Baba Farid University of Health Sciences

Ordinances & Syllabus

Bachelor of Science in Cardiac Technology
B.Sc.(CT)
(3 Years Degree Programme)

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

Faridkot -151203

Ordinances
Bachelor of Science in Cardiac Technology
B.Sc. (CT)

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. Cardiac Technology Examination:

The First Year B.Sc. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac Technology Examination:

The Second Year B.Sc. Cardiac 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 First Year B.Sc. Cardiac 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. Cardiac 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. Cardiac 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.	Basics of Cardiology	80	20	20	120	60	20	80	200

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

The Third Year B.Sc. Cardiac 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. Cardiac 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. Cardiac 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.	Cardiology	80	20	20	120	60	20	80	200
2.	Cardiac Catherization	80	20	20	120	60	20	80	200
3.	Echocardiography	80	20	20	120	60	20	80	200
4.	Electrocardiography	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. Cardiac 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. Cardiac 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. Cardiac Technology examination only after passing all the subjects of First Year B.Sc. Cardiac Technology Examination.

d) Candidate who passes in one or more subjects of First Year B.Sc. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac Technology examination only after passing all the subjects of Second Year B.Sc. Cardiac Technology Examination.

g) Candidate who passes in one or more subjects of Second Year B.Sc. Cardiac 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. Cardiac 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. Cardiac Technology examination the students shall be awarded the Degree of Bachelor of Science in Cardiac Technology.

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SYLLABUS

First Year B.Sc. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac 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. Cardiac Technology

PAPER –IV

BASICS OF CARDIAC TECHNOLOGY

Theory 30 Hours
Practicals:100Hours

1) Medical ethics & the relevant medico legal aspects.

- Responsibilities and duties
- Ethical behavior & conduct
- Medico legal aspects & its relation to consumer protection act

2) Basics of computer application

- Basic structure of computers - Micro processors in computers
- Principles of programming
- Principles of computer application in various fields -Data processing

3) Basics of medical statistics

- Common statistical terms
- Sources and presentation of data
- Measures of location
- average and percentiles
- Measures of central
- tendency and dispersion
- Normal distribution and normal curve
- Sampling and probability
- Sampling variability and its significance
- Significance of difference in mean
- Chi –square test
- Designing and methodology of an experiment of a study
- Representation of data as tables and graphs
- Demography of vital statistics
- Standard deviation
- P value and its significance
- Recording of data and maintenance of records.

4) Biomedical waste & its management.

5) Cardiopulmonary resuscitation

- Basic cardiac life support
- Advanced cardiac life support

6) Intensive coronary unit & recovery room concepts

7) Electricity & electro medical equipments & their safe guards

- Basics of electricity & functioning of electro medical equipments. Earthing & care of apparatus. Static electricity.

8) Basic principles of blood transfusion & fluid therapy

- Sterlisation-Materials & methods.
- Preparation of Scientific paper and presentation

9) Echocardiography

- Basic principles of ultrasound
- M-Mode Echocardiography
- Two dimensional Echocardiography
- Doppler Echocardiography, colour flow
- Transoesophageal Echocardiography

10) Instrumentation:

- Basic pulse Echosystem
- Transducers
- Pulse generation
- Echo detection
- Echo displays
- A mode, B mode, M-mode
- Display & recording

11) Echocardiographic Examination:

- Selecting transducers
- Position of the patient
- Placement of the transducer
- Setting control
- M-Mode labelling
- 2 D Echo
- Normal variants
- Terminology
- Identification of segments

12) Doppler Echocardiography

a) Introduction to Doppler colour Echocardiography

- The Doppler principles
- Doppler ultrasound techniques Colour Doppler flow imaging
- Clinical application of Doppler Echocardiography

b) Physical principles & instrumentation in spectral & color Doppler flow imaging.

c) Physical principles and Doppler effect. The Doppler echocardiography system display.

d) Blood flow pattern-Laminar & non-laminar flow.

e) Doppler echo cardiograph modes

- Continuous wave Doppler frequency
- Pulsed Doppler system
- High pulse repetition frequency
- Problems of color- imaging

13) Contrast Echo

14) Echo measurements- 'ASE' recommendation.

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SYLLABUS

Third Year B.Sc. Cardiac Technology

Paper – I

CARDIOLOGY

Theory 80 Hours
Practicals:100 Hours

I. Prevalence, causes and prevention of cardiovascular diseases

a) IHD b) RHD C) Hypertension d) CHD

II. Heart failure

Causes, Types, symptoms and signs, diagnosis, management, prevention.

III. Arrythmias

Brady and Tachyarrythmias, causes, diagnosis and management.

IV. Atherosclerosis.

Definition, risk factors, pathogenesis, Clinical significance and prevention.

V. Coronary artery disease

Types, Causes, Symptoms and signs, diagnosis, investigations, management, complications.

VI. Hypertension

Definition, causes, signs and symptoms, diagnosis, evaluation, management.

VII. Pulmonary Hypertension

Definition, Causes, diagnosis and treatment.

VIII. Rheumatic fever, Rheumatic Heart disease, Mitral valve and aortic valve disease. Infective endocarditis.

IX. Congenital Heart Diseases

Common CHD, Diagnosis and management ASD, VSD, PDA, PS, AS, Coarctation of aorta, Dextrocardia.

X. Cardiomyopathies

Dilated Cardiomyopathy, Hypertrophic Cardiomyopathy, Restrictive Cardiomyopathy

XI. Pericardial diseases

Acute Pericarditis, Pericardial effusion, Pericardial tamponade. Chronic constrictive pericarditis.

XII. Peripheral vascular diseases

XIII. Anaemia

XIV Chronic obstructive Lung disease

XV. Acute and chronic renal failure

XVI. Fluid therapy, Central venous lines. Interpretation of Investigation reports.

XVII. Basics of 64 slice CT angio, CT and MRI.

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SYLLABUS

Third Year B.Sc. Cardiac Technology

Paper – II

CARDIAC CATHETERIZATION

Theory 30 Hours
Practicals: 250 Hours

1. Preparation for Cath procedure and post procedure care.

2. Cardiac Catheterization laboratory- General details of Cardiac Catheterization equipment, how to handle the machine, common problems, one may come across and how to overcome it. Radiation hazards.

3. Materials used in the Cath Lab- All catheters , balloons, guidewires, pacemakers, contrast materials & other materials used in the Cardiac Catheterization Laboratory and Sterlisation of all these materials.

4. Right heart Catheterization- procedure, cath position, Oxymetry at various levels, angios done & its interpretation.

5. Left heart catheterization- procedure, cath position, Oxymetry at various levels, angios done & its interpretation.

6. Coronary Angiogram-procedure, materials used, type & amount of dye used, indications & contra indications, various pictures recorded in various angles and gross interpretation.

7. Peripheral Angiogram- procedure, indication & contra indication.

8. Coronary Angioplasty- procedure, materials used, complications one may encounter and how to manage it.

9. Peripheral Angioplasty- materials used & procedure. Angioplasty of coarctation of aorta

10. Valvuloplasties- procedure, indications, complications and preparation of balloons, mitral valvuloplasty, balloon aortic valvuloplasty, Balloon pulmonary valvuloplasty & Balloon tricuspid valvuloplasty.

11. Coil closure & device closure of PDA- procedure , indications & materials used for coil & device closure of PDA

12. Device Closure of ASD- procedure , indications & materials used for device closure of ASD.

13. Device Closure of VSD procedure , indications & materials used for & device closure of VSD.

14. Electrophysiological studies-basic knowledge of electrophysiological studies.

15. Oxymetry – handling of the instruments & use fullness of the instruments, normal & abnormal values.

16. Pressure recording- handling of the instrument & pressures in various chambers, normal & abnormal values.

17. Temporary & permanent pacing- materials used, procedure, complications one may encounter & management.

18. CD recording & storage- Recording & storage of all the procedures over CD.

19. Procedure during pregnancy- precautions to be followed.

20. Nuclear cardiology- instrumentation, radiopharmaceuticals, patient imaging techniques.

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SYLLABUS

Third Year B.Sc. Cardiac Technology

Paper – III

Echocardiography

Theory 100 Hours
Practicals:700 Hours

1. Echo in rheumatic heart disease-Echo in mitral stenosis, mitral incompetence, aortic stenosis, aortic incompetence, pulmonary hypertension, post MVR, Post AVR. Prosthetic valve. Malfunction, LA clot.

2. Echo in congenital heart disease- Echo in ASD,VSD, PDA, pulmonary stenosis, aortic stenosis, coarctation of aorta, TOF, Dextrocardia.

3. Echo in ischemic heart disease- Echo in acute myocardial infarction, old myocardial infarction & other ischemic heart disease related conditions, LV aneurysm.

4. Echo in other cardiovascular disease- Echo in various types of Cardiomyopathy, infective endocarditis, diseases of aorta, mitral valve prolapse, myxoma & other cardiovascular diseases.

5. Trans esophageal echocardiogram- indications, procedures, usefulness & complications, one may encounter and its management.

6. Stress Echo- procedure & indications.

7. Fetal echocardiogram- procedure, basic interpretation

8. Peripheral Doppler- procedure & usefulness of peripheral Doppler

9. Assessment of cardiac function- measurements of all cardiac chambers and assessment of cardiac function.

10. Contrast Echo cardiogram-Procedure & usefulness of Contrast Echo cardiogram.

11. Myocardial Contrast Echo- Basic knowledge

12. Echo in pericardial disease-pericardial effusion, cardiac tamponade, constrictive pericarditis.
    - 3D Echo
    - Other latest developments in the field of Echocardiogram

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SYLLABUS

Third Year B.Sc. Cardiac Technology

Paper – IV

ELECTROCARDIOGRAPHY

Theory: 100 Hours
Practicals:250 Hours

1. Basic principles

   The Electrocardiographic paper The Electrocardiograph
   The Electrical field of Heart
   The leads. standard limb lead, Precardial lead, 'V' lead & ' AV' lead Basic ECG deflections.

2. Normal ECG

   The 'P' wave
   The 'QRS' complex
   T wave, the S-T segment, P-R segment
   The 'U' wave
   Rate & rhythm
   Rotation of the heart,
   The Q-T interval.

3. The Electrical axis
4. Precardial pattern of ECG
5. Chamber enlargement-atrial enlargement, LV hypertrophy & RV hypertrophy

6. Bundle branch block General principles

   Right Bundle branch block Left Bundle branch block
   The Hemi blocks (Fasicular blocks)

7. Exercise stress Testing

   a. Exercise
   b. Exercise protocols
   c. Electrocardiographic measurements
   d. Exercise testing-Indication and techniques.

8. ECG in myocardial infarction –ECG in anterior wall, Inferior wall, true posterior wall and sub endocardial infarction and RV infarction

9. ECG in rheumatic heart disease–ECG in mitral stenosis, mitral incompetence, aortic stenosis and aortic incompetence.

10. ECG in hypertension

11. ECG in congenital heart disease-common congenital heart disease-ASD,VSD, PDA, pulmonary stenosis, aortic stenosis, coarctation of aorta, TOF, definition of all these conditions, ECG changes in all these conditions.

12. ECG in other conditions-ECG in various types of Cardiomyopathy, Myxodema, pericardial effusion, acute pericarditis and other vascular diseases. WPW syndrome, Dextrocardia.

12. Interpretation of common ECG

13. Cardiac monitoring –definition, purpose of cardiac monitoring, how to recognize various arrhythmias, how set up a intensive coronary care unit & usefulness of ICCU.

14. Interpretation of TMT report- Criteria for TMT positive test, contra indication of TMT, conditions where TMT is not useful, complications that may occur in TMT room and its management.

15. Use of Defibrillator-Indications, how to use the defibrillator, complications during the procedure & its management.

16. Management of Cardiac arrest- definition, causes, external cardiac message, artificial respiration & other drugs and procedures used in the management of cardiac arrest.

17. Myocardial perfusion scan- procedures & usefulness of Myocardial perfusion scan.

18. Cardiac arrhythmias- Brady-arrhythmia & Tachy arrhythmias and ECG diagnosis of all rhythm disturbances.

19. Sinus arrhythmia, APC, JPC, VPC, VF, Ventricular Tachycardia, af, AF, SVT, I^0 HB, II^0 HB, Complete heart block.

20. Electrolyte disturbances- ECG in hypokelemia, Hyperkelemia

21. Holter Monitoring- procedure & and usefulness.

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