc. (PT)

1. Duration of course

Duration of course shall be 3 years.

2. Admission criteria and qualifications:

The students shall be admitted as per the admission criteria and qualifications prescribed in the Notification issued by the Government of Punjab or by Baba Farid University of Health Sciences, from time to time.

3. Medium of Instructions

The medium of instruction during the course and examinations shall be English.

4. Examination Schedule

4.1 The examination shall be held twice a year in the months of May/June and November/December or on such other dates as may be decided by the Board of Management on the recommendation of Faculty of Medical Sciences and Academic Council.

4.2 Normally, the University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than four and not more than six months between the two examinations.

4.3 Normally, the last dates for receipt of examination form and late fee in the University Office shall be as under:-

Examination Session	**Date for without late fee**	**Date with late fee of Rs.200/-**	**Date with late fee of Rs.500/-**	**Date with late fee of Rs.1500/-**
May/June	March 1	March 15	March 31	April 15
Nov./Dec.	Sept. 15	Sept. 30	Oct. 15	Oct. 31

4.4 In the case of late declaration of result due to any reason, the last dates for receipt of examination form and fee in the University Office shall be as under:-

Up to 15 days from the date of declaration of result	**Up to 30 days from the date of declaration of result**	**Up to 45 days from the date of declaration of result**	**Up to 60 days from the date of declaration of result**
Without Late Fee	With a late fee of Rs.200/-	With a late fee of Rs.500/-	With a late fee of Rs.1500/-

Note: 1. Examination Fee including cost of form should be submitted in the shape of Demand Draft in favour of "The Registrar, BFUHS" payable at Faridkot.

2. The Vice chancellor may permit acceptance of admission form and fee ten days before the commencement of examination with a late fee of Rs.5000/.

5. First Year B.Sc. Perfusion Technology Examination:

The First Year B.Sc. Perfusion Technology Examination shall be open to a person who

a) has been enrolled for one academic year preceding the examination in a College of Health Sciences affiliated to this University.

b) has his/her name submitted to the Registrar by the Principal of the college with the following certificates:-

i) of having attended separately in theory and practical/clinical not less than 75% of the lectures delivered and practicals conducted in each of the subjects prescribed for the examination provided that deficiency in the number of lectures delivered and practicals conducted may be condoned by the Principal to the extent of 5% of the lectures delivered.

ii) of having secured at least 35% marks of the total marks fixed for internal assessment in each subject, separately, in order to be eligible to appear in all University examinations.

iii) of good moral character.

Note: If a candidate fulfils the condition laid down in clause 5(a) & (b) above for one or more subject (s) he/ she may be allowed to take the examination in such subject (s) in which he/ she fulfils the requirements.

(c) The First Year B.Sc. Perfusion Technology Annual Examination shall be held in May/June and the supplementary within six months of the annual examinations.

d) The First Year B.Sc. Perfusion Technology examination shall be in the following subjects and candidate shall be required to pass all the subjects:-

Sr. No.	Subject	Theory				Practical			Grand Total
		Marks	Int. Assessment	Oral/Viva	Total	Marks	Int. Assessment	Total	
1.	Anatomy	80	20	20	120	60	20	80	200
2.	Physiology	80	20	20	120	60	20	80	200
3.	Biochemistry	80	20	20	120	60	20	80	200
4.	Introduction to Computer*	50	-	-	50	50	-	50	100
5.	English*	80	20	-	100	-	-	-	100

*Note: The Examination in the subject of Introduction to Computers and English will be conducted at College level and minimum pass marks in the subject of English shall be 35% and marks will be sent to the University for final inclusion in the result.

6. Second Year B.Sc. Perfusion Technology Examination:

The Second Year B.Sc. Perfusion Technology shall be open to a person who

a) has been enrolled for one academic year preceding the examination in a College of Health Sciences affiliated to this University.
b) has previously passed the First Year B.Sc. Perfusion Technology examination of this University or an examination of any other recognized University/Institution in India considered equivalent for the purpose by the University.
c) has his/her name submitted to the Registrar by the Principal of the college with the following certificates:-

i) of having attended separately in theory and practical/clinical not less than 75% of the lectures delivered and practicals conducted in each of the subjects prescribed for the examination provided that deficiency in the number of lectures delivered and practicals conducted may be condoned by the Principal to the extent of 5% of the lectures delivered.
ii) of having secured at least 35% marks of the total marks fixed for internal assessment in each subject, separately, in order to be eligible to appear in all University examinations.
iii) of good moral character.

Note: If a candidate fulfils the condition laid down in clause 6 (a), (b) and (c) above for one or more subject (s) he/ she may be allowed to take the examination in such subject (s) in which he/ she fulfils the requirements.

(d) The Second Year B.Sc. Perfusion Technology Annual Examination shall be held in May/June and the supplementary within six months of the annual examinations.

(e) The Second Year B.Sc. Perfusion Technology examination shall be in the following subjects and candidate shall be required to pass all the subjects:-

Sr. No.	Subject	Theory				Practical			Grand Total
		Marks	Int. Assessment	Oral/Viva	Total	Marks	Int. Assessment	Total	
1.	Pathology	80	20	20	120	60	20	80	200
2.	Microbiology	80	20	20	120	60	20	80	200
3.	Pharmacology	80	20	20	120	60	20	80	200
4.	Principles of Perfusion Technology	80	20	20	120	60	20	80	200

7. Third Year B.Sc. Perfusion Technology Examination:

The Third Year B.Sc. Perfusion Technology Examination shall be open to a person who

a) has been enrolled for one academic year preceding the examination in a College of Health Sciences affiliated to this University.

b) has previously passed the Second Year B.Sc. Perfusion Technology examination of this University or an examination of any other recognized University/Institution in India considered equivalent for the purpose by the University.

c) his/her name submitted to the Registrar by the Principal of the college with the following certificates:-

i) of having attended separately in theory and practical/clinical not less than 75% of the lectures delivered and practicals conducted in each of the subjects prescribed for the examination provided that deficiency in the number of lectures delivered and practicals conducted may be condoned by the Principal to the extent of 5% of the lectures delivered.

ii) of having secured at least 35% marks of the total marks fixed for internal assessment in each subject, separately, in order to be eligible to appear in all University examinations.

iii) of good moral character.

Note: If a candidate fulfils the condition laid down in clause 7 (a), (b) & (c) above for one or more subject (s) he/ she may be allowed to take the examination in such subject (s) in which he/ she fulfils the requirements.

(d) The Third Year B.Sc. Perfusion Technology Annual Examination shall be held in May/June and the supplementary within six months of the annual examinations.

(e) The Third Year B.Sc. Perfusion Technology examination shall be in the following subjects and candidate shall be required to pass all the subjects:-

Sr. No.	Subject	Theory				Practical			Grand Total
		Marks	Int. Assessment	Oral/Viva	Total	Marks	Int. Assessment	Total	
1.	Introduction to Surgery & CSSD	80	20	20	120	60	20	80	200
2.	Cardio-pulmonary Bypass & Perfusion Technology	80	20	20	120	60	20	80	200
3.	Cardio-pulmonary Bypass & its complications	80	20	20	120	60	20	80	200

8. Internal Assessment

i) Internal Assessment shall be submitted to the University at least two weeks before the commencement of theory examinations or within one week from the issuance of Roll Numbers by the University. All the colleges shall adopt uniform criteria for Internal Assessment as follows:-

a) Attendance above 90% to be acknowledged with 10% extra weight-age for Internal Assessment.

b) At least two tests to be held in each year in addition to the pre-final (send up) examination. The Internal Assessment should be the average of all awards of these tests taken together.

c) Criteria for calculation of Internal Assessment

i)	House Examinations	- 80%
ii)	Attendance (above 90%)	- 10%
iii)	Subject assessment (candidate's conduct and extra curricular participation)	- 10%

d) Additional mandatory requirement for Internal Assessment to be observed by all colleges.

i) All test marks obtained by candidates will be displayed on Notice Boards of respective departments as and when they are awarded.

ii) All computations of Internal Assessment of the entire class made by the HOD of the department shall be displayed on the notice board of the department showing individual test marks, advantage of all tests, attendance advantage and subjective assessment and the total Internal Assessment thus derived for at least one week before sending the awards to the Principal's office.

iii) Professor Incharge/HOD preparing Internal Assessment shall certify that the detailed assessment of the entire class has been displayed on the department Notice Board for at least one week prior to its being submitted for onward transmission to the University and that adequate opportunity has been given to all the students to file any objections and that the same have been addressed satisfactory.

iv) The Principal forwarding the Internal Assessment to the University shall countersign the above referred certificate of the HOD/Professor Incharge preparing the Internal Assessment.

e) The re-appear/fail students may be re-assessed for improvement in the Internal Assessment and awards of Internal Assessment of all the re-appear/fail students will be submitted to the University every time.

9. Promotion and number of attempts allowed

a) A candidate who fails in all the subjects in the First Year B.Sc. Perfusion Technology examination shall not be promoted to Second Year class.

b) The candidate who will absent himself/herself from the examination will be deemed to have been failed in that subject.

c) A candidate who passes in at least one subject of University level First Year B.Sc. Perfusion Technology examination will be permitted to attend classes of Second Year. However, he/she will be allowed to appear in the Second Year B.Sc. Perfusion Technology examination only after passing all the subjects of First Year B.Sc. Perfusion Technology Examination.

d) Candidate who passes in one or more subjects of First Year B.Sc. Perfusion Technology examination shall be exempted from appearing in these subject at a subsequent examination, but the candidate must pass the examination in a maximum of four attempts (including first attempt, as a regular candidate), failing which he/ she shall not be allowed to continue his studies.

e) A candidate who fails in all the subjects in the Second Year B.Sc. Perfusion Technology examination shall not be promoted to Third Year class.

f) A candidate who passes in at least one subject of University level Second Year B.Sc. Perfusion Technology examination will be permitted to attend classes of Third Year. However, he/she will be allowed to appear in the Third Year B.Sc. Perfusion Technology examination only after passing all the subjects of Second Year B.Sc. Perfusion Technology Examination.

g) Candidate who passes in one or more subjects of Second Year B.Sc. Perfusion Technology examination shall be exempted from appearing in these subject at a subsequent examination, but the candidate must pass the examination in a maximum of four attempts including first attempt, as a regular candidate plus one mercy chance at the discretion of the Vice-Chancellor, failing which he/ she will have to appear in all the subjects of the examination.

h) Candidate who passes in one or more subjects of Third Year B.Sc. Perfusion Technology examination shall be exempted from appearing in these subject at a subsequent examination, but the candidate must pass the examination in a maximum of four attempts (including first attempt, as a regular candidate), failing which he/ she will have to appear in all the subjects.

10. Appointment of Examiners:

The examiners shall be appointed by the University on the recommendations of the Board of Studies in Medical Sciences (Undergraduates)/Faculty of Medical Sciences.

i) There shall be four examiners – two internal and two external.

ii) Professor& Head of the Department shall be the Convener. The second Internal Examiner will be appointed by annual rotation from amongst the Professors/Associate Professors/Assistant Professor with at least 3 years post PG teaching experience. In case of non-availability of Professors/Associate Professors/Assistant Professor in the department the teacher working in another Medical College affiliated to this University, who fulfils the minimum requirements as per MCI norms for appointment as examiner may be appointed as Internal Examiner.

iii) The examiners shall be appointed by the University from the teachers working in the Medical Colleges affiliated to it, preferably from the colleges where this course is being run, on the recommendations of the Board of Studies in Medical Sciences and Faculty of Medical Sciences.

iv) In case of non-availability of External Examiners from amongst the affiliated colleges of BFUHS, External Examiners may be appointed from the colleges which are not affiliated to BFUHS, Faridkot, in and outside the State of Punjab.

11. Paper setting and moderation of Question Papers

Each theory paper shall be of three hours duration. The paper setting and moderation of Question Papers will be got done under the direction of the Vice-Chancellor, if necessary.

The question paper covering the entire course shall be divided into two sections.

Section A:

Question 1: This will consist of five short answer questions with answer to each question up to 250 words in length. All questions will be compulsory. Each question will carry 5 marks total weight-age being 25 marks.

Question 2: This will consist of two long answer questions with answer to each question up to 1000 words in length in length. Two questions will be set by the examiner and the candidate will be required to attempt one. Each question will carry 15 marks.

Section B

Question 1: This will consist of five short answer questions with answer to each question up to 250 words in length. All questions will be compulsory. Each question will carry 5 marks total weight-age being 25 marks.

Question 2: This will consist of two long answer questions with answer to each question up to 1000 words in length. Two questions will be set by the examiner and the candidate will be required to attempt one. Each question will carry 15 marks.

12. Evaluation of Answer Books

The answer books shall be got evaluated by putting fictitious roll numbers thereon or spot evaluation (table marking) or any other method under the direction of the Vice-Chancellor.

13. Minimum pass marks:

The minimum number of marks to pass the examination shall be 50% in theory including Internal Assessment & Oral/Viva and 50% in practical including Internal Assessment in each subject separately except in the subject of English where minimum pass marks shall be 35%.

A successful candidate on the basis of theory and practical marks taken together shall be classified as under: -

Second Class : A candidate obtaining 50% or more marks but less than 60% marks
First Class : A candidate obtaining 60% or more marks
First Class with Distinction : A candidate obtaining 80% or more marks

14. Grace Marks:

That the grace marks up to 5 (five) be given to the best advantage of the students irrespective of Theory or Practical examinations.

15. Declaration of Result

The Registrar/Controller of Examinations shall publish the result after the examination. The candidates shall be issued Detailed Marks Certificate through their Principals.

16. Award of Degree

On successfully passing the Third Year B.Sc. Perfusion Technology examination the students shall be awarded the Degree of Bachelor of Science in Perfusion Technology.

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SYLLABUS

First Year B.Sc. Perfusion Technology

Paper – I

ANATOMY

Theory: 70 Hours
Practical: 20 Hours

Theory:

1. **Introduction:**

   - Definition of anatomy and its divisions, Terms of location, positions and planes.
   - Cell and its organelles, Tissues & its classification, Glands.

2. **Musculoskeletal system:**

   - Structure of Bone & its types.
   - Joints- Classification of joints with examples; details of synovial joint.
   - Bones & joints of upper limb, lower limb and their movements.
   - Axial skeleton & appendicular skeleton.
   - Skull, spine & its movements, intervertebral disc.
   - Muscles & its types.
   - Muscles of the upper limb, lower limb, trunk and neck.

3. **Cardiovascular System:**

   - Arteries & veins, Capillaries & arterioles.
   - Heart- size, location, chambers, blood supply of heart, pericardium.
   - Systemic & pulmonary circulation.
   - Major blood vessels of Heart- Aorta, pulmonary artery, common carotid artery, subclavian artery, axillary artery, brachial artery, common iliac artery, femoral artery.
   - Inferior vena cava, portal circulation, great saphenous vein.

4. **Lymphatic System:**

   - Lymph & Lymph vessels.
   - Structure of lymph node, names of regional lymphatics, axillary and inguinal lymph nodes.

5. **Gastro-intestinal System:**

   - Parts of GIT, structure of tongue, pharynx, salivary glands.
   - Location & Gross structure of Oesophagus, stomach, intestine (small and large), liver, gall bladder, pancreas, spleen.

6. **Respiratory system:**

   - Parts of Respiratory system; Structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments.

7. **Urinary System:**

   - Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra.

8. Reproductive system:

- Parts of male reproductive system, gross structure of testis, vas deferens, epididymis, prostate.
- Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.

9. Endocrine glands:

- Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland.

10. Nervous system:

- Neuron, classification of NS.
- Meninges, ventricles, CSF.
- Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei.
- Blood supply of brain, cranial nerves.
- Spinal cord and spinal nerves.
- Autonomic nervous system.
- Visual & auditory pathways

11. Sensory Organs:

- Skin & its appendages.
- Structure of eye & lacrimal apparatus, name of extraocular muscles.
- Structure of ear: external, middle & inner ear.

Practical:

Demonstration of all bones of the human body.
Demonstration of all organs of the human body.

Histology:

- Epithelium: Simple (squamous, cuboidal, columnar, ciliated), Stratified, Transitional
- Bone, muscles (skeletal, smooth, cardiac)
- Cartilage (hyaline, elastic, fibro cartilage).
- Connective Tissue (loose and dense).
- Arteries (large & medium sized), Veins.

Reference Books

1. Ross and Wilson, Anatomy and Physiology, Chruchill Livingstone.
2. Companion Pocketbook for quick review
3. B.D. Chaurasia's Human Anatomy -Vol. (1,2,3)
4. Anatomy for B.Sc. Nursing – Dr Renu Chauhan

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SYLLABUS

First year B.Sc. Perfusion Technology

Paper – II

Physiology

Theory: 70 Hours
Practical: 20 Hours

Theory:

1. **Blood**
   - Red Blood Cells- Functions, count, Physiological variations. Erythropoisis-stages
   - Hemoglobin-Functions, Physiological variations.
   - White Blood cells-Functions, count, morphology.
   - Platelets-count, morphology, functions. Hemostasis-Definition, Mechanism, clotting factors.
   - Blood groups-ABO system, Rh system, Blood transfusion- Indication, transfusion reactions.
   - Anaemias-classification, morphological and Etiological, effects of anaemia on body.

2. **Cardiovascular System**
   - Heart-Physiological Anatomy, Nerve supply, Properties of cardiac muscle.
   - Cardiac Cycle-Events –systole, diastole
   - Cardiac Output-Definition and factors affecting it.
   - Heart sounds-normal heart sounds, its causes, areas of auscultations.
   - Blood Pressure-Definition, normal value, Physiological variations, its measurement.
   - ECG- normal waves.
   - Shock-Definition, Types.

3. **Gastrointestinal System**
   - Physiological Anatomy, functions of GIT.
   - Salivary Gland-functions of saliva.
   - Stomach- structure and functions, Gastric secretions-composition, functions, Mechanism
   - Pancreas- structure, functions, composition of Pancreatic juice.
   - Liver-Functions of liver.
   - Bile-Composition, functions.
   - Jaundice-Types and its causes.
   - Gall Bladder- Functions
   - Intestine- Movements of small and large intestine.
   - Digestion and Absorption of Carbohydrates, Protiens, Fats.
   - Hormones of GIT- Functions of Gastrin, Secretin, CCK-Pz.

4. **Respiratory System**

   - Physiological Anatomy, Functions of the respiratory system.
   - Types of respiration, respiratory membrane.
   - Lung volumes and capacities, vital capacity and factors affecting it.
   - Transport of Oxygen-Forms of transportation, Oxy-hemoglobin dissociation curve

and factors affecting it.
- Transport of Carbon-Dioxide- Forms of transportation.
- Hypoxia-Definition, types, effects of hypoxia.
- Cyanosis-Definition and types.
- Artificial Respiration- CPR

5. Endocrine System

- Classification of Endocrine glands and their hormones.
- Thyroid Gland-Physiological Anatomy, hormones secreted, functions, disorders-Hypo and hyper secretion of hormone.
- Adrenal Gland-Adrenal Cortex-Physiological Anatomy, its hormones and functions.
- Adrenal Medulla-Hormones, functions.
- Pituitary Gland- Anterior and posterior pituitary hormones and their functions, disorders.
- Pancreas- Hormones and their functions, Diabetes Mellitus-types, pathophysiology, signs and symptoms.
- Parathyroid Gland- Hormones and their functions.

6. Central Nervous System

- Structure of neuron, functions of nervous system.
- Classification and properties of nerve fibres
- Synapse- structure and types
- Receptors-Definition, classification, properties, Reflex Arc
- Ascending and Descending tracts- names and functions
- Functions of Hypothalamus
- Functions of Cerebellum and Basal Ganglia
- Functions of Cerebral Cortex
- **Autonomic Nervous System-** Actions of sympathetic and parasympathetic system and their comparison.
- **Special Senses-**Eye-structure, functions of different parts,Visual acuity, Refrective errors
  Ear-structure, functions, General mechanism of hearing

7. Excretory System
- Kidneys-structure of nephron, functions of kidney
- Glomerular filtration Rate(GFR) and factors affecting it
- Counter Current Mechanism
- Bladder-its innervation, micturition reflex

8. Reproductive System
- Male Reproductive System-Stages of spermatogenesis, function of Testosterone
- Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone

9. Nerve Muscle Physiology
- Classification of Muscle, structure of skeletal muscle
- Neuromuscular Junction
- Excitation Contraction Coupling

Practicals:

- Estimation of Hemoglobin Concentration
- Determination of Bleeding Time and Clotting Time
- Determination of Blood Groups
- Recording of normal Blood Pressure
- Clinical Examination of Arterial Pulse
- Determination of Vital Capacity

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SYLLABUS

First year B.Sc. Perfusion Technology
Paper – III
BIOCHEMISTRY

Theory : 70 Hours
Practical : 20 Hours

THEORY

1. **Cell**: Morphology, structure & functions of cell, cell membrane, Nucleus, chromatin, Mitochondria, Endoplasmic Reticulum, Ribosomes.

2. **Carbohydrates**: Definition, chemical structure, functions, sources, classifications, Monosaccharides, Disaccharides, Polysaccharides, mucopoloysaccharide and its importance, glycoproteins

3. **Lipids**: Definition, function, sources, classification, simple lipid, compound lipid, derived lipid, unsaturated and saturated fatty acid. Essential fatty acids and their importance, Blood lipids and their implications, cholesterol with its importance.

4. **Proteins** :Definition, sources, amino acids, structure of protein, their classification, simple protein, conjugated protein, derived proteins and their properties.

5. **Enzymes**: Definitions, mechanism of action, factors affecting enzyme action, enzyme of clinical importance.

6. **Nutrition**
   1) **Vitamins**: Types, functions and role.
   2) **Principal minerals** and their functions(Ca, P, Mg, Na, K, Cl)
   3) Balanced diet, Diet for Chronically and terminally ill patients, post operative patients

7. **Bioenergetics**: Energy rich compounds, Respiratory chain and Biological oxidation.

8. **Carbohydrate Metabolism**: Glycolysis, TCA cycle, Glycogen metabolism, Gluconeogenesis, Maintenance of Blood Glucose. Diabetes Mellitus and its complications.

9. **Lipid Metabolism**: Beta oxidation, Ketone bodies, Cholesterol and atherosclerosis, obesity.

10. **Protein Metabolism**: Transamination, Deamination, Fate of ammonia, urea synthesis and its inborn errors.

11. **Water and Electrolyte**, Fluid compartment, daily intake and output sodium and potassium balance

12. **Nerve tissue**: Neuro transmitters and nerve activity.

13. **Hormones**: Actions of Hormone Insulin, Glucagon, Thyroid and Parathyroid hormones, Cortical hormones.

14. **Biophysics**: Concepts of pH and buffers, osmotic pressure and its physiological applications. Acid Base Balance , role of lungs and kidneys,– Regulation of blood pH, acidosis, Alkalosis

15. Physical Chemistry: Osmosis, Dialysis, Donann membrane equilibirium

16. Organ function Tests: Renal and Liver Function Tests

PRACTICAL - SYLLABUS:

I. Introduction of Laboratory apparatus

a) Pippettes
b) Burettes, Beakers
c) Flasks
d) Funnels
e) Bottles, Reagent bottles
f) Measuring cylinders
g) Tubes – Test Tubes
h) Cuvettes, significance of cuvettes in colorimeter, cuvetter for visible, UV range, cuvette holders racks – Bottle, Test Tube, Pippette.
i) Maintenance of lab glass ware and apparatus
j) Care and cleaning of Glass and plastic ware in Laboratory

II. Instruments (Theory & demonstration)

i. Water bath
ii. Oven & incubators
iii. Water distillation plant, water deionizers, deep freezers
iv. Centrifuges
v. Laboratory balances

III Practicals

1. **Urine Analysis** – normal constituents and detection of abnormal constituents

2. **Quantitative analysis** (keeping in view their clinical correlations)

   a. Colorimeter
   b. Analysis of blood sugar
   c. RFTs (Estimation of blood urea, serum creatinine, creatinine clearance, and their implications)

3. **Clinical Interpretations of**

   a. Liver Function Tests (serum bilirubin, SGOT, SGPT, ALP)
   b. Electrolytes(sodium, potassium, Chloride)
   c. Serum Calcium, magnesium
   d. Arterial Blood Gas Analysis

4) **Investigative work out for**

   a. Myocardial Infarction
   b. Unconscious patient
   c. Diabetic ketoacidosis

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SYLLABUS

First year B.Sc. Perfusion Technology

PAPER - IV
INTRODUCTION TO COMPUTERS

Theory : 35 hours
Practicals : 35 hours

Introduction to computer – I/O devices – memories – RAM and ROM – Different kinds of ROM – kilobytes. MB, GB their conversions – large computer – Medium, Micro, Mini computers – Different computer languages – Number system – Binary and decimal conversions – Different operating system – MS DOS – Basic commands – MD, CD, DIR,TYPE and COPY CON commands – Networking – LAN, WAN,MAN(only basic ideas)

Typing text in MS word – Manipulating text – Formatting the text – using different font sizes, bold, italics – Bullets and numbering – Pictures, file insertion – Aligning the text and justify – choosing paper size – adjusting margins – Header and footer, inserting page No's in a document – Printing a file with options – Using spell check and grammar – Find and replace – Mail merge – inserting tables in a document.

Creating table in MS-Excel – Cell editing – Using formulas and functions – Manipulating data with excel – Using sort function to sort numbers and alphabets – Drawing graphs and charts using data in excel – Auto formatting – Inserting data from other worksheets.

Preparing new slides using MS-POWERPOINT – Inserting slides – slide transition and animation – Using templates – Different text and font sizes – slides with sounds – Inserting clip arts, pictures, tables and graphs – Presentation using wizards.

Introduction to Internet – Using search engine – Google search – Exploring the next using Internet Explorer and Navigator – Uploading and Download of files and images – E- mail ID creation – Sending messages – Attaching files in E- mail – Introduction to "C" language – Different variables, declaration, usage – writing small programs using functions and sub – functions.

PRACTICAL

- Typing a text and aligning the text with different formats using MS-Word
- Inserting a table with proper alignment and using MS-Word
- Create mail merge document using MS-word to prepare greetings for 10 friends
- Preparing a slide show with transition, animation and sound effect using MS-Powerpoint
- Customizing the slide show and inserting pictures and tables in the slides using MS-powerpoint
- Creating a worksheet using MS-Excel with data and sue of functions Using MS-Excel prepare a worksheet with text, date time and data Preparing a chart and pie diagrams using MS-Excel
- Using Internet for searching, uploading files, downloading files creating e-mail ID
- Using C language writing programs using functions

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SYLLABUS

First Year B.Sc. Perfusion Technology

Paper – V

ENGLISH

Theory : 35 hours

Communication:-

Role of communication Defining Communication Classification of communication Purpose of communication
Major difficulties in communication Barriers to communication
Characteristics of successful communication – The seven Cs Communication at the work place
Human needs and communication "Mind mapping" Information communication

Comprehension passage:-

Reading purposefully
Understanding what is read
Drawing conclusion
Finding and analysis

Explaining:-

How to explain clearly
Defining and giving reasons
Explaining differences
Explaining procedures
Giving directions

Writing business letters:-

How to construct correctly
Formal language
Address
Salutation
Body
Conclusion

Report writing:-

Reporting an accident
Reporting what happened at a session
Reporting what happened at a meeting

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SYLLABUS

Second year B.Sc. Perfusion Technology

Paper –I
PATHOLOGY

Theory: 70 Hours
Practical: 20 Hours

1. Cell injury, cellular adaptation and cell death

- Causes of cell injury
- Reversible and Irreversible cell injury (Necrosis and its types with examples & morphology)
-Apoptosis
-Calcification
-Hyperplasia, Hypertrophy, Atrophy Metaplasia (Definition with examples).

2. Inflammation and Repair

-Definition and type of inflammation
-Granulomatous inflammation with examples
-Chemical mediators of inflammation.
-Wound healing by 1^{st} & 2^{nd} intention.

3. Fluid and Haemodynamic disturbances

-Oedema (Pathogenesis)
-Shock (Definition, Types)
-Thrombosis (Definition & Pathogenesis)
-Embolism (Definition & Pathogenesis)
-Infarction (Definition & Pathogenesis)

4. Neoplasia

-Definition and types of Neoplasia (Benign & Malignant neoplasms)
-Charactisties of Neoplasia.
-Pathogenesis of Neoplasia.
-Routes of spread

5. Nutritional disorders

-Vitamin deficiency diseases

6. Skin Diseases

-Scleroderma
-Fungal and bacterial infections of skin
-Psoriasis

7. Bone & Joints:

-Osteomy elitis (Definition & Pathogenesis)
-Arthiritis (Definition, Pathogenesis & Types)
-Poliomyelitis (Definition & Pathogenesis)
-Myopathies (Definition & Pathogenesis)

8. CNS:

-Meningitis (Definition, types & Pathogenesis)
-Vascular disorder (CVA)

9. Respiratory:

-Pneumonia
-COPD's
-T.B.

10. Urinary system:

-Nephrotic syndrome
-ARF
-CRF

11 Cardiovascular system

-M.I (Definition, pathogensis & clinical features)
-Congenital Heart Disease
-Rhematic Heart Disease
-Atherosclerosis (Risk factors, pathogenesis & complications)

12. Haematology

-Normal constituents of blood, their structure & function
-Anaemia (Definition, Classifications)
-Leukemias (Outline of classification & types)

13. Handling and management of Bio-medical waste

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Syllabus in Pathology (Practical)

A. Histopathology:

1. Introduction to histopathology with microscope
2. Receiving of specimen in the laboratory
3. Various fixatives used in cytology & histopathology
4. Tissue processing (sample receiving) and section cutting.
5. H & E staining.
6. Frozen Section

B. Haematology

1. Collection of blood Samples
2. Various anticoagulants used in Haematology
3. Various instruments used in Haematology
4. H b estimation.
5. TLC/DLC (Leishman stain)
6. Blood grouping
7. Urine complete examination

C. Cytology

1. Examination of Body Fluids
2. C.S.F Examination
3. Sputum examination
4. PAP Smear
5. FNAC

Books:

1. Harshmohan Practical Book
2. Tajinder singh & Uma chaturvedi practical book
3. Remnik Sood Lab Technician 4th Edu.
4. Satish Gupta short text book of medical laboratory for technician J.P Pros, New delhi-1998.
5. Essentials of Clinical Pathology. Shirish M. Kawthalkar. 1st Edition, 2010.
6. Kawathalkar Practical Book.

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SYLLABUS

Second year B.Sc. Perfusion Technology

PAPER – II

MICROBIOLOGY

Theory: 70 Hours
Practical: 20 Hours

1. Introduction and History of Microbiology

2. Microorganisms

   (a) Classification-Prokaryotes, Eukaryotes, Viruses, Fungi
   (b) Morphology-size, shape, arrangement
   (c) Special characteristics–spores, capsules, enzymes, mortality, reproduction
   (d) Gram staining, ZN staining
   (e) Different types of microscopes

3. **A** : Sterilization

   (a) Definition.
   (b) Different methods of sterilization including – Gaseous sterilization Plasma sterilization
   (c) Advantage and disadvantage of various methods and their controls
   (d) Sterilization of different instruments used in patients
   (e) Preparation of materials for Autoclaving: packing, loading, holding time, unloading

   B : Disinfection

   (a) Definition
   (b) Different type of methods including High level disinfectants
   (c) Disinfection of patient care unit and rooms(O.T., Wards, ICUs & Laboratories)
   (d) Central supply department Areas and floor plan for instrument cleaning high level disinfection & sterilizing area

   C : Asepsis

   (a) Universal Precautions
   (b) Use of aseptic precautions to prevent infection,
   (c) Safety mechanisms including vaccination in prevention of blood borne infections

4. Culture media- Liquid and Solid

5. Collection & transport of specimens for Microbiological Investigations

6. Infection
   - Source
   - Portals of entry
   - Spread of infection

7. Antimicrobial agents

   - Fundamental aspects
   - Antibiotic sensitivity testing

8. Immunity – Non specific

   - Natural & Acquired
   - Allergy and Anaphylaxis

9. Outline of common infections, diseases, etiology, treatment and prevention.
   - Skin and soft tissue infections
   - Respiratory tract infections
   - Meningitis
   - Enteric infections
   - Urinary tract infections
   - Ocular infections
   - Wound infections
   - PUO

   Hospital acquired infections

   - Catheter associated urinary tract infections (CAUTI)
   - Ventilator associated pneumonia (VAP)
   - Catheter related blood stream infections (CRBSI)
   - Surgical Site Infection (SSI

10. Pathogenic yeasts and fungi

11. Virology with special reference to hepatitis, poliomyelitis, HIV & Influenza

    - Viruses relevant in dialysis patients including their modes of transmission
    - Diseases communicable to healthcare workers in hospital set up and their prevention.
    - Prevention measures to combat spread of these infections by monitoring and control.

12. Microbial surveillance and sampling

    (i) Bacteriology of air, water and food
    (ii) Hospital infection Control.

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SYLLABUS

Second year B.Sc. Perfusion Technology

PAPER – III

PHARMACOLOGY

1. OBJECTIVES

a. B.Sc. student, at the end of training in Pharmacology, is expected to:
b. Understand pharmacokinetic and pharmacodynamic principles involved in the use of drugs
c. Understand and identify the various factors that can affect the action of drugs
d. Know the various routes of drug administration with advantages and disadvantages of the various routes.
e. To be able to identify and monitor adverse drug reactions (ADRs) and appreciate the importance of ADR reporting
f. Know the drugs used in systemic illnesses, infections and chemotherapy etc. with main mechanism(s) of action, pharmacokinetics, uses, side-effects and indications
g. Understand the principles and practice of pharmacy
h. Have knowledge of common drugs and doses used for different ailments
i. Have an understanding of basic mechanism by which a drug acts

2. COURSE CONTENT

The students should be able to enumerate the Classification of drugs and should be able to explain in details: The Mechanism of Action, Uses and Adverse Effects including interactions and contraindications of prototype drugs.

Theory

(A) General Pharmacology (10 Hours)

a) Absorption, distribution, metabolism and elimination of drugs, routes of drug administration.
b) Basic principles of drug action.
c) Adverse reactions to drugs.
d) Factors modifying drug response.

(B) Autonomic nervous system & Peripheral nervous system (10 Hours)

a) Neurohumoral transmission
b) Sympathetic nervous system - sympathomimetics, sympatholytics
c) Parasympathetic - Cholinergics, Anticholinergics, Ganglion stimulants and blockers
d) Skeletal muscle relaxants
e) Local anaesthetics

(C) Central nervous system (10 Hours)

a) General principles - neurotransmitters, definition and common transmitters
b) Drug therapy of various CNS disorders like epilepsy, depression, Parkinson’s disease, schizophrenia, neuro- degeneration etc.

c) Pharmacotherapy of pain
d) General anaesthetics
e) Drugs for arthritis & gout

(D) Autacoids (5 Hours)

a) Histamine and antihistaminics
b) Prostaglandins, leukotrienes, thromboxane and PAF
c) Substance P, bradykinin

(E) Cardiovascular system (10 Hours)

a) Drug therapy of hypertension, shock, angina, cardiac arrhythmias
b) Renin angiotensin system
c) Diuretics
d) Coagulants and anticoagulants, antiplatelet drugs
e) Hypo-lipidemics

(F) Gastrointestinal and respiratory system (5 Hours)

a) Emetics and antiemetics
b) Drugs for constipation and diarrhoea
c) Drug treatment of peptic ulcer
d) Drug therapy of bronchial asthma
e) Pharmacotherapy of cough

(G) Hormones (5 Hours)

a) Drug therapy of Diabetes
b) Thyroid hormones
c) Pituitary-hypothalamic axis
d) Corticosteroids
e) Oxytocin and drugs acting on uterus
f) Drugs affecting calcium balance

(H) Chemotherapy (12 Hours)
a) General principles of antimicrobial chemotherapy, rational use of antibiotics
b) Chemotherapeutic agents - b- Lactam Antibiotics, fluoroquinolones, macrolides, aminoglycoside, tetracyclines, chloramphericol and polypeptide antibiotics.
c) Chemotherapy of tuberculosis,
d) Cancer Chemotherapy

(I) Miscellaneous (3 Hours)

a) Immunomodulators
b) Drug therapy of glaucoma and cataract
c) Treatment of poisoning

PRACTICALS

A) Experimental exercise on pharmacy (10 Hours)

a) General principles of pharmacy
b) Prescription writing exercises
c) Preparation and dispensing of powders, emulsions ointments, mixtures, liniments, suppositories and syrups

B) Spotting exercise - Identify the commonly used items in Pharmacology (2 Hours)

C) Exercises on drug interactions (8 Hours)

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SYLLABUS

Second year B.Sc. Perfusion Technology

PAPER –IV

Principles of Perfusion Technology

Theory: 70 Hours
Practical: 20 Hours

1. Physiology of extracorporeal circulations.
2. Heart Lung Machine Basics
3. Principles of extracorporeal circulation
4. History of evolution of pump
5. Principles of extracorporeal gas exchange
6. Various types of Oxygenators
    - Bubble
    - Membrane
7. Theory of blood pump
    - Pulsatile flow
    - Continuous flow
8. Occlusive and Non-occlusive pump
9. Various types of pumps
    - Rotatory pumps
    - Roller pumps
    - Bellow pumps
    - Compression pump
    - Ventricle pump
    - IABP
10. Elements of extracorporeal circulation and its hazards
11. Blood filters
12. Bubble trap
13. Flow meter
14. Temperature probes
15. Heat exchangers
16. Regulating devices
17. Connections of vascular system and extracorporeal circulation
    - Venous drainage
    - Suction pump
    - Hemodynamics of artery re-entry
    - Arterial infusion
    - Cardiotomy blood return

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SYLLABUS

Third Year B.Sc. Perfusion Technology

Paper - I

INTRODUCTION TO SURGERY & CSSD

Theory: 70 Hours
Practical: 20 Hours

INTRODUCTION TO SURGERY

History of Surgery, role of the surgeon, importance of team work and anticipating the needs of surgeons; stresses that may arise during operative procedure; surgical terminology, types of incision and indications for the use of particular incision; Haemorrhage-signs and symptoms of internal and external; classification and management; identification of types of tourniquets-reasons for use and duration of application, dangers of use; Wounds, types, process of healing, treatment and complications; inflammation; wound infections – causes and treatment; incision and drainage of abscesses; importance of personal cleanliness and aseptic techniques; Pre-operative and post-operative care of the surgical patient; Emergency procedures; Endotracheal intubation; Tracheostomy. Major symptoms of presentation in adults, Equipments used in wards, Common terms used in cardiology, Commonly used drugs and their action, Checking vitals – pulse, BP, respiratory rate, Establishing an IV line and Venepuncture, STERILE TECHNIQUES AND SURGICAL ASEPSIS – Preparation of neckline sets, cut down sets, etc. – Knowledge of surgical asepsis, skin preparation for invasive procedures

CSSD PROCEDURES

The development of CSSD, The growth of CSDD Aim and objectives of CSSD

Topic: CSSD work practice, return of equipment and initial processing:-

Waste disposal collection of used items from user area, reception protective clothing and disinfections sage guards, use of disinfectionists sorting and classification of equipment for cleaning purposes, sharps, blunt lighted etc. contaminated high risk baby care – delicate instruments or hot care instruments, cleaning process – use of detergents. Mechanical cleaning apparatus, cleaning instruments, cleaning jars, receivers bowls etc. trays, basins and similar hand were utensils. Cleaning of catheters and tubings, cleaning glass ware, cleaning syringes and needles. Drying inspection of instruments and needles instruments lubrications.

Topic: Assembly and packaging:-

Materials used for wrapping and packing assembling pack contents. Types of packs prepared. Inclusion of trays and galliparts in packs. Method of wrapping and making use of indications to show that a pack of container has been through a sterilization process date stamping.

Topic: Sterilization process

General observations principles of sterilization. Moist heat sterilization. Dry heat sterilization. EO gas sterilization. H2O2 gas plasma vapour sterilization.

a) Moist heal sterilization mechanism of biocardial action. Loading of sterilizer. Sterilization process unloading of sterilizer.Tests for efficiency of sterilization. Tests for pre vacuum porous load sterilizers.

b) Dry heat sterilization. Open system and closed system of dry heat sterilization Packing and loading of sterilizer, sterilization process.

c) Sterilization by gaseous chemicals.
Physical and chemical properties of E O and H2O2 plasma vapour absorption by natural and synthetic materials, toxicity, mechanism of biocidal action.
Sterilization by 100% Ethylene oxide gas testing efficiency of sterilization.

d) Sterilization by Ironizing radiation units or terms.
Mechanism of Biocidal action.Sterilization does installation of cobalt 60.
Controls of safety precaution. Product sterility test. Product release.
Application of radiation sterilization of medical equipment, pharmaceuticals and biological products,

e) Aseptic filtration of liquids and air liquids: Types of filters depth of filters, membrane of filters, Testing efficiency of filtration. Integrating test application of membrane filtration.Pressure and vacuum filtration. Integrity test application of membrane filters. Pharmaceutical biological materials microbiological culture media. Sterility test. Aseptic filtration of air, fibrous depth filters. Mechanism of filtration. Granular carbon filtration fibrous (Paper) sheet filtration. Efficiency of HEPA filtration, Disinfection of used filters.

f) Chemical disinfection. Alcohols aldehydes, cholorapexidine, chlorine compounds, idophers phenols, strong oxidizing agents. Chlorine dioxide. Peracetic acid. Peroxigen biocide hydrogen peroxide.

Topic: Principles of Chemical disinfection

Mechanism of microbiocidal action. Factors affecting in use effectiveness. Number of organisms present. Conditions of grown. Conentration of disinfectant temperature. Temperature contract time presence of organic matter, surface of contact. Cellolous and synthetic materials.Contaminated disinfectants in the test.

Evaluation of disinfectants, expression of disinfectant concentration.
Bactericidate test.

Test organisms Policy for disinfection in hospitals.

Disinfection of hospital equipment. Disinfection of hospital environment. Disinfection of skin and mucous membrane. Administration of disinfection policy selection of disinfectants. Types of products.

Topic: Issue and Collection Techniques

Responsibilities of user department. Responsibility of CSSD equipment used for collection and issue. Techniques of collection and issue.

Topic: Infection control

Infection, cross infection control. Hospital policy manual regarding decontamination of articles, rooms, etc. Fumigration procedure.

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SYLLABUS

Third Year B.Sc. Perfusion Technology

Paper - II

CARDIO-PULMONARY BYPASS & PERFUSION TECHNOLOGY

Theory: 70 Hours
Practical: 20 Hours

1. Haemodynamic aspects of total heart – Lung bypass

   Perfusion flow pressure and resistance distribution of blood flow among various vascular beds.

2. Metabolic aspects of total heart – Lung bypass Oxygen need and perfusion flow requirements Perfusion flow and oxygen uptake

   Acid-base balance Electrolyte and water balance Oxygen toxicity

3. Effects of perfusion on organs

   Brain, heart, lungs, kidney liver and spleen area and other organs

4. Control of adequacy of perfusion

   The ideal perfusion
   Monitoring devices
   Techniques of control

5. Hematological problems

   Blood prime
   Priming solutions
   Control of
   Effects of various priming solution on RBC trauma

6. Induced cardiac arrest and myocardial protection

   Physiological principles of including cardiac arrest, morphology, function and metabolism of the arrested heart

   Cardioplegia – Cold blood, potassium and Modified cold prime cardioplegia

7. Hypothermia

   Blood stream cooling nerves peripheral cooling modes of blood stream cooling heart and circulation at low termprature

8. Assisted circulation
   Circulatory support metabolic support by partial heart lung bypass. Effects of partial heart-lung bypass on organs.

9. Biomedicus pump

10. LV assist devices – LVAD, RVAD, BIVAD

11. Intra-aortic balloon pump – IABP

12. Autotransfusion, cell saver.

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SYLLABUS

Third Year B.Sc. Perfusion Technology

Paper - III

CARDIO PULMONARY BYPASS AND COMPLICATIONS

Theory: 70 Hours
Practical: 20 Hours

1. Complications while initiating the bypass, during bypass and at the termination of bypass. Hemolysis / haematuria / hemoglobinurea.
2. Air locking, air embolism.
3. Re-warming and cooling, cerebral damage.
4. Loss of electrical power – running a pump with hand rotation.

INVESTIGATIONS

Routine - Haematological – their significance

-Urine

- E.C.G.
- - Chest X-ray

Special - Endocrine, hormonal assays
- Echocardiography
- Angiography
- Liver function test
- Renal function test
- Others

STERILE TECHNIQUES AND SURGICAL ASEPSIS

- Preparation and assembling of circuits on heart lung machine. Taking circuits from the surgeons.
- Assembling filters.
- Knowledge of surgical asepsis, skin preparation for invasive procedures.

MAINTENANCE

- Proper cleaning, attending troubleshoot in time and periodical maintenance including cultures taken specific intervals from heart lung machine and hemotherm.

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