



Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed - to - be - University under section 3 of UGC Act 1956)

B.Sc. ALLIED HEALTH SCIENCE
REGULATIONS AND SYLLABUS 2017

MEDICAL LABORATORY TECHNOLOGY

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Regulations for B.Sc. (Allied Health Science) Course: 2017

Introduction

B.Sc. (Allied Health Science), a (3-year course work + 1-year internship) program under the Faculty of Allied Health Sciences, is aimed at training students to prepare them as qualified physician assistants who will be able to meticulously assist the concerned specialist in handling the various illnesses. This program is a taught course that covers relevant topics and specialized areas of knowledge as opted. The aim of this B.Sc. Program is to provide a thorough training to the candidates through formal lectures and/or seminars and practical programs which culminate in a one year internship that finally prepares the student for the rigors of the medical world.

1. Short Title and Commencement

These Regulations shall be called the “Regulations for B.Sc. (Allied Health Science) Course” of BIHER. These regulations shall be deemed to have come into force from the academic year 2017-18. These regulations are subject to modifications as may be approved by the Academic council from time to time.

2. Eligibility for Admission

- a) A candidate desiring to join the (3-year course work + 1-year internship) programme, leading to the degree B.Sc. (Allied Health Science) should have passed the HSC/CBSE/ISC or equivalent examination with one of the following subject combinations:
 - i) Physics, Chemistry, Biology
 - ii) Physics, Chemistry, Botany and Zoology
- b) A candidate shall, at the time of admission submit to the Head of the Institution, a certificate of medical fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. Age limit for admission

A candidate should have completed the age of 17 years as on 31st December of the year of admission.

4. Eligibility Certificate

Candidates, who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu, shall obtain an Eligibility Certificate, from BIHER and produce the same at the time of admission.

5. Registration

A candidate admitted to the course shall register his/her name with the University by submitting the application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution within the stipulated date.

6. Duration of the course

The duration of the B.Sc. (Allied Health Science) Degree Course shall be (3-year course work + 1-year internship) comprising of 8 (eight) semesters and one year (semesters 7 & 8) of compulsory internship. The candidate is required to pursue the course on a full time basis, and must complete the course within seven years from the date of provisional registration.

7. Commencement of the Course

The course shall ordinarily commence on 1st August of the academic year. Admission for the said course shall be completed by 31st August.

8. Curriculum

The first three years of the course will be utilized as follows:

The first two semesters will be spent on Pre and Para clinical subjects including Anatomy, Physiology, Biochemistry, Basics in Medical Physics, English, Computers, Microbiology, Pathology, Pharmacology, Environmental Science and Community Medicine and Nursing. At the beginning of the third semester students will be assigned to branch of Specialization, to which allotted and they will proceed with the specialty during the third, fourth, fifth and sixth semesters,

The fourth year of the course shall be compulsory internship in the respective specialty. The Syllabus for the course shall be as specified in the regulation.

9. Medium of Instruction

English shall be the medium of instruction for all the subjects of study and for the examination.

10. Working Days

In the case of I to VI semesters, each semester shall consist of not less than 100 working days and each academic year shall have a total of 200 working days or above. In the case of VII & VIII semesters, each semester shall have 140 working days.

11. Attendance

The candidate shall have not less than **80%** attendance in Theory and Practical separately. Each semester shall be taken as a unit for the purpose of calculating the attendance. The candidate lacking attendance in a subject shall be denied permission to appear for the University Examination in that subject.

12. Condonation of Lack of Attendance

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the University.

Lack of attendance can be condoned up to a maximum of 5% of the minimum attendance required in the following exceptional circumstances:

- (i) Any illness / accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)
- (iii) Participation in NCC/NSS and other co curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination.

13. Commencement of the examinations

There shall be two sessions of University examinations in an academic year, viz., December and June.

14. Cut-off dates for admission to the examinations

The candidates admitted from 1st August to 31st August of the academic year shall be registered to take their first semester examination in the month of December of the academic year after fulfillment of the stipulated regulations.

15. Grading system

All assessments of a course shall be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

Letter Grade	Grade Point	Range of Marks*
O (Outstanding)	10	86-100
A+ (Excellent)	9	70-85
A (Very Good)	8	60-69
B+ (Good)	7	55-59
B (Above Average)	6	50-54
C (Average)	5	45-49
D – (Pass)	4	40-44
F (Fail) / RA (Reappear)	0	Below 40
Ab (Absent)	0	-
NC- not completed	0	-

After results are declared, Grade Statement will be issued to each

student which will contain the following details:

- The college in which the candidate has studied

- The list of subjects enrolled during the semester and the grades scored.
- The Credits awarded and accumulated.
- The Grade Point Average (GPA) for the semester and
- The Cumulative Grade Point Average (CGPA) of all subjects enrolled from first semester onwards.

GPA is the ratio of, the sum of the products of the number of credits of subjects (C) and the grade points scored in those subjects (GP), to the sum of the credits of all the subjects in that semester.

$$\text{GPA} = \frac{\text{Sum of [C} \times \text{GP]}}{\text{Sum of C}}$$

CGPA will be calculated using the above formula, considering all the subjects enrolled from first semester onwards. “RA”, “I” and “NA” grade will be excluded for calculating GPA and CGPA.

16. Classification of successful candidates

The CGPA arrived at the completion of the course shall be the criteria for the classification of successful candidates as below:

CGPA (Percentage)	Classification
10.0 (90-100%)	First class with honours
8.0-9.9 (75-89%)	First class with Distinction
6.5 to 7.9 (60-74%)	First class
4.5 to 6.4 (40-59%)	Second class

- Successful candidates who secure 75% marks and above as a course aggregate in the first appearance taking University theory, practical, project / dissertation evaluation and viva shall alone be awarded Distinction. This will also apply for award of University rank.
- Successful candidates who secure 60% marks and above as a course aggregate in the University theory, practical, project / dissertation evaluation and viva shall be awarded First Class.
- All others who secure 40-59% in gross percentage will be classified to have passed in Second Class.

17. Continuous (Internal) Assessment

- Continuous (Internal) Assessment for Theory shall be the average of the best two out of three.

- b. Continuous (Internal) Assessment for Practicals shall be the average of the best two out of three.
- c. The minimum Internal Assessment will be 40% separately for Theory & Practical

18. Semester – End Examination (University/Department)

- a) The examination in B.Sc. (Allied Health Science) shall consist of Written Theory examinations and Practical Examinations. The semester – End Examination (University/Department) shall be conducted at the end of each semester.
- b) Papers for which Internal Examination is recommended by the Board of Studies and approved by the Academic Council, the following criteria shall be followed.
 - i) The weight age for Continuous (Internal) Assessment and Internal Examination (to be conducted by the respective department) shall be in the ratio of 25% and 75% respectively.
 - ii) The Continuous (Internal) Assessment marks shall be the average of the best two out of three. The date of Semester – End Examinations (Internal examinations) shall be as per the University guidelines.

19. EXAMINATION PATTERN (for all specialties) (with practical) – UNIVERSITY EXAM.

A. <u>Theory</u>		Max. Marks – 60	Duration: 2 1/2hrs	
I. Essay Questions (1×10)	10 Marks	}		Ist & IInd Semesters alone
II. Short Notes (8×5)	40 Marks			
II. Short Answers (5×2)	10 Marks			

B. <u>Theory</u>		Max. Marks – 60	Duration: 2 1/2hrs	
I. Essay Questions (2×10)	20 Marks	}		IIIrd, IVth, Vth, VIth Semesters
II. Short Notes (8×5)	40 Marks			
C. <u>Practical</u>				

I. Practical (Including Oral)	20 Marks
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D. Continuous (Internal) Assessment

I. Theory	10 Marks
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II. Practical **10 Marks**

Internal Examination

Short Notes or Short Answers **8×5 = 40**

IA **= 10**

Total **50**

20. Marks Qualifying for a Pass

For passing the University / End-semester Examination from Semester I to Semester VI, the candidate shall secure the marks as stated below,

- a) **40% minimum in the End-Semester examination as well as 40% aggregate marks (continuous assessment and End – Semester examination). The minimum marks for internal assessment shall be 40%.**
- b) For papers which are internally evaluated the same distribution of 25% for Continuous (Internal Assessment and 75% for Semester – end Examination (which shall be conducted by the respective department) shall be followed.

Criteria to pass:

I and II SEMESTER

1.Theory – Minimum Pass - 40% .

2.Theory&Practical–40%of the aggregate(i.e)theory(60)+practical(20)=80,

40% of this (i.e) 32 is the minimum marks to pass.

III and VI SEMESTER

1.Theory –Minimum Pass - 40%,

2.Practical – Minimum Pass - 40%

21. Carry-over of failed subjects

A candidate who fails in any one or more of the first year subjects, shall be permitted to carry over the subjects to the second year. However a candidate should clear all the

subjects of the second year along with the carried over subjects of the first year before getting promoted to the third year. The student shall start the Internship training (VII & VIII semester) only after he/she clears all the papers from Semester I to Semester VI.

22. Revaluation of answer papers

There shall be no revaluation of answer papers of failed candidates. Failed candidates are however, permitted to apply to the University for retotaling within fifteen days of publication of the results for retotaling.

23. Temporary break of study

- a) A Candidate is not normally permitted to temporarily break the study.
- b) If a candidate is continuously absent from the institute for one year without any information / permission.
 - i) having notified the Dean/Director/Principal within this period, this absence shall be treated as "Temporary Break of Study".
 - ii) without notifying the Dean/Director/Principal, his/her name will be removed from the institute rolls.
- c) If a candidate is compelled to temporarily break the study for valid reasons (such as accident or hospitalization due to prolonged ill health), he/she shall apply for condonation of the break to the Dean/Director/Principal through the Head of the Department.
- d) For condonable break of study:
 - i) If the lack of attendance is within condonable limits as per Clause No. 12 the candidate shall be permitted to write the examination for the current semester.
 - ii) If there is non-condonable lack of attendance, the candidate shall rejoin the program at the respective semester as and when it is offered after the break and shall be governed by the rules and regulations in force at the time of rejoining.
- e) The total period for completion of the programme reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in Clause No. 6 irrespective of the period of break of study in order that he/she may be qualified for the award of the degree.
- f) In any case, a candidate shall be permitted to temporarily break the study only once during the entire duration of the program. The candidate shall forfeit the registration in case of a second break or in case of a non-condonable break of study.
- g) Without prejudice to the above rules, the candidate who has completed the attendance requirement for a semester, but has proceeded on a condonable break of study without appearing for the University Examination, shall be permitted to appear for the examinations without repeating the semester and thereafter continue the subsequent semester.

SCHEME OF EXAMINATION 2017-2018

B.Sc. ALLIED HEALTH SCIENCES

SEMESTER I (Common to all Courses)

S.No	Paper	Teaching Hrs		Evaluation-University Examination {marks}					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Anatomy[UE]	60	20	10	10	60	20	100	5
2.	Physiology[UE]	60	20	10	10	60	20	100	5
3.	Biochemistry [UE]	60	20	10	10	60	20	100	5
4.	Medical Physics[I.E.]	60	20	10	-	40	-	50	5
5.	English[I.E.]	60	-	10	-	40*	-	50	4
6.	Basics of Computers[I.E.]	30	30	10	-	40*	-	50	4
TOTAL									28

SEMESTER II (Common to all Courses)

S.No	Paper	Teaching Hrs		Evaluation-University Examination {marks}					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Microbiology[U.E.]	60	20	10	10	60	20	100	5
2.	Pathology [U.E.]	60	20	10	10	60	20	100	5
3.	Pharmacology [U.E.]	60	20	10	10	60	20	100	5
4.	Environmental Science &Community Med.[I.E.]	60	20	10	-	40*	-	50	5
5.	Basics of Nursing[I.E.]	60	-	10	-	40*	-	50	4
Total									24

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective departments.

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – III

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Histopathology – Theory(UE)	60	-	20	-	60	-	80	4
2.	Histopathology – Practical(UE)	-	120	-	20	-	60	80	4
3.	Cytology – Theory(UE)	60	-	20	-	60	-	80	4
4.	Cytology – Practical(UE)	-	120	-	20	-	60	80	4
5.	Basic Principles of Hospital Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Histopathology and Cytology: Comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – IV

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Clinical pathology (Hematology & Urine Analysis – Theory(UE)	60	-	20	-	60	-	80	4
2.	Clinical pathology (Hematology & Urine Analysis – Practical(UE)	-	120	-	20	-	60	80	4
3.	Blood banking and Immunology – Theory(IE)	60	-	20	-	60	-	80	4
4.	Blood banking and Immunology – Practical(IE)	-	120	-	20	-	60	80	4
5.	Health Care Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Clinical pathology and Blood banking: comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – V

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Paper-I General Bacteriology, Immunology and Systematic Bacteriology – Theory(UE)	60	-	20	-	60	-	80	4
2.	Paper-I General Bacteriology, Immunology and Systematic Bacteriology – Practical(UE)	-	120	-	20	-	60	80	4
3.	Paper –II Virology, Mycology and Parasitology – Theory(UE)	60	-	20	-	60	-	80	4
4.	Paper –II Virology, Mycology and Parasitology – Practical(UE)	-	120	-	20	-	60	80	4
5.	Hospital Products, Promotion, Sales & Public relation (or) Physician's Office Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in General Bacteriology, Immunology, Virology and Mycology : comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – VI

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Clinical Chemistry Paper-I – Theory(UE)	60	-	20	-	60	-	80	4
2.	Clinical Chemistry Paper-I – Practical(UE)	-	120	-	20	-	60	80	4
3.	Clinical Chemistry Paper-II – Theory(UE)	60	-	20	-	60	-	80	4
4.	Clinical Chemistry Paper-II – Practical(UE)	-	120	-	20	-	60	80	4
5.	Trauma & Cardiac Life Support(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Clinical Chemistry: comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

COMMON TO ALL BRANCHES
INTERNSHIP [VII & VIII SEMESTER]

Sl. No.	Programme	Hours Prescribed	University Examination			
			Project Evaluation	Viva	Total	Credits
1	Internship	675				15
2	Project	6 months	80	20	100	6
No Minimum for Passing			Total Credits			21

B.SC. ALLIED HEALTH SCIENCE 2017-2018

MEDICAL LABORATORY TECHNOLOGY

An **ALLIED HEALTH SCIENCE** professional is an important part of a multidisciplinary Health care team who provide support service and rehabilitation measures for the patients in the hospital.

Duration of the course: Three years followed by one year internship which is **compulsory**

Medium of instruction: ENGLISH

The first & second Semester syllabi for Allied Health sciences is common for all the courses.

FIRST YEAR: (Semester I & II)

MAIN SUBJECTS:

Anatomy	Physiology	Biochemistry
Pathology	Microbiology	Pharmacology

SUBSIDIARY SUBJECTS:

English, Computer, Medical physics, Environmental Science & Community, Medicine & Basics of Nursing.

Exams in subsidiary subjects shall be conducted at the college level and marks forwarded to the university.

INTERNAL ASSESSMENT:

1. Written tests-average of 2 tests, viva, assignments, aptitude, punctuality and Attitude.
2. Log book-It will have the recordings, of all activities department and date wise including practical demonstrations. There will not be a practical record

INTERNAL ASSESSMENT MARKS:

1. Written test etc.....	10
2. Log book & Practical.....	10
Total	20

80% ATTENDANCE & 40%of INTERNAL ASSESSMENT marks are essential to appear for the University Examination

University Exams shall be conducted at the end of each semester. (JUNE & DEC)

B.SC. ALLIED HEALTH SCIENCE 2017-2018

SCHEME OF EXAMINATION - SEMESTER I

(Common To All Courses For Anaesthesia Technology, Cardiac Technology, Medical Laboratory Technology, Renal Dialysis Technology, Radiology And Imaging Science Technology, Perfusion Technology, Respiratory Care Technology)

S.No	Paper	Teaching Hrs		Evaluation [marks]				University Examination	
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Anatomy[UE]	60	20	10	10	60	20	100	5
2.	Physiology[UE]	60	20	10	10	60	20	100	5
3.	Biochemistry [UE]	60	20	10	10	60	20	100	5
4.	Medical Physics[I.E]	60	20	10	-	40*	-	50	5
5.	English[I.E.]	60	-	10	-	40*	-	50	4
6.	Basics of Computers[I.E.]	30	30	10	-	40*	-	50	4
Total									28

U.E University examination.

*I.E Internal examination.

[These examinations shall be conducted by respective departments].

B.SC. ALLIED HEALTH SCIENCE 2017-2018

SYLLABUS

SEMESTER – 1

(Common To All Courses For Anaesthesia Technology, Cardiac Technology, Medical Laboratory Technology, Renal Dialysis Technology, Radiology And Imaging Science Technology, Perfusion Technology, Respiratory Care Technology)

1.ANATOMY (UE)

UNIT I: Organization of the human body

1. Introduction

- Introduction to human body
- Definition and subdivision of anatomy
- Anatomical position and terminology
- Region and systems of the body
- Cavities of the body and their contents
- Levels of organization of the body

2. Cell and genetics

- Parts of cell – cell membrane, cytoplasm, organelles, inclusion bodies, nucleus
- Structure of chromosome, DNA, RNA.
- Basics & fundamentals of Genetics, Karyotyping, Chromosomal disorders, prenatal diagnosis, genetic counseling and gene therapy.
- Cell division – Definition and main events that occur in different stages of mitosis and meiosis.
- Tissues – Definition, characteristic features and types with example.
- Types of glands with example

UNIT II: Systems of support and movement

1. Skeletal system

- Cartilage: Type and basic histological feature.
- Bones: definition, classification based on location, name and number of bones with general feature of important bones, function of bone, histological feature of a compact bone.
- Joints – Definition and types with example, Axis and movements. Shoulder, elbow, hip, knee joints – type, bones and ligaments involved, possible movements.

2. Muscular system

- Types of muscle with basic histological features
- Parts of skeletal muscle.
- Definition of origin and insertion
- Origin, insertion, nerve supply, action of sternocleidomastoid, pectoralis major, deltoid, gluteus maximums and diaphragm.

UNIT III: Controls systems of the body

1. Nervous system

- Subdivisions of the nervous system
- Spinal cord-location, extent, external features and blood supply
- Brain-subdivision, location, external features of Medulla oblongata, Pons, Midbrain, Cerebellum, and Cerebrum, Thalamus and Hypothalamus, Location and subdivision of ventricles of brain. Circle of Willis.
- Cranial nerves-name, number, attachment, area of distribution
- Spinal nerves-typical spinal nerve. Name and location of plexuses. Location and distribution of brachial and lumbosacral plexus.
- Autonomic nervous system-sympathetic and parasympathetic nervous system. Location of pre-ganglionic and post-ganglionic neurons.

2. Sense organs

- Location and features of nose, tongue, eye, ear and skin.

3. Endocrine system

- Names of the endocrine glands. Location and features of pituitary, thyroid, parathyroid, suprarenal, pancreas, ovaries and testis. Names of hormones produced by each gland.
- Microscopic features of thyroid and pancreas.

UNIT IV: Maintenance of the human body.

1. Cardio vascular system

- Types and general features of blood vessels. Structure and types of arteries and veins. Shape, size, location, covering, external and internal features of

Heart. Conducting system of heart. Blood supply of the heart. Name, location, branches and main distribution of principal arteries and veins

2. Lymphatic system

- General features of Lymph node and lymphatic vessels. Name, location, external features, microscopic feature of tonsil and spleen.

3. Respiratory system

- Name the organs of respiration. Location and features of Nasal cavity, pharynx, larynx, trachea, lung & pleura. Mention the microscopic feature of lung.

4. Digestive system

- Name the parts of the alimentary canal and accessory organs. Location & features of esophagus, stomach, small and large intestine. Location and feature of tongue, salivary glands, pancreas, liver and gall bladder. Microscopic feature of liver.

5. Urinary system

- Names of urinary organs. Location and features of kidney, ureter, urinary bladder & urethra. Microscopic feature of kidney.

6. Reproductive system

- Names of male and female organs of reproduction. Location and features of testis, epididymis, vas deferens, prostate gland and spermatic cord. Location & features of uterus, uterine tube, ovary and breast.

7. Embryology

- Structure of gametes & gametogenesis. Fertilization to development of embryo till 3rd week. Derivatives of germ layers. Teratogens, Structure and Functions of placenta.

UNIT V: Anatomical regions

- Simple ideas about scalp, triangles of neck, axilla, cubital fossa, carpal tunnel, mediastinum, umbilicus, inguinal canal, femoral triangle
- subsartorial canal popliteal fossa

PRACTICALS/DEMONSTRATIONS

1. Demonstrations of dissected specimens.
2. Viewing of projection of microscopic slides of muscle, bone, cartilage, spleen, tonsil, lung, liver, kidney, thyroid and pancreas

REFERENCE BOOKS

1. Manipal manual for AHS by Dr. Sampath Madhyastha, (Second Edition) Published by CBS Publishers.
2. Handbook of anatomy for nurses by Dr. P. Saraswathi
3. Ross and Wilson, Anatomy and physiology in health & illness.

2. PHYSIOLOGY (UE)

Unit-I

1. General Physiology:

- Concept of Homeostasis
- Cell structure and functions
- Transport across membranes

2. Body and body fluids:

- Body fluid volumes, compartments and composition
- Blood composition and functions
- Plasma proteins – Types and functions
- Erythrocytes – functions, Erythropoiesis, anemias
- Leucocytes – classification and functions
- Platelets – morphology and functions
- Blood coagulation – Mechanism and name of anticoagulants
- Blood groups – Basis of ABO & Rh grouping, Erythroblastosis Foetalis

3. Muscle physiology:

- Muscles – Classification & structure of striated, nonstriated & cardiac muscle
- Neuromuscular junction
- Mechanism of skeletal muscle contraction

4. Digestive system:

- Salivary glands, functions of saliva
- Parts of stomach, composition & functions of gastric juice
- Pancreatic Juice – composition & functions
- Bile – composition & functions of bile & bile salts
- Functions of Small intestine & large intestine

Unit-II

1. Skin

- Structure & Functions

2. Excretory system:

- Kidney: Basic physiological anatomy (Including JGA)
- Formation of urine – GFR
- Formation of urine – Reabsorption & secretion
- Micturition Reflex
- Dialysis – Principle, types
- Renal function tests

Unit-III

1. Endocrine system:

- Hypothalamo hypophyseal inter relationship
- Posterior pituitary hormones and its actions
- Anterior pituitary hormones, Growth hormone – Actions
- Dwarfism, gigantism, acromegaly
- Thyroid hormones – Actions
- Cretinism, Myxoedema, Grave's disease (clinical features)
- Parathyroid hormones – Functions, Tetany
- Insulin, Glucagons – Actions, Diabetes mellitus
- Adrenal medullary hormones & their actions
- Adrenal cortex hormones & their actions

2. Reproductive system:

- Male reproductive organs – Spermatogenesis, Testosterone actions
- Female reproductive organs – menstrual cycle (endometrial and ovarian cycles) and its hormonal control
- Contraceptive methods in male and female

Unit-IV

1. Respiratory system:

- Basic physiological anatomy
- Surfactant
- Mechanics of respiration
- Lung volumes and capacities

- Oxygen transport, Carbon-di-oxide transport
- Nervous and chemical regulation
- Pulmonary function tests.

2. Cardiovascular system:

- Basic physiological anatomy, innervations of heart
- ECG – normal waves, intervals and their significance
- Cardiac cycle – mechanical events, Heart sounds
- Blood pressure – Definition, measurement, normal values, factors maintaining BP Regulation

Unit-V

1. Nervous system:

- Structure of neuron, neuroglial cells, synapse and transmission across it
- Reflex – Components of reflex arc, examples.
- Functions of ascending tracts – anterior, lateral spinothalamic tracts, Dorsal column
- Functions of Corticospinal (Pyramidal) tract-Descending tract
- Functional areas of cerebral cortex
- Functions of basal ganglia, thalamus, hypothalamus, limbic system and cerebellum

2. Special senses:

- Receptors for various special senses

Practical Demonstration

Haematology:

1. Enumeration of RBC count.
2. Enumeration of WBC count.
3. Differential Count.
4. Estimation of Hemoglobin.
5. Determination of blood group.
6. Determination of bleeding time and clotting time.

Clinical physiology:

1. Measurement of blood pressure.
2. Determination of Radial pulse

Reference Book

1. Human Physiology for BDS by A.K.Jain, 4th Edition, Avichal publishing co

3. BIOCHEMISTRY (UE)

Unit I – Cell and its molecules

- **Cell** – Cell organelles, Fluid Mosaic Model, functions of cell membrane, Brief description of transport across the cell membrane.
- **Carbohydrates** – Definition, Classification with examples, Sources, physiological significance and HbA1c.
- **Lipids** – Definition, Classification with examples, Sources, Types of lipids present in the body, storage form, storage site, free cholesterol structure, functions of lipids, lipoprotein structure and its functions.
- **Nucleic acids** – Nucleotide, Nucleoside, types of nucleic acids, secondary structure of DNA & Its functions; Types of RNA & its functions.

UNIT II – Proteins and Enzymes

- **Proteins** – Definition, Classification, functions of proteins, Plasma proteins; Classification of Aminoacids with examples
- Hemoglobin structure, Functions of hemoglobin, hemoglobin derivatives, Abnormal hemoglobin
- **Enzymes:** Definition, Classification, coenzymes, Metalloenzymes, Factors affecting enzyme activity, Regulation of enzymes, over view of Mechanism of enzyme action, Isoenzymes and Clinical importance of enzymes

UNIT III-Vitamins, Minerals, Nutrition

Vitamins: Definition, Classification of Vitamins

Sources, RDA, Function & Deficiency symptoms of

- Fat Soluble Vitamins (A, D, E & K);
- Water Soluble Vitamins (Thiamine, Riboflavin, Niacin, Biotin, Pantothenic acid, Pyridoxine, Folic acid, Cobalamine) and Vitamin C

Minerals: Definition, Classification of Minerals

Sources, RDA, Function, Reference levels & Deficiency Symptoms of

- Calcium, Phosphorus, Iron Copper, Zinc, Sodium, Chloride, Iodine, Potassium, Fluorine and Selenium.

Nutrition: BMR, SDA, Dietary fibres, protein Energy Malnutrition and Obesity

UNIT IV – Bioenergetics and Metabolism

Bioenergetics: Electron Transport chain and Oxidative Phosphorylation

Metabolism

- **Carbohydrates:** Digestion and absorption, Glycolysis, TCA cycle, Metabolism of Fructose and Galactose.
- **Lipids:** Digestion and absorption, Beta oxidation of fatty acids, Regulation of Cholesterol level in the cell and outline of lipid transport.
- **Proteins:** Digestion and Absorption, Formation and Disposal of Ammonia, Urea Cycle, Special Products of Glycine, Tyrosine and Tryptophan.

UNIT V – Miscellaneous

Outlines of DNA organization, Replication, Transcription, Genetic code and Translation

Organ function Tests: Liver, Renal and Bone.

PRACTICAL

- Spotters

Reference Book

1. Essentials of Biochemistry by Satyanarayana, Current edition and Allical publishers.

4. BASICS IN MEDICAL PHYSICS AND ELECTRONICS (IE)

Unit I: Laser

Nature of light-Reflection-Refraction-Total internal reflection-Optical fibers-Applications in Medicine – Laser-Principles-Action-Types of laser, Basic principles of laser in Medical Application – Argon-Iron laser photo coagulator-Photo thermal-Photochemical application-Applications of laser in Medicine-Laser hazards and safety measures

Unit II: Radiation Physics

Introduction to nuclear physics and radioactivity, Radioactive radiations – X-ray, production of x-ray, Properties of x-ray radiations – Biological effects of radiation, Radiation damage in matter, Radiation protection principles, radiation detection and measurement – Ultrasound and generation of ultrasound.

Unit III: Introduction to Imaging Technique

Principles of Microscope: Simple microscope and compound microscope- Radiography: Making and X-ray image-Fluoroscopy. CT Scans, MRI – Ultrasonography: Ultrasound picture of Body-A-Scan-M-Scan-Ultrasound diathermy-Phonocardiography – Radio isotopes: Uses of Radio isotopes – ^{99m}Tc Generator – Scintillation detectors – Application of scintillation detectors – Gamma Camera – Positron Camera

Unit IV: Semiconductor devices

Principles of diodes and Transistors – Integrated circuits – Amplifiers – Basic configuration and types – differential and operational amplifiers – Waveform generators – Timer – A/D and D/A converters – Active filters – Transducers – Basic configuration and types.

Unit V: Biopotential Recording Systems

Introduction to bioelectric potential – Electrodes and surfaces – Biopotential amplifier – Frequency ranges of various biopotential signals – Working principles of bio potential recording systems – Electrocardiography – Electroencephalograph – Electromyography.

Reference Books:

1. New Understanding physics for advanced level – Jim Breithaupt.
2. Advanced Physics for you by Keith Johnson, Simmons hewett, Sue holt, John miller
3. Christensen's Physics of diagnostic Radiology by Thaomas S. Curry III, M.D., Robert C Murry, Jr. Phd., Dow Dey, Phd.
4. Applied Electronics, A. Subramanyam, The National Publishing co., Madras (1996).
5. Design and Development of Medical Electronic Instrumentation, David Prutchi and Michael Norris, John Wiley & Sons (2005).

5. ENGLISH (IE)

Unit I : Spoken Communication

- Learning to read the phonetic symbols
- Stress
- Intonation
- Rhythm
- Commonly mispronounced words
- Correct pronunciation of important commonly used words in hospital practice

Unit II : Vocabulary and Reading

- Special features of English vocabulary
- Common errors in choice of word
- Semi technical vocabulary
- Collecting material from library on scientific topics
- Comprehensive exercises

Unit III : Writing

- Writing letters regarding permission, leave, opening bank account etc.
- Taking notes from lecture / reading materials
- Writing reports on patient care
- Summarizing scientific passages

Unit IV : Grammatical and Idiomatic Usage

- Correction of errors
- Types of interrogative sentences
- Active-Passive voice
- Tense
- Principles of precision, clarity and specificity

6. BASIC OF COMPUTERS (IE)

UNIT I: INTRODUCTION

Computer basics – Types of computers – hardware components – input devices – output devices – storage devices – memory – units and sizes – factors affecting performance – operating systems – applications software – networking – LAN and WAN – Accessories – backup – computer virus – software copyright.

UNIT II: WORD PROCESSING

Windows – Office automation – WORD processor – open a new document – toolbars – menus – font dialog box – enter text – scroll – spelling checker – Autocorrect – undo and redo – bullets and numbered lists – indenting – moving and copying – find and replace – autosshapes – saving document – preview and print.

UNIT III: ELECTRONIC SPREADSHEET AND DATA PRESENTATION

EXCEL spreadsheet – grid of rows and columns – active cell – selecting range – entering data – editing data – row and column labels – adjusting width – creating and copying formulae – relative – logical functions – lookup function – creating chart – bar chart – pit chart – print and save.

POWERPOINT presentation – creating slide shows- building outline – switching levels in outline – adding pictures – slide designs – design templates – formatting – color scheme – customized backgrounds – inserting content – hyperlink – revolution in education.

UNIT IV: DATABASE MANAGEMENT SYSTEM

ACCESS database – concept – template –primary key – records and fields – Student roster database – input mask – adding records – viewing data – updating entries – searching and querying – sorting – Table, forms and reports.

UNIT V: APPLICATIONS IN HEALTH CARE AND MEDICINE

INTERNET – e-governance – access to information – communication facility – mechanics of E-mail – social transformation – electronic billing – drug information – information flow in lab and radiology – storage of medical records – networking the organization – patient care – intelligent monitoring – scholarly information – health informatics – robotic assisted surgery – Clinical decision support systems – Telemedicine.

REFERENCES BOOKS

1. Peter Norton., Introduction to Computers. 7th Edition, Tata Mcgraw hill Education Private Limited 2010.
2. Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat., Microsoft Office 2007. 1st Edition, Delmar Cengage Learning 2010.

B.SC. ALLIED HEALTH SCIENCE 2017-2018

SCHEME OF EXAMINATION SEMESTER - II

(Common To All Courses For Anaesthesia Technology, Cardiac Technology, Medical Laboratory Technology, Renal Dialysis Technology, Radiology And Imaging Science Technology, Perfusion Technology, Respiratory Care Technology)

S.No	Paper	Teaching Hrs		Evaluation-University Examination [marks]					
		L	P	I.A.		University Exam		Total	Credits
				T	P	T	P		
1.	Microbiology [U.E.]	60	20	10	10	60	20	100	5
2.	Pathology [U.E.]	60	20	10	10	60	20	100	5
3.	Pharmacology [U.E.]	60	20	10	10	60	20	100	5
4.	Environmental Science & Community Med.[I.E.]	60	20	10	-	40	-	50	5
5.	Basics of Nursing[I.E.]	60	-	10	-	40	-	50	4
Total no. of credits									24

B.SC. ALLIED HEALTH SCIENCE 2017-2018

SYLLABUS

SEMESTER – II

(Common To All Courses For Anaesthesia Technology, Cardiac Technology, Medical Laboratory Technology, Renal Dialysis Technology, Radiology And Imaging Science Technology, Perfusion Technology, Respiratory Care Technology)

1. MICROBIOLOGY (UE)

UNIT – I: General Bacteriology

Introduction & History of Microbiology, Classification & Morphology of Bacteria, Growth & nutrition, Culture Media & Methods, Sterilization & Disinfection, Fundamental aspects of antibacterial agents and antimicrobial susceptibility testing.

UNIT – II: Immunology

Infection, Immunity, Immunization schedule, applications of antigen antibody reactions, Hypersensitivity, Tumor & Transplantation Immunology.

UNIT – III: Virology

Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immunodeficiency virus.

UNIT – IV Mycology & Parasitology

Introduction to mycology, pathogenic yeasts & fungi, Introduction to parasitology, Amoebiasis, Malaria, Helminthic infections.

UNIT – V : Applied Microbiology

Outline of common bacterial diseases, treatment & prevention-Respiratory tract infections (upper & lower), Meningitis (septic & aseptic), Enteric infections (food poisoning & gastro enteritis), Anaerobic infections, Skin & soft tissue infections, Urinary tract infections, Sexually transmitted diseases, Tuberculosis & Leprosy, Hospital acquired infections, Biomedical waste management.

PRACTICAL EXERCISES: Spotters, Gram staining.

Reference Books

1. Textbook of Microbiology by Ananthanarayan & Panicker's, 8th edition- Universities Press (India) PVT LTD.
2. Textbook of Microbiology by C. P. Baveja, 4th edition, Arya Publications.
3. Textbook of Medical Parasitology, CK Jayaram Paniker, 5th edition, Jaypee Publications.
4. Medical Parasitology by C. P. Baveja & V. Baveja, 2nd edition, Arya Publications.
5. Publications.

2. PATHOLOGY (UE)

UNIT-I: General Pathology I: Cellular Pathology, Acute and Chronic Inflammation, Tissue Renewal Regeneration and Repair, Hemodynamic Disorders Thromboembolic Disease And Shock

Introduction to Pathology, Adaptations Of Cellular Growth And Differentiation, Causes Of Cell Injury, Mechanisms Of Cell Injury, Necrosis, Apoptosis, Pathologic Calcification, Cellular Aging, Acute Inflammation – Mediators Of Inflammation Outcomes Of Acute Inflammation, Morphologic Patterns Of Acute Inflammation, Chronic Inflammation – Causes Of Chronic Inflammation, Granulomatous Inflammation, Healing By Repair, Scar formation And Fibrosis, Cutaneous Wound Healing, Healing By First Intention, Healing By Second Intention, Edema, Hemostasis and Thrombosis, Infarction, Shock

UNIT-II: General Pathology II: Diseases of the Immune System, Neoplasia, Environmental And Nutritional Disease, Diseases Of Infancy And Childhood

Innate Immunity, Adaptive Immunity, Components Of The Immune System, Mechanisms Of Hypersensitivity Reactions, Acquired Immunodeficiency Syndrome (AIDS), Neoplasia – Definition and Nomenclature, Characteristics Of Benign And Malignant Neoplasms, Molecular Basis Of Cancer, Essential Alterations For Malignant Transformation, Clinical Aspects Of Neoplasia, Laboratory Diagnosis Of Cancer, Common Environmental And Nutritional Pathology, Nutritional Diseases, Tumors And Tumor-Like Lesions Of Infancy And Childhood

UNIT-III: Systemic Pathology I: Blood Vessels, the Heart, Red Blood Cell and Bleeding Disorders, Diseases Of White Blood Cells

Arteriosclerosis, Atherosclerosis, Hypertensive Vascular Disease, Ischemic Heart Disease, Hypertensive Heart Disease, Valvular Heart Disease, Infective Endocarditis, Rheumatic Fever And Rheumatic Heart Disease, Cardiomyopathies, Leukopenia, Anemias, Polycythemia, Bleeding Disorders, Reactive Proliferations Of White Cells, Definitions And Classifications of Lymphoid Neoplasms and Myeloid Neoplasms, Splenomegaly.

UNIT-IV: Systemic Pathology II: The Lung, The Gastrointestinal Tract, Liver And Biliary Tract

Acute Respiratory Distress Syndrome, Obstructive Pulmonary Diseases, Pulmonary Infections, Gastritis, Peptic Ulcer Disease, Inflammatory Bowel Diseases, Liver Function Tests, Hepatic Failure, Cirrhosis, Portal Hypertension, Jaundice, Cholelithiasis

UNIT-V: Systemic Pathology III: The Urogenital System, The Breast, The Endocrine System, Bones Joints And Soft-Tissue, Peripheral Nerve And Skeletal Muscle, The Central Nervous System

Renal Function Tests, Nephrotic Syndrome, Nephritic Syndrome, Urolithiasis, Pap Smear, Carcinoma Of The Breast-Types And Classification, Thyroid Gland – Hyperthyroidism, Hypothyroidism, Thyroiditis, Graves Disease, Diffuse And Multinodular Goiters, Parathyroid Glands – Hyperparathyroidism, Hypoparathyroidism, Diabetes Mellitus, Fractures, Osteomyelitis, Arthritis, Osteoarthritis, Rheumatoid Arthritis, Infectious Arthritis, Diseases of Peripheral Nerve, Diseases of Skeletal Muscle, Infections of CNS – CSF Findings

REFERENCE BOOKS

1. Pocket companion to Pathologic Basis of Disease by Robbins and Cotran, 7th edition, Saunders.
2. Pathology Quick Review and MCQs by Harsh Mohan, 2nd edition, Jaypee Publications.

SEMESTER II

PATHOLOGY – UNIVERSITY PRACTICAL EXAMINATION

(Common to all courses)

Duration – 2 Hrs

Maximum Marks – 20

EXPERIMENTS:-

I. URINE EXAMINATION:

(8 Marks)

- Physical - 2 Marks
- Chemical (Any one) - 2 Marks
 - a) Test for Sugar
 - b) Test for Protein
 - c) Test Ketone bodies
- Microscopic Examination - 4 Marks

II. BLOOD EXAMINATION: (Any one of the following)

(8 Marks)

- Blood grouping
Bleeding time, clotting time
- Hb Estimation & PCV
- Differential Count
- WBC Count

III. SPOTTERS:

(4 Marks)

Any two instruments & 2 Charts

3. PHARMACOLOGY (UE)

UNIT-I: General Pharmacology

Introduction to pharmacology-various terminologies-sources & routes of drug administration – Absorption & Factors modifying drug absorption – Distribution of drugs – Metabolism: Phase II, - Excretion: routes, modes & kinetics of elimination – Excretion – Mechanism of drug action in brief, synergism & antagonism and Factors modifying drug action – Adverse drug reactions – ADR reporting & monitoring – Drug interactions.

UNIT-II: Central Nervous System & Respiratory System

Introduction to CNS and Neurotransmitters, drugs used in insomnia, Sedatives and hypnotics – diazepam – alprazolam, anti anxiety drugs, Antiepileptics – phenytoin, carbamazepine, sodium valproate, General Anesthetics – halothane, isoflurane, sevoflurane – Local Anesthetics – lignocaine – list of other drugs, Alcohols – ethyl alcohol – disulfuram, Anti parkinsonians – levodopa – carbidopa, Opioids – morphine – naloxone – tramadol – pentazocine, NSAIDs – aspirin – diclofenac – ibuprofen – paracetamol – cox 2 inhibitors. Drugs used in bronchial asthma and cough

UNIT-III: Cardio vascular system & blood

Drugs used in Ischemic Heart Disease-nitrates-Calcium channel blockers-nifedipine, verapamil-list of other drugs – Beta blockers – propranolol, atenolol – metoprolol and antiplatelets – aspirin, clopidogrel, and names of other drugs-fibrinolytic drugs-streptokinase and other drugs, Drugs used in CCF-digoxin and list of other drugs useful in CCF, Shock. Diuretics: 4 groups – Thiazides, Loop diuretics, Potassium sparing and osmotic diuretics. Hypertension – outline of drugs used in hypertension, Renin angiotensin system – ACE inhibitors – captopril, ramipril and names of other drugs – Receptor antagonist – losartan and list of other drugs, Antiarrhythmic drugs-classification – Quinidine, Lignocaine and amiodaron – Drugs for Hypercholesterolemia – statins. Drugs for anemia – oral & parenteral iron preparations, folic acid, vit B12 and erythropoietin. Coagulants and anti coagulants

UNIT-IV: Hormones and GIT

Contraceptives – oral and injectable, Corticosteroids – glucocorticoids – hydrocortisone-prednisolone-dexamethasone and names of topical steroids – Insulin – Oral hypoglycemic – sulphonyl ureas, biguanides and others, Thyroid and Antithyroid drugs, Sex Hormones-Estrogen and anti estrogens, Progestin and Anti progestins, Androgen And anti androgens.

Emetics and anti emetics-metoclopramide and domperidone, Drugs used in peptic ulcer, constipation-lactulose & Diarrhea-ORS-Loperamide.

UNIT-V: Chemotherapy and Miscellaneous

Introduction – Beta lactum antibiotics: Penicillins – natural, semi synthetic penicillins – amoxicillin – cloxacillin-clauvulinic acid – sulbactam – Cephalosporins – cephalexin – cefuroxime – cefixime – ceftriaxone-cefipime, Broad spectrum antibiotics – Doxycycline – chloramphenicol-imipenem-Macrolides – erythromycin, azithromycin and others – Quinolones- ciprofloxacin and list of other drugs and sulfonamides-cotrimoxazole- Amino glycosides-gentamycin, amikacin and names of other drugs Anti TB-first line drugs, Anti leprosy-dapsone and clofazimine Anti malarial- chloroquine- mefloquine and artemisinins, Anti fungal- amphotericin B- fluconazole and topical drugs & Anti viral drugs- acyclovir and anti HIV, Anti protozoals- metronidazole – Anthelmintics- albendazole- praziquantel.

Anti cancer drugs-Introduction – Anti metabolites- methotrexate- 6 mercapto purine- Alkylating agents- cyclophosphamide- busulphan and cisplatin – Plant products- vinblastin- vincristine- taxanes, antibiotics-actinomycin D- monoclonal antibodies.

Immuno modulators- cyclosporine, tacrolimus, azathioprine and steroids.

Toxicology-Drugs used in common poisoning, organophosphates, methyl alcohol, Benzodiazepam.

PRACTICALS:- SPOTTERS / CHARTS

REFERENCE BOOKS:

1. Lippincott's Illustrated Reviews: Pharmacology, 5th edition, by Richard A. Harvey and Pamela C. Champe, Lippincott Williams & Wilkins Publisher
2. Essentials of Medical Pharmacology: K.D. Tripathi, 6th edition, Jaypee Publishers.

4. ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE (IE)

UNIT – I:

- **Natural Resources:** Introduction, Multi-disciplinary nature of environmental studies, Earth Resources and Man, Renewable And Non-Renewable Resources, Water Resources, Mineral Resources: Food Resources: Effect of modern agriculture, Fertilizer/pesticide problems, Water logging, and salinity, Energy Resources.
- **Ecosystems:** Concept of an Ecosystem, Structure And Functions of an Ecosystem, Producers, Consumers and Decomposers, Cycles in the Ecosystem
- **Biodiversity:** Introduction, Definition: Genetic, Species, Ecosystem diversity, India as a Mega Diversity Nation, Hotspots Of Biodiversity Threats to Biodiversity. Poaching of Wildlife, Man-Wildlife Conflicts, Endangered and Endemic Species Of India, Conservation of Biodiversity

UNIT – II:

- **Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards, Solid Waste Management role of Individuals in Pollution Prevention.
- **Social Issues Human, Population and Environment:** From Unsustainable To Sustainable Development, Urban Problems Related To Energy, Water Conservation, rain Water Harvesting, global warming, acid rain, ozone layer depletion, nuclear accidents and nuclear holocaust. Environment Protection Act.

UNIT – III:

- **Concept of health & disease:** Concept of health, Definition of health, Philosophy of health- Dimension of health – Concept of well being, Spectrum of health, Responsibility of health – Determinates of health & Indicators of health – Concepts of disease & Concepts of cessation – Natural history of disease – Iceberg phenomenon, Concepts of control – Concepts of prevention – Modes of Intervention, Changing pattern of disease.

UNIT – IV:

- **Epidemiology:** Definition & explanation, Aims, Epidemiologic approach, Basic measurements in epidemiology & tools of measurements – Measurements of Mortality & Morbidity, Epidemiologic methods- Descriptive epidemiology- Analytical epidemiology – case control study – analytical epidemiology – Cohort study – Experimental epidemiology – RCT – Association & Causation Uses of epidemiology (Criteria for judging causality) – Infection disease epidemiology Definitions Dynamic of disease transmission & Modes of transmission – Disinfection – Definition Types Agents used Recommended disinfection procedures-Investigation of an epidemic.

Unit – V:

- **Environment & health:** Definition & components (environment sanitation environmental sanitation)
- **Water:** Safe & Whole some water Requirements Uses source of water supply (sanitary well)-Purification of water (1). Large scale purification, (2). Small scale purification – Water Quality – Special treatment of water
- **Air:** Composition The air of occupied room discomfort. Air pollution & its effects. Prevention & Control of air pollution
- **Ventilation:** Definition Standards_of ventilation Types of ventilation. Light, Noise & Radiation, Metrological environment, Housing, Disposal of waste Excreta disposal

PRACTICALS:

1. Epidemiology Problems
2. Environmental spotters

REFERENCE BOOK

1. Textbook of Preventive and Social medicine by k. Park, 21st edition, published by Banarsidas Bhano

5. Basics of nursing (IE)

CONTENTS

Unit I: Introduction of Health

Health care system, major health problems of the country, nature of disease pattern, technological advances and national health programmes, health for all by 2000 AD. Role of health care workers in the health care delivery system, impact of illness of the individual family and community.

History of Nursing

Communication Skills: Relationship with patients, process of communication

UNIT II: Concept of Nursing

Nursing Processes: Problems solving approach, assessment, diagnosis, planning, implementation and evaluation.

Unit III: First Aid and Nursing in Emergencies

- Definition, basic principles, scope and rules
- Wounds, haemorrhages, shock, fracture, dislocation and muscle injuries, respiratory emergencies, resuscitation, unconsciousness, Miscellaneous conditions, burns, scalds, foreign bodies in the skin, eyes, ear, nose, throat and stomach.
- Frost bite, effects of heart cramps, bites and stings.
- Poisoning
- Transporting injured persons.

Unit IV: Personal Hygiene and Health

- Care of skin, mouth, eyes, nails, hair
- Menstrual hygiene, clothing, mental health, common health problems of poor personal hygiene.
- Comfort, Rest and Sleep
- **Hospital Housekeeping**

Unit V: Health Education

Introduction to principles and methods of health education. Use of audio visual aids, mass education, role of nurse in health education.

LIST OF BOOKS

Anatomy

1. Manual of Anatomy and Physiology – Prof. P.Saraswathi (Vengadam Publishers, Phone no: 044-26263469)
2. B D Chaurasia: Gemera; human anatomy

Physiology

1. Basics of Medical Physiology (Third edition) by D. Venkatesh/H.H. Sudhakar

Psychology

1. Textbook of Biochemistry for Paramedical Students By Dr. P. Ramamoorthy
2. Essentials of Biochemistry by U. Sathyanarayana

Psychology

1. Psychology – The Sciences of Behaviour – Fifth edition 1982 – Neil Carlson – William Bulkist – Allyn and Bacon.
2. Psychology made simple – Abraham Sperling, Ph. D -Advisory editor – M.S. Gill. MA, Ph D- 'Made simple books' –W.H. Allen, London.

Elements of health and nursing principles

1. Clint & Geraldine, 2011, Potter and Perry's fundamentals of Nursing, Elsevier publications.

English

1. Effective English Communication by Krishna Mohan and Meenakshi Raman, Tata McGraw – Hill Publishing Company Limited, New Delhi. (Approx. Cost Rs. 200)

2. English for colleges and Competitive Exams by Dr. R. dyvadatham, Emerald Publishers (Approx. cost Rs. 150)

Microbiology

1. Prof C P Baveja – Text book of Microbiology.
2. Satish Gupte – Text Book of Microbiology

Pathology

1. Textbook of Pathology, Harsh Mohan, 3rd edition

Pharmacology

1. Prep Manual for Undergraduates in Pharmacology by Tara V Shanbag, 2nd edition
2. Pharmacology for Dental and Allied Health Sciences by Padmaja Udaykumar, 3rd edition

Medical Physics

1. Basic Radiological physics – K. Thayalan, Jaypee Brothers, Medical Publishers (P) Ltd, New Delhi.
2. Lasers and optical fibre communications-P. Sarah, I.K. Internation publishing House Pvt, Ltd. New Delhi.

Community Medicine

1. Park's Textbook of Preventive and Social Medicine-23rd Edition

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – III

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Histopathology – Theory(UE)	60	-	20	-	60	-	80	4
2.	Histopathology – Practical(UE)	-	120	-	20	-	60	80	4
3.	Cytology – Theory(UE)	60	-	20	-	60	-	80	4
4.	Cytology – Practical(UE)	-	120	-	20	-	60	80	4
5.	Basic Principles of Hospital Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Histopathology and Cytology: Comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

B.SC. ALLIED HEALTH SCIENCE
MEDICAL LABORATORY TECHNOLOGY
SYLLABUS
SEMESTER – III

1.Histopathology – Theory(UE)

Unit I: Introduction – Receipt and despatch of biopsy material Documentation

Unit II: Fixation Grossing, Tissue processing

- a) (Dehydration, clearing, impregnation, embedding)
- b) (Decalcification)

Unit III: Microtomy

- Knives & Knife sharpening
- Tissue sectioning, mounting etc.

Unit IV: Principles of staining

Staining techniques – Routine & special

Unit V: Filling, indexing & preservation of blocks etc.

Frozen section (Cryostat)
Museum techniques

2. Histopathology (Practical)

Note: Exercises / Spotters to be chosen by the examiners

EXERCISE: (3X10=30 marks)

- Tissue sectioning and H & E staining (1x10=10 marks)
- Special staining: (Any one of the following) (1x10=10 marks)
 - Perls stain
 - PAS stain
 - Giemsa stain
 - Ziehl – Neelsen stain
 - Reticulin stain
 - van Gieson stain
- Any one of the following: (1x10=10 marks)
 - Embedding
 - Frozen sectioning

SPOTTERS: (5x2=10 marks) (Any five of the following)

- Lab materials – Name & application of each:
 - Tissue cassette
 - Paraffin wax
 - Disposable blade for microtome
 - DPX
 - Waterbath
 - Diamond pencil
 - Cover slip
- Mention two applications of each:
 - Formalin
 - Chloroform
 - Alcohol
 - Xylene
- Charts / photographs:
 - Histokinette
 - Microtome
 - Cryostat
 - Embedding station

3. Cytology – Theory[UE]

Unit I:

- 1) Introduction to FNAC & Exfoliative cytology
- 2) Fixation of smears
- 3) Coating fixatives
 - a. Polyethylene glycol solution
 - b. Diaphane solution
- 4) Rehydration of air dried smears
- 5) Mailing of unstained smears
- 6) Preservation of fluid specimens prior to processing – Fresh material
 - a. Specimens with a high mucous content
 - b. Specimens with a high protein content
 - c. Specimens with a low mucous or protein content
 - d. Specimens with low PH
- 7) Pre fixation of material
 - a. Ethyl alcohol (50% solution)
 - b. Sacromannos fixative
 - c. Mucolex
- 8) Preparation of fluid smears for microscopic examination
- Direct or sediment smears on glass slides (fresh / clotted / bloody / prefixed)

Unit II:

- 1) Processing of fluids
 - a. Sputum, bronchial aspirates, bronchial washings, gastric washings
 - b. Urine & other watery fluids
 - c. Cerebrospinal fluid

Unit III:

- 1) Cytocentrifuge preparations
 - a. Shandon's cytospin
 - b. Unloading the machine
 - c. Operation
 - d. Comments
- 2) Preparation with membrane filters
 - a. Materials needed
 - b. Specimen requirements
 - c. Method of filtration
- 3) Preparation of cell blocks
 - a. Fixed sediment method
 - b. Bacterial agar method
 - c. Plasma thrombin clot method

Unit IV:

- 1) Preparations of stains and solutions used in the Papanicolau method
 - a. Graded alcohols
 - b. Bluing solutions
 - c. Preparation of Harris, Mayer, Lillie Mayer and Gill Haematoxylin

- d. EA50, EA36, EA65 and Orange G
- 2) Stains for hematologic material and air dried smears
 - a. Wright stain
 - b. Giemsa stain
 - c. Wright Giemsa stain
 - d. Modified May GrunwaldGiemsa stain

Unit V:

- 1) Important factors influencing staining results
 - a. Maintenance of solutions and stains
 - b. Dipping slides
 - c. Intensity of staining reaction
 - d. Contamination control
 - e. Important factors influencing the staining results of filters
 - f. Destaining slides
 - g. Timing
 - h. Dye solubility and impurities
 - i. Total dye content
 - j. Stains with special purpose depending on category, use stain and fixative
- 2) Mounting the cell sample
 - a. Mounting medium
 - b. Dissolving nuclear pore filters prior to staining
 - c. Dissolving nuclear pore filters after staining
 - d. Cover slips
 - e. Cover slipping the entire sample
 - f. Method of cover slipping glass slides and filters
 - g. Cooling slides
- 3) Stains used in hormonal evaluation
- 4) Stains used in the identification of sex chromatin

4. Cytology –Practical[UE]

Note: Exercises / Spotters to be chosen by the examiners

EXERCISE: (3x10=30 marks)

- Pap staining (1x10=15 marks)
- Any one the following: (1x10=15 marks)
 - Centrifuging fluid, making smear out of it and staining it with MGG (or) Leishman (or) Wright-Giemsa stain
 - Preparation of cytoteck smear and staining it with MGG (or) Leishman (or) Wright-Giemsa stain

SPOTTERS: (5X2=10 marks)

- Lab materials – Name & application of each:
- (Any two of the following) (2x2=4 marks)
 - Cytotek cassette
 - Pasteur pipette
 - Koplín jar
 - Diamond pencil
 - Mention two applications of the following: (Any one) (1x2=2 marks)
 - 95% ethanol
 - Absolute methanol
 - Xylene
- Charts: (Any two of the following) (2x2=4 marks)
 - Pap smear – normal
 - Pap smear – malignancy

EXAM PATTERN:

Exercise = 30 marks

Spotters / Charts = 10 marks

Viva = 20 marks

REFERENCE

Diagnostic Cytology and its Histopathologic Bases by “Leopald G Koss”, Third Edition

5. Basic Principles Of Hospital Management[UE]

(Common to all specialties – Anaesthesia Technology, Cardiac Technology, Clinical Laboratory Technology, Renal Dialysis Technology, Radiology & Imaging Science Technology and Perfusion Technology)

Unit I: Introduction to management & Organization

The evolution of Management, Definition and importance of Management. Planning – Organizing – staffing – Motivating – Leading – Controlling. Management of health care units (in brief). Individual behaviour in organization; organizational functioning (Group / Individual); Perception; Motivation MBO; Organizational Development.

Unit II: Planning and Management of Hospitals & Clinical Services:

Building and physical layout – space required for separate function – Planning of infrastructure facilities, clinical services, equipment & Human resources – Types of Hospitals. Organization and administration of various clinical services; outpatient services. In-patient services, emergency services, operation theatres, ICU's and super specialty services.

Unit III: Organizing of support clinical services & Hospital management:

Imaging – CSSD – Laboratory – Blood Bank – diet – Medical Records – Mortuary. Housekeeping – Maintenance (Water, Electricity, Civil, Air Conditioning, Lift) – Pest Control – transport – Security. Forecasting – Purchasing & procurement (Sourcing, methods and procedures). – Storing & Issuing, Concept of inventory control, Maintenance of equipments and contracts (with special reference to major biomedical equipments). Trends in financing of Health and Hospital Services – Classification of Hospitals depending on source of financing – roles of financial institutions.

Unit IV: Personnel and quality Management in Hospital & Marketing:

Concepts – Manpower planning – Training & Developments – Team Building – Conflict Management – Performance appraisal – Office rules and regulations Outline of Strategic Planning and Marketing. Concepts of quality – Professional Audit System – QA program – Medical Audit – Quality Circle – TQM – Patient Satisfaction – ISO 9000. A brief outline – computerization in hospital departments. Concept, Techniques, Indicators, Evaluation of Efficiency & Effectiveness evaluation of hospital and medical care services.

Unit V: Ethical, current issues and Legal Aspects of Hospitals management services:

Laws related to Hospital – Medico Legal Cases law of Torts – Autopsy – Dying declaration – CPA. – Waste Management – Telemedicine – Organ Transplantation – Rehabilitation Service – Health Insurance. Operations Research and Quantitative Methods in Hospital Administration & Nursing Services in a Hospital.

6. Clinicals In Histopathology And Cytology: Comprehensive Viva(IE)

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – IV

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Clinical pathology (Hematology & Urine Analysis – Theory(UE)	60	-	20	-	60	-	80	4
2.	Clinical pathology (Hematology & Urine Analysis – Practical(UE)	-	120	-	20	-	60	80	4
3.	Blood banking and Immunology – Theory(IE)	60	-	20	-	60	-	80	4
4.	Blood banking and Immunology – Practical(IE)	-	120	-	20	-	60	80	4
5.	Health Care Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Clinical pathology and Blood banking: comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

B.SC. ALLIED HEALTH SCIENCES
MEDICAL LABORATORY TECHNOLOGY

SYLLABUS

SEMESTER-IV

1. CLINICAL PATHOLOGY (HEMATOLOGY & URINE ANALYSIS – THEORY (UE))

Unit I:

- 1) Components of blood and their functions
- 2) Haematopoietic system of the body
- 3) Specimen collection for haematological studies
- 4) Discarding procedures
- 5) Cleaning of laboratory glassware in hematology
- 6) Determination of Hb concentration
- 7) Calculation of blood cell indices – MCA, MCH & MCHC
- 8) Estimation of erythrocyte sedimentation rate
- 9) Estimation of packed cell volume

Unit II:

- 1) Peripheral smear examination-staining, interpretation, normal & abnormal cells, parasites
- 2) Reticulocyte count
- 3) Counting on hemocytometer
- 4) Automated systems in hematology

Unit III:

- 1) Approach to the diagnosis of anemia
 - a. Screening for sickle cell anemia
 - b. Estimation of fetal Hb
 - c. Hemoglobin electrophoresis
 - d. Osmotic fragility test

- e. Heinz body preparation
- 2) Lupus erythematosus (LE) cell preparation
- 3) Approach to the diagnosis of leukemias
 - Cytochemical tests and other investigations
- 4) Preparation of bone marrow smears for microscopic examination

Unit IV:

- 1) Haemostasis
- 2) Mechanism of blood coagulation
- 3) Fibrinolysis
- 4) Bleeding time determination
- 5) Whole blood clotting time
- 6) Thrombin time
- 7) Clot retraction and lysis time
- 8) Preparation of blood samples for coagulation test
- 9) PT, PTT, APTT, Plasmarecalcification time, thrombin time
- 10) Lab diagnosis of bleeding disorders

Unit V:

- Urine analysis with manual & strip methods
- CSF analysis
- Analysis of serous fluids, synovial fluids, gastric juice
- Semen analysis

2. CLINICAL PATHOLOGY (HEMATOLOGY & URINE ANALYSIS) – PRACTICAL

Note: Exercises / Spotters to be chosen by the examiners

EXERCISE: (3x10=30 marks)

- Smearing peripheral blood, staining with Leishman stain and differential counting (1x10=10 marks)
- Any one of the following: (1x10=10 marks)
 - Urine physical & chemical examination for the presence of reducing sugar, protein, blood, ketone – manual method
 - Urine physical & chemical examination for the presence of reducing sugar, protein, blood, ketone – strip method
- Any one of the following: (1x10=10 marks)
 - Hb estimation by colorimeter
 - Estimation of ESR
 - Total count on hemocytometer
 - Staining of reticulocytes
 - Semiautomated PT
 - Semiautomated aPTT
 - Urine microscopic examination
 - Fluid – Physical examination, Total count
 - Fluid – differential count on a stained smear

SPOTTERS: (5X2=10 marks) (Any five of the following)

- Lab materials – Name & application of each:
 - Vacutainer – Lavender / Blue / Green / Grey topped
 - ESR tube
 - Cuvette
 - PCV tube
 - Pasteur pipette
 - Micropipette
 - RBC pipette
 - WBC pipette
 - Neubauer chamber
 - Bone marrow needle
 - Lancet
- Slide identification:
 - Malaria
 - Iron deficiency anemia
- Charts:
 - Microfilaria
 - Reticulocyte
 - Sickle cell
 - Chronic myeloid leukemia

EXAM PATTERN:

Exercise = 30 marks

Spotters / Charts = 10 marks

Viva = 20 marks

REFERENCE

“Medical Laboratory Technology: Methods and Interpretations” by R. Sood, 6th edition

3. BLOOD BANKING AND IMMUNOLOGY – THEORY (UE)

Unit I – Immunology

- Introduction to immunology
- Cells of Immune System
- Complement pathway
- Cytokines
- Hypersensitivity reactions
- HLA and Tissue typing
- Blood group genetics
- Elisa, Western blot

Unit II-Introduction to immunohematology-

- Introduction to immunohematology
- Characteristics of antigens – antibodies
- Factors influencing antigen – antibody reactions
- Principles of antibody potentiators
- Direct antiglobulin test
- Indirect antiglobulin test
- Sources of error in antiglobulin test
- Blood banking reagents
- Routine testing procedures in immunohematology laboratory
- ABO blood group system
- Rh blood group system
- Other blood groups

Unit III- Blood Banking Technology

- Blood donor selection
- Blood donor reactions
- Blood collection
- Blood component preparation and storage
- Blood component uses
- Pretransfusion testing
- Blood administration
- Adverse reactions of blood transfusion

Unit IV-Transfusion Transmitted Diseases and safety precautions

- Transfusion transmitted diseases
- HIV, HBsAg, HCV, Syphilis and Malaria
- Testing for TTI
- Universal precautions

Unit V- Quality Assurance and Regulation of Blood Bank Industry

- Blood bank licensing issues
- Good manufacturing practices
- Blood bank safety programs
 - Sickle cell
 - Chronic myeloid leukemia
 - LE cell

EXAM PATTERN: (UE) Total marks – 60

Exercise = 30 marks

Spotters / Charts = 10 marks

Viva = 20 marks

REFERENCE

“Medical Laboratory Technology: Methods and Interpretations” by R. Sood, 6th edition

4. BLOOD BANKING & IMMUNOLOGY – PRACTICALS[UE]

Note: Exercises / Spotters to be chosen by the examiners

Exercise: Any three of the following: (10x3= 30 marks)

1. Blood grouping & Rh typing
2. Cross matching
3. Direct Coombs test
4. Indirect Coombs test
5. TTI rapid tests
6. Antisera affinity & avidity

Spotters: Any five of the following: (2x5 = 10 marks) (1 mark for identification and 1 mark for mentioning the use)

1. Antisera
2. Gel cards
3. Pasteur pipette
4. Elisa plates
5. Antiglobulin reagents
6. TTI rapid test rate
7. Blood bags – single, double, triple
8. Fresh frozen plasma
9. Platelet concentrate
10. Leukodepletion filters

Viva = 20 marks

EXAM PATTERN: (UE) Total marks – 60

Exercise – 30 marks

Spotters – 10 marks

Viva – 20 marks

5. HEALTH CARE MANAGEMENT[UE]

UNIT I: Concept of Health Care and Health Policy

Health in Medical Care, Indigenous systems of Health Care & their relevance, Framework for Health Policy Development.

UNIT II: Health Organisation

Historical development of Health Care System in the third world & India, Organization & Structure of Health administration in India, Type of Health Organization including International Organizations, Private & Voluntary Health care provider, Distribution of Health Care Services, Health Care System in Public sector Organization, Health systems of Various Countries.

UNIT III: Health Policy and National Health Programme

National Health Policy, Drug Policy, National Health Programs (Malaria, T.B., Blindness, AIDS etc.,) Evaluation of Health Programs (Developing indicators for evaluation), Medical Education & Health Manpower Development.

UNIT IV: Health Economics – Fundamentals of Economics

Scope & Coverage, Demand for Health Services, Health as an Investment, Population, health of Economic Development. **Economics of Health-**

Population based health services, Economics of Communicable and Non Communicable diseases

UNIT V: Methods & Techniques of Economic Evaluation of Health Program

Cost Benefit & Cost Effective Methods

- **Household & Health**

Health Expenditure & Outcome, Rationale for Government action, Household capacity, income and schooling

- **Health Insurance.**

6.CLINICALS IN CLINICAL PATHOLOGY AND

BLOOD BANKING: COMPREHENSIVE VIVA (IE)

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – V

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Paper-I General Bacteriology, Immunology and Systematic Bacteriology – Theory(UE)	60	-	20	-	60	-	80	4
2.	Paper-I General Bacteriology, Immunology and Systematic Bacteriology – Practical(UE)	-	120	-	20	-	60	80	4
3.	Paper –II Virology, Mycology and Parasitology – Theory(UE)	60	-	20	-	60	-	80	4
4.	Paper –II Virology, Mycology and Parasitology – Practical(UE)	-	120	-	20	-	60	80	4
5.	Hospital Products, Promotion, Sales & Public relation (or) Physician's Office Management(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in General Bacteriology, Immunology, Virology and Mycology : comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

B.SC. ALLIED HEALTH SCIENCES
MEDICAL LABORATORY TECHNOLOGY

SYLLABUS

SEMESTER-V

**1. GENERAL BACTERIOLOGY, IMMUNOLOGY AND SYSTEMATIC
BACTERIOLOGY- THEORY (UE)**

Course Objective

This course will cover the following areas.

1. Basic principles of General Bacteriology and Immunology.
2. Fundamental knowledge about bacterial, viral, parasitic and fungal infections.
3. Techniques involved in diagnostic microbiology – preparation of media, sterilization and disinfections procedures, specimen collection, processing of clinical specimen, serological procedures etc.

Unit 1 : General bacteriology

- **Morphological** classification of bacteria
- **Bacterial cell structure** – cell wall, cytoplasmic membrane, cytoplasm, flagella, fimbriae, nucleic acids, capsule, spore (diagram of bacterial cell structure)
- **Definition of sterilization** and disinfection, classification of physical and chemical methods of sterilization, autoclave, hot air oven filtration, chemical agents of sterilization – alcohol, aldehydes, halogens, phenol, gaseous method of sterilization, surface active agents, quality controls for sterilization procedures

Unit 2: Culture media & methods

- **Culture Media** – Types – simple media, enriched media, enrichment media, selective media, indicator media, sugar media, transport media, anaerobic media (suitable examples)
- **Culture methods** – Aerobic culture method – streak culture, lawn culture, stroke culture, stab culture, inoculation in liquid culture, anaerobic culture media and methods Robertson's cooked meat media, thioglycollate medium, anaerobic jar
- **Identification of bacteria** – staining techniques – grams staining, acid fast staining.
Biochemical reactions – sugar fermentation and IMViC tests.
- **Antibiotic susceptibility testing** – Kirby Bauer disc diffusion test

Unit 3: Immunology

- Sources and spread of infections
- Immunity – definition types of immunity with examples, vaccines, antibodies – types and functions

- Antigen antibody reactions – precipitation, agglutination, ELISA, immunochromatography.
- Hypersensitivity – definition, types, anaphylaxis

Unit 4: Systemic Bacteriology

- Staphylococci, Streptococcus, - morphology, culture characteristics, Laboratory diagnosis
- Neisseria – Gonococcus and meningococcus – morphology, culture characteristics
- Gram negative bacilli – Escherichia coli, Klebsiella species, Proteus species, Pseudomonas species, Salmonella species, Shigella species, Vibrio species, Acinetobacter species – Morphology, cultural characteristics, laboratory diagnosis

Unit 5 :

- Mycobacterium tuberculosis – morphology, culture characteristics & Laboratory diagnosis
- Hospital acquired infections – definition, types, source and mode of spread of infection, hospital infection control
- Biomedical waste management – definition, segregation, management
- Universal precautions

2. GENERAL BACTERIOLOGY, IMMUNOLOGY AND SYSTEMATIC BACTERIOLOGY - PRACTICAL

Unit 1: General Bacteriology

- **Microscope** – Structure, operation, maintenance, types.
- **Staining techniques** – simple staining, Gram staining, Acid fast staining
- **Detection of motility by hanging drop.**
- **Sterilization – Autoclave** – Principle, working, maintenance

Hot air oven – Principle, working, maintenance

Chemical disinfectants – sodium hypochlorite, lysoformin, phenols, gluteraldehyde, chlorhexidine/betadine (Povidine iodine)-uses

Unit 2: Culture Media & Culture methods

- **Culture Media** – Types – simple media, enriched media, enrichment media, selective media, indicator media, sugar media, transport media, anaerobic media – **Preparation, sterilization and uses**
- **Culture methods** – Aerobic and anaerobic culture methods – **Techniques**
- **Identification of bacteria – biochemical reactions preparation and inoculation and interpretation**
- **Antibiotic susceptibility testing – Kirby Bauer disc diffusion test**

Unit 3: Immunology

- Serological tests – agglutination tests – Latex agglutination, tube agglutination
- Immunochromatography – Rapid card tests.
- ELISA (Enzyme linked immunosorbent assay)
- Mantoux test – Administration (type IV hypersensitivity)

Unit 4: Systemic Bacteriology

- Staphylococcus, Streptococcus – Microscopy, colony morphology, identification
- Neisseria – Gonococcus and meningococcus – Microscopy
- Gram negative bacilli – Escherichia coli, Klebsiella species, Proteus species, Pseudomonas species, Salmonella species, Shigella species, Vibrio species – Microscopy, colony morphology, Identification
- Mycobacterium tuberculosis – Microscopy, colony morphology, identification

Unit 5: Applied Microbiology

- Hospital acquired infections – definition, types, source and mode of spread of infection, hospital infection control – charts
- Biomedical waste management – spotter & charts

- Universal precautions – spotters & charts
- Drinking water analysis / Milk analysis
- Allergen testing

Exam pattern (UE) Total marks – 60

- 1. Spotters & Charts – 10 (10x2=20)**
- 2. Staining and culture techniques – 20**
- 3. Serological techniques – 10**
- 4. VIVA – 10**

3. VIROLOGY, MYCOLOGY AND PARASITOLOGY – THEORY (UE)

Unit 1 : General virology

- General properties of viruses – Basis structure of the virus, classification of viruses, viral multiplication
- Cultivation of viruses – Animal inoculation, embryonated eggs, tissue cultures
- Laboratory diagnosis of viral infections – Briefly on Microscopy detection of viral antigens and antibodies, isolation of virus, molecular diagnosis.
- Viral vaccines – Live and killed viral vaccine routinely administered

Unit 2: Medically important viruses I

- Mode of transmission, clinical manifestations, and preventive measures.
 1. Herpes simplex viruses (HSV I & II)
 2. Influenza virus
 3. Polio virus
 4. Measles.

Unit 3: Medically important viruses II

- Mode of transmission, clinical manifestations, and preventive measures.
 1. Dengue
 2. Japanese B encephalitis
 3. Chikungunya
 4. Hepatitis
 5. HIV

Unit 4: Medically important fungi

- Morphology & infections caused by – Candida species, Dermatophytes, Aspergillus species, Mucor & Rhizopus.
- Culture media and staining methods used in identification of fungi

Unit 5: Medically important parasites-

- Etiology, mode of transmission, sample to be collected – Ameobiasis, malaria, tape, worms, round worm, hook worm, filarial worm infections, pin worm, strongyloides & whip worm infections.
- Stool examination, Peripheral blood smear examination

4. VIROLOGY, MYCOLOGY AND PARASITOLOGY – PRACTICAL(UE)

- Sample collection-blood collection, serum separation, collection of other required specimens
- Rapid card tests & ELISA for detection of antigens and antibodies
- Fungal media preparation and inoculation – Sabouraud's Dextrose Agar, Corn meal agar.
- Staining techniques – LPCB mount, KOH mount
- Stool concentration techniques, identification of ova cyst in stool samples by saline and iodine mount,
- Peripheral blood smear – Preparation, Leishman's staining

Exam pattern (UE) Total marks - 60

- 1. Spotters & Charts – 10 (10x2=20)**
- 2. Staining and culture techniques – 20.**
- 3. Serological techniques – 10**
- 4. VIVA – 10**

5. HOSPITAL PRODUCTS, PROMOTION, SALES AND PUBLIC RELATIONS -(IE)

Unit I:

- **An introduction to Marketing**

Role of marketing in Business management – Evolution and definition of marketing – Concepts of Marketing – Service vs. Products – Management of Service Management process

- **Services Marketing**

Classification of services – Characteristics of services and their marketing implication – Selecting appropriate tools for marketing.

Unit II:

- **Component of Service Marketing**

Product Planning, Market research system – Market segmentation – Targeting – Positioning – Launching new service – Concept of product life cycle, Pricing, setting the price – Economic Theory – Responding to price change, Physical Distribution, Major Aspects – Channels of distribution – Selection of channel, Promotion, Role of communication – Promotion mix – Advertising (Media – budget – Cost effectiveness – (attributing to hospitals a human face – Good will – image building among major public), Sales promotion (techniques – Evaluation), Direct selling (Sales force – Evaluation), Physical Environment, Process, People **Unit III:**

Unit III:

- **Analysing Markets and Buyer Behaviour**

Model of consumer behavior – Factors influencing buyer behavior – Buying decision process.

- **Branding of a Hospital Facility**

Brand name and concept - Positioning hospitals – Developing and USP – Brand image – Image building – long term and short term activities.

Unit IV:

- **Other Marketing routes for Health Care Units**

Interpersonal communication – Print materials institutional marketing – seminars – conference.

- **One case study related to Hospital Marketing**

OR

5. PHYSICIAN'S OFFICE MANAGEMENT [IE]

UNIT I. Outpatient Section

Registration of new cases, Registration of repeat cases, Patient record guide, Laboratory X-Ray reports & reports & reports filing, Alpha index typing & Filing, O.P. Records coding (disease & indexing), O.P. records retrieval, O.P. Statistics

UNIT II. Inpatient Section

Admitting office procedure, Inpatient record removal & forwarding, Ward Census,

UNIT III. Assembling & deficiency checks, I.P. record coding & indexing,

UNIT IV. Discharge Analysis

Incomplete record control, Completed record control, Medico legal procedures & issue of Medical certification, Record retention & destruction of O.P. & I.P. records,

UNIT V. Miscellaneous

Hospital reception, Secretarial practice, Library (Medical)

**6. CLINICALS IN GENERAL BACTERIOLOGY, IMMUNOLOGY,
VIROLOGY AND MYCOLOGY: COMPREHENSIVE VIVA (IE)**

Exam pattern (IE) Total marks-100

1. VIVA-marks distribution (25 + 75 marks)

MEDICAL LABORATORY TECHNOLOGY

SCHEME OF EXAMINATION 2017-18

SEMESTER – VI

S.No	Paper	Hrs/Sem		Evaluation (Marks)					
		L	P	Internal Assessment		University Exams/Department* Exams		Total	Credits
				T	P	T	P		
1.	Clinical Chemistry Paper-I – Theory(UE)	60	-	20	-	60	-	80	4
2.	Clinical Chemistry Paper-I – Practical(UE)	-	120	-	20	-	60	80	4
3.	Clinical Chemistry Paper-II – Theory(UE)	60	-	20	-	60	-	80	4
4.	Clinical Chemistry Paper-II – Practical(UE)	-	120	-	20	-	60	80	4
5.	Trauma & Cardiac Life Support(IE)	60	-	20	-	60*	-	80	4
6.	Clinicals in Clinical Chemistry: comprehensive viva(IE)	-	180	-	25	-	75*	100	5
TOTAL									25

Total No. of Hours – 600 Hours

U.E.-University Examination

I.E.-Internal Examination.

*These examinations shall be conducted by the respective department.

B.SC. ALLIED HEALTH SCIENCES
MEDICAL LABORATORY TECHNOLOGY

SYLLABUS

SEMESTER-VI

1. CLINICAL CHEMISTRY PAPER – I – TEHEORY (UE)

Unit I

1. Role of a lab technician in Clinical Biochemistry lab.
2. Lab utensils: Beaker, Funnels, graduated cylinders, flasks, Volumetric flasks, Syringes, Pipettes, Micro pipettes, Multi – channel pipettes, Dilutors & dispensers. Quality control of micropipettes, Quality control validation for performance of pipettes.
3. Lab plastic & glass ware composition and cleaning.
4. Laboratory safety: Guidelines of OSHA, general safety (Fire, Electrical safety), Chemical Hygiene plan, Storage of chemicals, Labelling & Handling requirements, Waste generation & disposal

Unit II: Units of measurement

Measurement of mass – basic quantities and units of SI. SI derived units used in medicine. Types of balances – maintenances of balance.

Basic calculations in Laboratory. Normality, Molality, Molarity, Dilutions – per cent concentration (wt/w, v/v, w/v), pH, pk, buffer preparation.

Water as reagent – Reagent grade water – purification process – Grade of water purity – storage & handling of reagent water – suggested uses of reagent water – Quality control – system documentation & record keeping

Unit III: Instrumentation

Centrifuges – principles of centrifugation – centrifuge types, components, maintenance and quality assurance Water bath, Oven, Incubator – thermometer, calibration and maintenance

Photometry – principles of photometry. Components & applications of colorimeter. Spectrophotometer, Flame photometer, Nephelometer try, turbidimetry & reflectance photometry

Enzymes definition, action, and kinetics

Unit IV

Electrochemistry: Principles and measurements of electrochemistry & electro analytical chemistry. Potentiometry, Voltammetry coulometry methods – Principles, components, usage, advantages & disorder.

Electrophoresis – Principles, components, procedure, types, clinical application & interpretation of the data

Unit V

1. Chromatography – Principles, components, procedure, types, clinical application
2. Immunochemistry techniques – Principles of immunochemistry, detectors needed sensitivity & specificity – Elisa, Chemiluminscence, fluorescence assays.
3. Semi automatic, Automatic – Overview, Principles and methodologies used.

2. CLINICAL CHEMISTRY – PRACTICAL[UE]

Unit I – Pipetting & Weights and Measurements: Principles of weighing, usage of pipettes, pipetting

Practice – principles of weight – preparation of solutions, Normality – molality – molarity – Dilution – percentage (V/V, W/V, V/W)

Unit II – pH and Buffers – Preparation of different buffers – measurements of pH (pH paper, pH meter)

Unit III – Standardisation of Biochemical substances – Glucose, Urea, Creatinine

Unit IV – Estimation of Glucose, Urea, Creatinine, total protein, Albumin

Unit V – Charts / Spotters / Case Studies

1. Lab safety
2. Grading of reagent water
3. Conversion of Units
4. Calculation in Biochemistry
5. Waste generation St Disposal
6. PH
7. Buffer
8. Standardisation curve
9. Serum Protein Electrophoresis
10. Instrumentation – Identification

3. CLINICAL CHEMISTRY PAPER-II-THEORY (UE)

Unit I: Pre – analytical – Blood Collection – Types of blood sample – Preservatives & anti-coagulants – Errors related to it Vacutainer system procedures to decrease phlebotomy related variables – Patient identification sample collection – Past collection cause – sample transportation – Procedure to minimize sample transportation errors – use of mechanical transporters – sample processing – procedures – Pre analytical variables in urine collections – pre-analytical variables in other body fluids – Blood collection for inborn errors of Metabolism – criteria for rejection of specimens

Unit II: Analytical-

1. Overview of glucose homeostasis, Definition of Diabetes, overview of pathophysiology, Type I, II, GDM, Pre-Diabetes. Methodologies, comparison of methodologies, reference level. Diagnostic guidelines – Glucose, Insulin, C-Peptide, Glucose Tolerance test Determination, usage of HbA1C methodology to estimate.
2. Lipid Profile: Definition of lipid, Overview of types of lipid, distribution, their role in the LDL – Estimation of Total Cholesterol, triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol – Methodology – Reference level – Diagnostic guidelines.
3. Liver Profile – Overview of Liver damage and the tests to identify it – total protein, Albumin, Bilirubin (Total & Direct), ALT, AST, ALP & GGT – Methodology – Reference level.
4. Renal Profile – Overview about Renal function, GFR, tubular function tests.
5. Minerals: Role of minerals in health – estimation of calcium, phosphorus, Magnesium, Iron, copper – Methodology – Reference level – interpretation of data.

Vitamins: Estimation of Folic acid, Vitamin B12 Vitamin D, Vitamin K, Vitamin B6- methodology – Reference level – interpretation of data

Unit III: Special Investigations: Hormones

Thyroid Gland Regulation, Test to Identify Thyroid disorder (T3, T4, FT3, FT4, TSH), Methodology and interpretation, Role of PTH in our Body, Tests to identify parathyroid disorder, PTH (free and Intact) Interpretation, Tests for Infertility LH, FSH, Prolactin, Estradiol, Testosterone (Free & total), B HCG interpretation, Methodologies existing, Hormone analysis

Unit IV: Other Special Investigations

- Tumour markers – Investigation for Myocardial Infraction – Investigation for acute Pancreatitis – Acid – base abnormality – Anion Gap
- Nutritional assessment – Negative Nitrogen Balance – Positive Nitrogen Balance

Unit V: Quality Control:

Sensitivity – Specificity – Linearity – Accuracy & Precision, Primary Standard, Secondary standard, Calibration – Internal Quality control indicators, External Quality Control Program, test utilization and turn around time, around time, Regulations for Lab (by Indian Govt International: Guidelines). Hospital management structure – organisation of clinical lab, Communication within the total hospital, communication within the lab, Personal Management, Work Scheduling, Continuous Quality improvement – Continuing education – resource management (Lab staff, reagents, supplies & capital equipment).

4. CLINICAL CHEMISTRY PAPER II – PRACTICAL[UE]

Unit I-Estimation of Bilirubin, Cholesterol, Triglycerides, Uric Acid, Calcium, Phosphorus

Unit II-Estimation of Enzymes amylase, Alkaline Phosphatase, Lipase

Unit III-Electrophoresis – Agar gel Electrophoresis – serum Protein Electrophoresis Identification and interpretation

Unit IV-Chromatography – Circular paper chromatography – separation of Aminoacids & Sugars and calculation of Rf values

Unit V-Charts/Spotters/Case Studies

- Preservatives
- Anti-coagulants
- Types of Samples
- Vacutainers
- Blood Collection
- Reference interval
- Glucose Tolerance test graphs
- Interpretation of Routine tests
- QC materials
- Guideline for regulation of Lab

5.TRAUMA & CARDIAC LIFE SUPPORT[IE]

UNIT I. TRAUMA LIFE (Part 1)

- BLS
- TRIAGE
 - a. Primary Survey
 - b. Secondary Survey
- Airway & Ventilatory management
- Shock
- Central & peripheral venous access
- Thoracic trauma – Tension pneumothorax
- Other thoracic injuries
- Abdominal trauma – Blunt injuries
- Abdominal trauma – Penetrating injuries

UNIT II. TRAUMA LIFE (Part 2)

- Spine and spinal cord trauma
- Head trauma
- Musculoskeletal trauma
- Electrical injuries
- Thermal burns
- Cold injury

UNIT III. TRAUMA LIFE (Part 3)

- Paediatric trauma
- Trauma in pregnant women
- Workshop BLS
- Workshop cervical spine immobilization
- Imaging studies in trauma

UNIT IV. CARDIAC LIFE SUPPORT (Part 1)

- BLS
- The universal algorithm for adult ECC
- Ventricular fibrillation/Pulseless ventricular tachycardia algorithm
- Pulseless electrical activity (PEA) / asystole algorithm
- Bradycardia treatment algorithm
- Tachycardia Treatment algorithm

UNIT V. CARDIAC LIFE SUPPORT (Part 2)

- Hypotension / Shock
- Acute myocardial infarction
- Paediatric Advanced life support

- Airway management
- Defibrillation
- Drugs used in ACLS
- SEmergency Cardiac pacing
- AED
- Techniques for oxygenation and ventilation

6. CLINICALS IN CLINICAL CHEMISTRY : COMPREHENSIVE VIVA (IE)

Text Book

1. Medical Lab Technology Methods & Interpretation – Ramnik Sood
2. Medical Lab Technology (3 Units) – Mukerjee

Reference Books

- 1) An introduction to practical Biochemistry 3rd ed. – David T. Plummer
- 2) Hand Book of Quality Assurance in Laboratory Medicine – Dr. Shubangi Tambwekar
- 3) Biochemical Calculation 2nd – Irwin H. Segel
- 4) Text book of Practical Biochemistry – Varley

ALLIED HEALTH SCIENCE

*INTERNSHIP
PROGRAMME*

ALLIED HEALTH SCIENCE

INTERNSHIP

Regulation for Internship

Internship is an important part of training wherein an Allied Health Science Graduate acquires skills, and applies his knowledge gained during his course of study.

Objectives:

1. To Facilitate Reinforcement of Training.
2. To Develop Professionalism, Communication and Team Building skills.
3. To help in understating of ethical Practices like
 - Rights and dignity of patients
 - Ethical Conduct and professional obligations to colleagues, patients, families and community

The Internship is compulsory for all the candidates. It shall commence after the students have completed and passed all academic and clinical requirements.

The internship shall be for a duration of one year.

The degree shall be awarded after satisfactory completion of internship.

EVALUATION OF INTERNEES

Formative and Summative evaluation are carried out. A **Log Book** is maintained by all interneers. No Marks are allotted. Satisfactory completion of Log Book is essential for completion of internship.

Day to day assessment of the interneers during the internship posting should be done (Log Book). Summative evaluation is based on observation of the supervisors of different department and their records in the log books. Based on the formative and summative evaluation the head of department shall issue certificate of satisfactory completion of training, following which the university shall award the degree.

During internship a project is allocated to each intern by the respective Heads of departments. The project work is marked for 100 (including viva).

Six credits are given for the project

30 hours per credit

The Project is done for a Maximum duration of 6 months.

Internship credits

The internship is given 15 Credits. (i.e.) 45 hrs/Credit. A Total of 675 hours.

After Undergoing internship for a period of Six months, each Department shall conduct an **internal evaluation** of the student to assess the skills developed and progress of the student before issuing the certificate of completeness.

The duration of the posting and skill acquisition in various technology courses are attached.

Number of Working days for interns:-

All Sundays are holidays.

On Government holidays duties are allotted on turns to the interns. In cases of leave or absence extension of posting shall be given which is done at the discretion of Head of Department.

COMMON TO ALL BRANCHES

INTERNSHIP [VII & VIII SEMESTER]

Sl. No.	Programme	Hours Prescribed	University Examination			Credits
			Project Evaluation Max-80	Viva Max-20	Total Max-100	
1	Internship	675				15
2	Project	6 months	-	-	-	6
No Minimum for Passing		Total Credits				21

MEDICAL LABORATORY TECHNOLOGY

In the first six months every internee has to undergo one month posting in each department (Microbiology, Blood Bank, Histopathology & Cytology, Clinical Pathology, Clinical Chemistry, Human Genetics) and next six months they are given a choice to choose any of the above mentioned departments to specialize in that particular field.

Microbiology

Duration of postings - 1 month

The student should:

- Have the basic knowledge of all laboratory diagnostic procedures for infectious diseases
- Have the skills to carry out all microbiological technical procedures
- Be able to supervise sterilization and disinfection procedures in the laboratory
- Have knowledge of handling instruments and maintenance of equipments related to microbiology
- Be able to follow procedures needed for maintain quality control in the laboratory
- Have the basic knowledge about molecular techniques and special microscopic procedures

Blood Bank, Histopathology & Cytology, Clinical Pathology

Duration of postings

Blood Banking	-	1 month
Clinical Pathology	-	1 month
Histopathology / Cytology	-	1 month

Skill Acquisition

The intern is expected to demonstrate competence and independence in carrying out the following activities:

I. Blood Banking

- Have adequate skills to administer required protocols and develop good laboratory practice of standard operative procedures related to blood screening, blood collection and processing
- Have adequate training for donor education, motivation, recruitment and selection
- Have adequate basic knowledge relating to various machineries involved in executing blood bank procedures
- Be able to write reports as well as counsel the donors
- Be able to independently pain, execute and maintain records relating to all blood bank procedures
- Be capable of handling problems associated with various test reports as well as trouble shooting and maintenance of various machines involved in the execution of blood banking procedures
- Be capable of handling and rectifying errors occurring in day to day practice
- Have had adequate exposure to blood donation camps and be capable of organizing them individually as well as have interaction with the public

II. Clinical Pathology

- Have knowledge and be able to perform all the diagnostic tests done in the laboratory according to standard operative procedure
- Have basic knowledge about operation and maintenance of all equipments used in the laboratory including troubleshooting
- Should know about quality control programmes implemented in the laboratory
- Be familiar with the normal reference ranges of all tests done in the laboratory and be able to interpret results which are out of range

- Should be able to handle administrative and supervisory responsibilities

III. Histopathology

- Should be familiar with types of specimens received in the laboratory
- Should be able to receive tissue bits during grossing
- Should be well versed in tissue processing, embedding and sector cutting
- Have basic knowledge about routine and special stains used in the laboratory
- Should know about working of all equipments including maintenance and troubleshooting
- Have basic knowledge about special procedures like cryostat sectoring / microwave processing and immunohistochemistry

IV. Cytology

- Should be able to instruct patient and obtain consent for FNAC
- Be familiar with fixation of slides (WET / air dry)
- Should be familiar with staining of slides
- Well versed with PAP stain
- Have basic knowledge about cytospin preparation and processing of different body fluids

Clinical Biochemistry

Duration of postings

Skills - 1 month

- Students are advised to take precautionary steps against infection-wearing mask and gloves. The students are advised to wash hands with water and antiseptic solution before and after each procedure
- Students are trained in drawing samples using vacutainers
- They are given an idea about all the anticoagulants and how they have an effect on sample values

- The students are taught about collection of urine samples and use of various urine preservatives
- Students process all the collected samples and are advised to take necessary steps in case of hemolysed, icteric or lipemic samples
- Students are taught about calibration of instruments. After having accepted the control values, the students start analyzing the patient samples. Students are given instructions in handling critical values
- Statistical samples and critical values are reported immediately. All techniques are taught and monitored by senior biochemists
- Students are exposed to ABG analyzer, ACS chemiluminescence, dipstick methods etc.

Human Genetics

(Rotation for Medical Laboratory Technology students)

Duration of postings - 1 month

Objective: To expose students to basic diagnostic laboratory genetic technology

The student will be trained in:

- Basic knowledge about different microscopes cell culture techniques fixing, staining and banding techniques
- To observe Cytogenetics, Moloecular Genetics, Biochemical Genetics and other laboratory genetics protocols
- Participate in Genetic counselling
