



YENEPOYA UNIVERSITY

Deralakatte, Mangaluru - 575018

REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

B.Sc MEDICAL LABORATORY TECHNOLOGY

(CURRICULUM - EFFECTIVE FROM 2010-11)

ATTESTED

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Ref: No.YU/REG/ACA/3-ACM/2009

31.10.2009

NOTIFICATION

Sub: Starting of B.Sc. Medical Laboratory course with syllabus

Ref: Resolution of the Academic Council at its 3rd Academic Council meeting held
on 31.10.2009, vide agenda - 12

The Academic Council at its 3rd meeting subsequently the Board of Management at its
9th meeting held on 31.10.2009 have resolved to approve the proposal to start the B.Sc.
Medical Laboratory course with the syllabus.

This notification is issued for implementation with effect from the academic year 2010-
2011.



REGISTRAR

To:

The Principal - YMC

Copy to:

1. Controller of Examinations
2. Academic Section



Office of the Registrar
University Road,
Deralakatte
Mangalore - 575018
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10.07.2015

NOTIFICATION

Sub: Starting of B.Sc. Medical Laboratory course with syllabus

Ref: (1) Resolution of the Academic Council at its 3rd Academic Council held on 31.10.2009, vide agenda – 12

(2) This office notification no. YU/REG/ACA/3-ACM/2009 dated 31.10.2009

In partial modification of the notification No. YU/REG/ACA/3-ACM/2009 dated 31.10.2009 with regard to starting of B.Sc. Medical Laboratory program from the academic year 2010-2011, it is hereby re-notified that the said B.Sc. Medical Laboratory Program shall commence from the year 2015-2016 onwards.

To:

The Principal - YMC

Copy to:

1. Controller of Examinations
2. Academic Section


REGISTRAR
Registrar
Yenepoya University
University Road, Deralakatte
Mangalore - 575018

Preamble:

Health care sector has become one of the largest employment generation sectors in India and abroad. Rapidly changing and expanding horizon of the health care sector demands formal training programs in all its allied areas. Advanced complex instrumentation & equipment require technologists not only to operate but also to care & maintain these instruments and equipment. These technologists should possess a strong scientific foundation to be able to perform these tasks at a much higher level than the traditionally trained technicians of the past used to perform. The students who are trained in the technological aspects of medical care with a good scientific foundation will be in a position to competently assist the Physician or Surgeon With these goals Yenepoya deemed to be University , under Faculty of Allied Health Care started Bachelor of Science in Medical Technology in 2015 with a annual scheme of examination.

Objective: To produce skilled technologist with a strong scientific foundation who has knowledge, confidence, values and skills to perform and assist diagnostic and therapeutic services in his specialty.

**Regulations and Course Curriculum for
Bachelor of Science in Medical Laboratory Technology - B.Sc. MLT**

Title of the Course: Bachelors of Science Medical Laboratory Technology

Eligibility for admission:

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

Note:

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

Duration of the course:

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

Medium of instruction:

The medium of instruction and examination shall be in English.

Attendance

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

Internal assessment (IA):

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

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

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

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

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

Conduct and discipline:

- 1) Candidates shall conduct themselves within and outside the premises of the Institute in a manner befitting the student of an Institution of national importance.
- 2) As per the order of Honorable Supreme Court of India, **ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.**
- 3) The following act of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:
 - a) Ragging as defined and described by the Supreme Court/Government
 - b) Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.
 - c) Wilful damage or stealthy removal of any property/belongings of the Institute/Hostel or of fellow students/citizens.
 - d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
 - e) Mutilation or unauthorized possession of library books.
 - f) Noisy or unseemly behaviour, disturbing studies of fellow students.
 - g) Hacking in computer systems (such as entering into other person's domain without prior permission, manipulation and/or damage to the computer hardware and software or any other cyber crime etc.)
 - h) Plagiarism of any nature.

- i) Any other act of gross indiscipline as decided by the Board of Management from time to time.
- 4) Commensurate with the gravity of offense, the punishment may be: reprimand, fine, expulsion from the hostel, debarment from an examination, disallowing the use of certain facilities of the Institute, rustication for a specific period or even outright expulsion from the institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

Course of instructions:

Subject and hours of teaching for Theory and Practicals

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

Main and Subsidiary subjects are common in first year for all the courses in Allied Health Science.

The number of hours for teaching theory and practical for main subjects in first, Second and Third year are shown in Table-I, II and III.

Table - I Distribution of Teaching Hours in First Year Subjects

Main Subjects				
Sl.No	Subject	Theory	Practical	Total
		No. of hours	No. of hours	No. of hours
1.	Human Anatomy	70	20	90
2.	Physiology	70	20	90
3.	Biochemistry I	70	20	90
4.	Pathology I	70	20	90
5.	Microbiology I	70	20	90
	Total	350	100	450

Sl.No	Subsidiary Subject	Theory
		No. of hours
1.	English	25
2.	Kannada	25
3.	Healthcare	40
	Clinical /Lab Postings	470

Table - II Distribution of Teaching Hours in Second Year Subjects

Main Subjects					
Sl.No	Subject	Theory	Practical	Clinical /Lab Posting	Total
		No. of hours	No. of hours	No. of hours	No. of hours
1.	Biochemistry II	100	80	170	350
2.	Pathology II	100	80	170	350
3.	Microbiology II	100	80	170	350
	Total	300	240	510	1050

Sl.No	Subsidiary Subject	Theory
		No. of hours
1.	Sociology	20
2.	Constitution of India	10
3.	Environmental Science & Health	50

Table - III Distribution of Teaching Hours in Third Year Subjects

Main Subjects					
Sl.No.	Subject	Theory	Practical	Clinical /Lab Posting	Total
		No. of hours	No. of hours	No. of hours	No. of hours
1.	Biochemistry III	100	80	170	350
2.	Pathology III	100	80	170	350
3.	Microbiology III	100	80	170	350
	Total	300	240	510	1050

Sl.No.	Subsidiary Subject	Theory
		No. of hours
1.	Ethics & Database Management	50
2.	Research & Biostatistics	20
3.	Computer Application	10

Scheme of Examination:

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

First Year Examination:

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

The University examination for 1st year shall consist of theory examinations **ONLY**.

Second and Third year Examination:

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

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

For I year

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

Subsidiary subjects: English, Kannada, Healthcare

TABLE- IV

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

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

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

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

IA = Internal Assessment

Main Subjects shall have University Examination.

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

TABLE – V

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

Paper	Subject	Theory			Practicals			Grand Total
		Univ. Exam	IA	Sub Total	Univ. Prac.	IA	Sub Total	
I	Biochemistry II	80	20	100	80	20	100	200
II	Pathology II	80	20	100	80	20	100	200
III	Microbiology II	80	20	100	80	20	100	200

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

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

TABLE – VI**Distribution of Subjects and marks for Third Year Examination of B.Sc. MLT**

Paper	Subject	Theory			Practicals			Grand Total
		Univ. Exam	IA	Sub Total	Univ. Prac.	IA	Sub Total	
I	Biochemistry III	80	20	100	80	20	100	200
II	Pathology III	80	20	100	80	20	100	200
III	Microbiology III	80	20	100	80	20	100	200

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

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

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

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

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

Question paper pattern:

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

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

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

Board of Examiners:

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

Criteria for pass:

First year examination.

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

Second and Third year Examination

Main Subjects:

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

Declaration of Class:

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

70% and above - First Class with Distinction

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

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

Carry over benefit:

First year examination:

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

Second year examination:

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

Supplementary Examination:

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

Internship

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

Rules for grace marks:

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

Re-totalling:

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

Eligibility for the award of Degree:

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

Award of Ranks:

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

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

Maximum period for completion of course:

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

CURRICULUM

I Year

Human Anatomy

Physiology

Biochemistry I

Pathology I

Microbiology I

English

Kannada

Healthcare

II Year

Biochemistry II

Pathology II

Microbiology II

Sociology

Constitution of India

Environmental Science & Health

III Year

Biochemistry III

Pathology III

Microbiology III

Ethics & Database Management

Biostatistics & Research

Basics in Computer Application

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

ANATOMY

No. of theory classes: 70 hours

No. of practical classes: 20 hours

1. Introduction: human body as a whole Theory:

Definition of anatomy and its divisions

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

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

Practical: Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

2. Locomotion and support Theory:

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

Practical: Histology of the 3 types of cartilage

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

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

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

3. Cardiovascular System Theory:

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

Practical:

Demonstration of heart and vessels in the body

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

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

Histology of lymph node, spleen, tonsil & thymus

Normal chest radiograph showing heart shadows, Normal angiograms

4. Gastro-intestinal system Theory:

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

5. Respiratory system Theory

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

Practical: Demonstration of parts of respiratory system.

Normal radiographs of chest
Histology of lung and trachea

6. Peritoneum

Theory: Description in brief

Practical: Demonstration of reflections

7. Urinary system Theory:

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

Practical: demonstration of parts of urinary system

Histology of kidney, ureter, urinary bladder

Radiographs of abdomen-IVP, retrograde cystogram

8. Reproductive system Theory:

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

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

Histology of uterus, fallopian tubes, ovary

Radiographs of pelvis – hysterosalpingogram

9. Endocrine glands Theory:

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

Practical: Demonstration of the glands

Histology of pituitary, thyroid, parathyroid, suprarenal glands

10. Nervous system Theory:

- Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology)
- Meninges, Ventricles & cerebrospinal fluid,
- Names of basal nuclei

- Blood supply of brain,
- Cranial nerves, Sympathetic trunk
- Names of parasympathetic ganglia

Practical: Histology of peripheral nerve & optic nerve
 Demonstration of all plexuses and nerves in the body
 Demonstration of all part of brain
 Histology of cerebrum, cerebellum, spinal cord

11. Sensory organs Theory:

Skin: Skin-histology, Appendages of skin

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

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

Practical: Histology of thin and thick skin
 Demonstration and histology of eyeball
 Histology of cornea & retina

12. Embryology Theory:

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

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination

Internal assessment marks secured in Practicals need not be sent to the University.

Scheme of Examination Theory

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

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

REFERENCE BOOKS

Anatomy

1. William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill
2. Chaurasia –A Text book of Anatomy T.S. Ranganathan – A text book of Human Anatomy
3. Fattana, Human anatomy (Description and applied) Saunder’s & C P Prism Publishers, Bangalore – 1991
4. ESTER. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
5. Essentials of Human embryology – Revised Edition Orient Blackswan Pvt. Ltd.

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

PHYSIOLOGY

Theory 70 hours

Practical 20 hours

1. Introduction – General Physiology

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

2. Blood

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

3. Cardiovascular system

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

4. Digestive System

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

5. Respiratory system

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

6. Endocrine System

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

7. Special senses

- Vision – Function of different parts (brief), Optic pathway, Dark adaptation, Colour vision, structure of eye, structure of retina.
- Hearing - functions of middle ear, functions of inner ear, mechanism of hearing (brief)

- Chemical senses: Taste – types, receptors.
- Smell - physiology, receptors.

8. Nervous system

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

9. Excretory System

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

10. Reproductive system

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

11. Muscle nerve physiology

- Introduction, Classification and structure of muscle, Sarcomere
- Neuromuscular junction, Transmission across Neuromuscular junction.

- Excitation contraction coupling. Mechanism of muscle contraction, Rigor mortis
- Contractile proteins, fatigue

12. Skin and Body temperature

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

Internal Assessment

Theory: Average of two exams conducted. 20

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

Scheme of Examination Theory

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

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

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Physiology

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

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

BIOCHEMISTRY I

No. Theory classes: 70 hours

No. of practical classes: 20 hours

Theory:

1. Introduction and scope of Biochemistry

2. Specimen collection:

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

3. Introduction to Laboratory apparatus

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

4. Measuring cylinders, Porcelain dish

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

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

- Use, care and maintenance of – water bath, Oven & Incubators, Water Distillation plant, water deionisers, refrigerators, cold box, deep freezers, Reflux condenser, centrifuge, balances, colorimeter, spectrophotometer, pH meter and electrodes

- Centrifuge - Definition, Principle, Svedberg unit, centrifugal force, centrifugal field, RPM, Conversion of G to RPM and vice versa, Different types of centrifuges
- Manual balances: Single pan, double pan, triple balance, Direct read out electrical balances. Guideline to be followed and precautions to be taken while weighing
- Weighing different types of chemicals, liquids, hygroscopic compounds etc
- Colorimeter and spectrophotometer, pH meter, electrodes, salt bridge solution – Principles, parts, types, guidelines to be followed and precautions to be taken while using.

6. Safety of measurements

4. Conventional and SI units

5. Atomic structure

- Dalton's theory, Properties of electrons, protons, neutrons, and nucleus
- Rutherford's model of atomic structure
- Bohr's model of atomic structure, orbit and orbital, Quantum numbers, Heisenberg's uncertainly principle
- Electronic configuration – Aufbau principle, Pauli's exclusion principle, etc.
- Valency and bonds – different types of strong and weak bonds in detail with examples
- Theory & Practicals for all the following under this section -
Molecular weight, equivalent weight of elements and compounds, normality, molarity
- Preparation of molar solutions (mole/liter solution) eg: 1 M NaCl, 0.15 M NaCl, 1 M NaOH, 0.1 M HCl, 0.1 M H₂SO₄ etc.,
- Preparation of normal solutions. eg., 1N Na₂CO₃, 0.1N Oxalic acid, 0.1 N HCl, 0.1N H₂SO₄, 0.66 N H₂SO₄ etc.,
- Percent solutions. Preparation of different solutions – v/v, w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution

7. Dilutions

- Diluting solutions: eg. Preparation of 0.1 N NaCl from 1 N NaCl and from 2 N NaCl etc.,
- Preparing working standard from stock standard
- Body fluid dilutions, Reagent dilution techniques, calculating the dilution of a solution, body fluid, reagent etc.,
- Saturated and supersaturated solutions.
- Standard solutions. Technique for preparation of standard solutions eg: Glucose, urea, etc., Significance of volumetric flask in preparing standard solutions.
- Volumetric flasks of different sizes, Preparation of standard solutions of deliquescent compounds (CaCl₂, K₂CO₃, NaOH etc.,)
- Preparation of standards using conventional and SI units, Acids, bases, salts and indicators.

7. Acids and Bases

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

polyprotic acids and bases.

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

8. Acid- base indicators:

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

9. Quality control

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

10. Special Investigations:

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

-
- **PRACTICALS**
 - Analysis of Normal Urine
 - Composition of urine
 - Procedure for routine screening
 - Urinary screening for inborn errors of metabolism
 - Common renal disease
 - Urinary calculus
 - Urine examination for detection of abnormal constituents
 - Interpretation and Diagnosis through charts
 - Liver Function tests
 - Lipid Profile
 - Renal Function test
 - Cardiac markers
 - Blood gas and Electrolytes
 - Estimation of Blood sugar, Blood Urea and electrolytes
 - Demonstration of Strips
 - Demonstration of Glucometer

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

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

Scheme of Examination Theory

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

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

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Biochemistry

1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient Longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed
6. Das(Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

PATHOLOGY I

Theory – 70 hours

Practical – 20 hours

Histo Pathology, Clinical Pathology, Haematology and Blood Banking

1. Histopathology - Theory

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

2. Clinical Pathology - Theory

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

3. Hematology – Theory

- Introduction to Hematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Hematology
- Various instruments and glassware used in Hematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV, ESR
- Normal Haemostasis
- Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time

4. Blood Bank

- Introduction
- Blood grouping and Rh Types
- Cross matching

PRACTICALS

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

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

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

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks.

Distribution of type of questions and marks for Pathology shall be as given under.

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

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Pathology –

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

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

Microbiology I

Objectives: -

- To know the concepts and principles of Microbiology and its importance
- To know the structure, classification, morphology and growth of Pathogenic bacteria
- To know the methods of Infection control and role in hospital infection control program
- To know the different disease producing micro-organisms
- Describe the various diagnostic tests employed in laboratory diagnosis of diseases
- Explain the concepts of Immunity, Hypersensitivity and Immunization

Theory - 70 hours

Practicals -20 hours

1. Introduction

History of Microbiology, Classification of microorganisms, Morphology of bacterial cell, parts of bacterial cell, bacterial spore and its importance.

2. Growth and nutrition

Nutrition, growth and multiplications of bacteria, culture media and culture methods.

3. Sterilisation and Disinfection

Principles and its use in Laboratory and Hospital, and disinfection methods, chemicals used in disinfection

4. Immunology

Immunity, Concepts of Immunity, Types of Immunity

Vaccines, immunization schedule

Definition of Antigen, antibody, list of antigen reaction and their application

5. Systematic Bacteriology

Disease caused and lab diagnosis of medically important bacteria

(Staphylococcus, Streptococcus, Neisseria, Esch coli, Salmonella, Shigella, Vibrio, Mycobacteria, Treponema, Leptospira)

6. Parasitology

Introduction to Parasitology, List of medically important parasites and diseases (Morphology, life cycle & diagnosis of E. histolytica, Plasmodium, W.Bancrofti, Ascaris, Ancylostoma), Lab diagnosis of Parasitic infections

7. Mycology

Introduction to Mycology, List of medically important fungi and diseases (discuss

Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis, Mucor mycosis

Lab diagnosis of fungal infections.

8. Virology

Introduction to Virology, Classification of virus, cultivation

List of medically important viruses and diseases (Briefly discuss the disease, causative agent

and diagnosis of AIDS, Hepatitis, Rabies, Polio, Influenza, Dengue, Chikungunya)
Lab Diagnosis of viral infections.

9. Hospital infection Causative agents, transmission methods, investigation, prevention and control Hospital infection.

10. Biomedical waste management - Principles and methods

Practical

20 hours

- Compound Microscope.
- Demonstration and sterilization of equipments
- Demonstration of commonly used culture media and media with growth
- Antibiotic susceptibility test
- Demonstration of common serological tests – Widal, VDRL, ELISA,RA,CRP,ASO
- Stool exam for Helminthic ova

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

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

Scheme of Examination

Theory

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

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

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Microbiology

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

SYLLABUS FOR FIRST YEAR B.Sc TECHNICAL PROGRAM
B.Sc in Medical Laboratory Technology
SUBSIDIARY SUBJECTS

1 ENGLISH

Theory: 25 Hours

COURSE OUTLINE

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

BEHAVIOURAL OBJECTIVES:

The student at the end of training is able to

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

UNIT - I: INTRODUCTION:

Study Techniques

Organisation of effective note taking and logical processes of analysis and Synthesis

Use of the dictionary

Enlargement of vocabulary

Effective dictation

UNIT - II: APPLIED GRAMMAR:

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

UNIT - III: WRITTEN COMPOSITION:

Precise writing and summarising

Writing of bibliography

Enlargement of Vocabulary

UNIT - IV: READING AND COMPREHENSION:

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

Enlargement of Vocabulary.

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

Paragraph, Essay, Letter, Summary, Practice in writing

UNIT - VI: VERBAL COMMUNICATION:

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

Scheme of Examination

Written (Theory): Maximum Marks: 80 marks.

No Practical or Viva voce examination

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

REFERENCE

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

2 HEALTH CARE

Theory: 40 Hours

Introduction to Health

Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept.

National Health Policy

National Health Programmes (Briefly Objectives and scope)

Population of India and Family welfare programme in India

Introduction to Nursing

What is nursing? Nursing principles. Inter-Personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application.

Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Lifting and Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine.

Observation of sputum, Understand use and care of catheters, enema giving.

Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion

Care of Rubber Goods

Recording of body temperature, respiration and pulse,

Simple aseptic technique, sterilization and disinfection.

Surgical Dressing: Observation of dressing procedures

First Aid:

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

Reference Books:

1. Preventive and Social Medicine by J.Park

ಕನ್ನಡ : ಒಂದು

ಪಠ್ಯ ಕ್ರಮದ ರೂಪರೇಖೆ

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

ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ

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

ಅಧ್ಯಯನಕ್ಕೆ ಶಿಫಾರಸ್ಸು ಮಾಡಲಾಗಿರುವ ಗ್ರಂಥಗಳು

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

SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

BIOCHEMISTRY II

Theory – 100 hours

Practical – 80 hours

(CHEMISTRY OF BIOLOGICAL COMPOUNDS AND THEIR DETERMINATION)

THEORY

- Carbohydrates : Chemistry of sugar reactions, Metabolism of glucose, Diabetes and curve patterns.
- Non Protein nitrogenous compounds, principles of urea, creatinine and uric acid formation, significance, tests.
- Enzyme classification, definition, Co-enzymes, co-factors affecting enzyme activity , inhibitors, units of measurements, iso enzymes, biological interpretation.
- Proteins – chemistry, structure, plasma protein concentration and biochemical changes in disease, fractionation techniques, interpretation. Principles of electrophoresis, chromatography.
- Principles of photometry and spectrophotometry, laws of absorption, wavelength, turbidimetry, calibration, transmittance and absorbance, verification of Beer's law and its limitation.
- Flame photometry and atomic absorption, Burner system.
- Sample collection, preservation and preparation of protein free filtrates – theoretical aspects.
- Vitamin – definition, classification, source, function, deficiency, disorder.

PRACTICALS

- Identification of sugars by qualitative method for blood glucose, qualitative screening test for urine glucose, qualitative test for reducing substances in urine. Quantitative test for urine glucose and GTT.
- Non- protein nitrogenous compounds, determination of blood urea, ammonia, uric acid, creatinine, creatinine clearance.
- Protein : Determination of total protein and serum / plasma / CSF / Urine, determination of Albumin, Globulin and fibrinogen, electrophoretic separation of proteins.
- Sample collection, preservation and preparation of protein free filtrates.

Scheme of Examination Theory

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

SCHEME OF EXAMINATION- PRACTICALS

The scheme of examination for Biochemistry II Practical shall be as follows:

Distribution of marks

Type of Question	Marks allotted
Quantitative estimation	30
Qualitative estimation	30
Urine examination	20
Total	80

REFERENCE BOOKS

Biochemistry

1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed
6. Das(Debajyothi) Biochemistry Latest ED Academic, Publishers, Calcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.

SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

PATHOLOGY II

Theory – 100 hours

Practical – 80 hours

A) Topics – Histopathology and Hematology

THEORY

B) Histopathology

- **Instrumentation** : (a) Automated Tissue Processor
(b) Microtome's, Knives, Knife sharpeners, Ultra microtome
(c) Freezing microtome and Cryostat
(d) Automatic slide stainer
- **Techniques** : (a) Routine paraffin section cutting
(b) Frozen section and Cryostat section studies
- **Staining techniques:**
Special stains for Carbohydrates, Connective tissue, Nervous tissue, Bone tissue, Collage fibers, Elastic Fibers, Lipids, Organisms, fungi, parasites, pigments and deposits in tissues
- **Mounting techniques:** Various mounts and mounting techniques
- Electron Microscope, Scanning electron microscope, Dark ground and Fluorescent microscope
- Museum technology Microphotography and its applications
- Maintenance of records and filing of slides
- ICDS Classification and coding Application of computers in Pathology

C) Hematology

- Hemopoiesis, Stem cells, formed elements and their functions Anticoagulants used in various hematological studies
- Routine hematological tests and normal values:
 - (a) Determination of Haemoglobin and Hematocrit
 - (b) Enumeration of RBC, WBC & Platelets
 - (c) Absolute Eosinophil count
 - (d) Reticulocyte count
 - (e) Calculation of Red cell Indices
 - (f) Preparation of staining of blood film for morphology of red cells and Differential count
- **Special Hematological tests:**
 - (a) Sickling tests
 - (b) Osmotic fragility test
 - (c) Determination HbF and HbA2
 - (d) Haemoglobin Electrophoresis

- (e) Investigation of G6PD deficiency
 - (f) Plasma haptoglobin and demonstration of hemosiderin in urine
 - (g) Tests for Autoimmune hemolytic anaemia
 - (h) Measurement of abnormal Hb pigments
- **Hemostasis and Coagulation**
 - (a) Normal hemostasis, mechanism of blood coagulation and normal Fibrinolytic system
 - (b) Collection of blood and anticoagulants used in coagulation studies
 - (c) Investigation of hemostatic mechanism-BT, CT, whole blood coagulation Time test, PT, PTT
 - (d) Assay of clotting factors
 - (e) Tests for fibrinolytic activity- Euglobulin , clot lysis test and FDP
 - (f) Platelet function tests
- Investigation of Megaloblastic anemia and Iron deficiency anemia
 - B12 and Folate assay and Schilling test
 - Estimation of serum iron and iron binding capacity
 - Bone marrow biopsy study
 - Needle aspiration and surgical biopsy technique
 - Preparation of smears and staining
 - Demonstration of LE cells
 - Cytochemistry
 - Administration in Hematology and Quality control
- **Practicals:**
 1. Paraffin section cutting
 2. Staining by Haematoxylin & Eosin and other special stains
 3. Determination of Haemoglobin and Hematocrit
 4. Red blood cell count
 5. Total white blood cell count
 6. Platelet count
 7. Differential count of white blood cells
 8. Absolute Eosinophil count
 9. Reticulocyte count
 10. Calculation of red cell indices
 11. Determination of ESR
 12. Determination of BT, CT, Whole blood clotting time
 13. Determination of PT and PTT
 14. Blood smear preparation and staining
 15. Osmotic fragility test
 16. Sickling test
 17. LE cell preparation

Scheme of Examination Theory

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

Scheme of Examination *Practical*

Distribution of marks

Type of Question	Marks allotted
Haematoxylin and eosin or a special stain	10
Haemoglobin or PCV	10
Total count	10
Differential count	10
ESR	10
PS preparation and staining	10
Record	10
Spotters	10
Total	80

REFERENCE BOOKS – Pathology II

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

SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

MICROBIOLOGY II

Theory – 100 hours

Practical – 80 hours

Unit 1 – Systematic Bacteriology

1. Biochemical reactions for identification of bacteria
2. Antimicrobial Susceptibility testing
3. Normal flora of the human body

- **Gram Positive Bacteria**

Systemic study of the following bacteria with special reference to morphology, cultural characteristics, pathology, lab diagnosis and prophylaxis

1. Staphylococcus
2. Streptococcus
3. Pneumococcus
4. Corynebacterium
5. Bacillus
6. Mycobacterium
7. Clostridium
8. Actinomycetes

- **Gram Negative Bacteria**

1. Neisseria
2. Haemophilus, Bordetella, Brucella
3. Enterobacteriaceae, Salmonella & Shigella
4. Vibrio, Campylobacter & Helicobacter
5. Pseudomonas
6. Yersinia

- **Other bacterial pathogens**

1. Treponemes, Leptospira & Borrelia
2. Non sporing anaerobes
3. Gardnerella, Legionella & Listeria
4. Miscellaneous Bacteria

- **Applied Bacteriology**

1. UTI, Diarrhoeal diseases and food poisoning, Meningitis, Sexually Transmitted diseases, pyogenic infections, Hospital Infections & PUO
2. Laboratory Diagnosis of above conditions

- **Bacteriology of Water, Milk and Air**

Unit 2 - Parasitology

1. Protozoology –

Entamoeba, Balantidium coli, Giardia blood and Tissue protozoa

Trichomonas, Giardia, Leishmania, Trypanosoma

Malaria, Toxoplasma, Babesia

Cryptosporidium, Microsporidium, Isospora, Cyclospora

2. Helminthology

Cestodes-Morphology, Life Cycle, pathogenesis and lab diagnosis of Taenia,

Echinococcus, D. latum, H. Nana

Trematodes: Schistoma, Fasciola

Nematodes: Ascaris, Ancylostoma, Enterobius, Trichuris, Strongyloides, Trichinella,

Dracunculus, Wuchereria and other Filarial worms

- **Lab diagnosis of Parasitic Infections**

- **Arthropods of Medical Importance**

- **PRACTICALS for II year:**

- Staining:**

1. Gram Stain, Z N Stain, Albert Stain

- Simple Staining

- Differential Staining – Gram, Acid Fast Stain

- Negative Staining - India Ink

- Special Staining

2. Hanging Drop Preparation

3. Culture Media & Methods

4. Introduction to Biochemical reactions

5. Identifications of pure bacterial culture based on morphology, colony characteristics, motility, biochemical reaction and anti biogram

6. Antibiotic Sensitivity testing – Kirby Bauer Method

7. Stool examination, Concentration techniques

8. Saline mount

9. Iodine mount

10. Peripheral smear examination for malaria & filariasis

Scheme of Examination Theory

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

Scheme of Examination Practical

The scheme of examination for Microbiology **II Practical** shall be as follows:

Types of Questions	Marks
Spotters	20
ZN staining + Gram Stain	10+10
Pure Culture of the organism	15
Stool Examination	15
Record	10
Total Marks	80

There shall be a practical examination for 100 marks, including 20 marks for Internal Assessment.

Theory			Practical			Grand Total
Theory	IA	Total	Practical	IA	Total	
80	20	100	80	20	100	200

SYLLABUS FOR SECOND YEAR B.Sc TECHNICAL PROGRAM
B.Sc in Medical Laboratory Technology
SUBSIDIARY SUBJECTS

1 SOCIOLOGY

Theory: 20 Hours

Course Description

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

- **Introduction:**
Meaning – Definition and scope of sociology
Its relation to Anthropology, Psychology, Social Psychology
Methods of Sociological investigations – Case study, social survey, questionnaire, interview and opinion poll methods.
Importance of its study with special reference to health care professionals
- **Social Factors in Health and Disease:**
Meaning of social factors
Role of social factors in health and disease
- **Socialization:**
Meaning and nature of socialization
Primary, Secondary and Anticipatory socialization
Agencies of socialization
- **Social Groups:**
Concepts of social groups, influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup.
- **Family:**
The family, meaning and definitions, Functions of types of family, Changing family patterns, influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy
- **Community:**
Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community.
Urban community – Meaning and features – Health hazards of urbanities
Culture and Health: Concept of Health Concept of culture Culture and Health
Culture and Health Disorders
- **Social Change:**
Meaning of social changes Factors of social changes
Human adaptation and social change Social change and stress

Social change and deviance
Social change and health programme
The role of social planning in the improvement of health and rehabilitation

- **Social Problems of disabled:**

Consequences of the following social problems in relation to sickness and disability remedies to prevent these problems

Population explosion, Poverty and unemployment Beggary

Juvenile delinquency, Prostitution, Alcoholism

Problems of women in employment

- **Social Security:**

Social Security and social legislation in relation to the disabled

- **Social Work:**

Meaning of Social Work

The role of a Medical Social Worker

Reference Books:

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

Scheme of Examination for Sociology

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

No Practical or Viva voce examination

2 CONSTITUTION OF INDIA

Theory: 10 Hours

Unit-I: Meaning of the term ‘Constitution’. Making of the Indian Constitution 1946-1950.

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

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

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

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

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

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

Unit – VIII: Method of amending the Constitution.

Unit – IX: Enforcing rights through Writs:

Unit – X: Constitution and Sustainable Development in India.

Books:

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

3 ENVIRONMENTAL SCIENCE AND HEALTH

Theory: 10 Hours

Introduction to Environment and Health

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

Recommended Books.

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

SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

BIOCHEMISTRY III

Theory – 100 hours

Practical – 80 hours

THEORY

1. Liver Function tests. Role of the Liver in metabolism, formation of bilirubin and mode of excretion.
2. Gastric Analysis
3. Composition of gastric juice: concepts of free and bound acids, gastric acid secretions stimulations. Accuracy precision, quality control, statics classification of observation, frequency distribution, error in laboratory test, definition of terms, quality control charts. Normal values.
4. Radio isotope techniques. Principles of RIA: definition of units, measurements of radiation standards, crystal counting, conditions of use, resources and application.
5. Acid – Base balance, blood gases- bicarbonate buffering system, Henderson Hasselbach equation, blood pH, CO₂ content, and its calculation, nomograms.
6. Calculi: Theory of formation and analysis, Renal clearance concentration and Phenolsulfonaphthalein
7. Automation, micro and ultra micro techniques – theory.
8. Role of enzymes in clinical practice – discuss the marker enzymes and inborn errors of metabolism.
9. Lipid – chemistry of fatty acids, triglycerides, cholesterol, phospholipids and metabolism.
10. Inorganic ions: Concept of inorganic ions, Calcium metabolism, phosphate excretion, sodium-potassium balance and trace element (Fe, Cu).
11. Renal function test and renal clearance test.
12. Immunoassay: Different methods, principle and applications.
13. Quality control affecting enzyme action – accuracy precision specificity, sensitivity, standard deviation, coefficient, frequency distribution, errors in calculation, reference values, quality control charts.

PRACTICALS:

- Enzymes: Simple enzymatic reaction, demonstration of factors affection enzyme action, determination of alkaline phosphatase, LDH, SGOT, Acid phosphatase, Amylase – salivary and pancreatic, determination of LDH isoenzymes.
- Liver function tests : estimation of Bilirubin – total and conjugates, Urobilinogen, urobilin and Bile acids.
- Gastric analysis: Determination of free and total acid, gastric stimulation, specimen collection.
- Accuracy, precision and quality control – Demonstration and preparation of two methods using: F-test and Barr test.
- Radio isotope technique. Determination of CEA, AFP, T3, T4, TSH, HCG.
- Collection and measurements
- Automation, Micro and ultra micro techniques.
- Lipids - determination of serum lipids – cholesterol, triglycerides and lipoprotein fractionation.
- Inorganic ions, determination of calcium in serum and urine, serum phosphates, iron, copper,

chloride, sodium and potassium.

- Analysis of Calculi
- Estimation of calcium, phosphorous and iron
(relevant charts on the above topics for interpretations and diagnosis)

Scheme of Examination *Theory*

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

Distribution of marks **Scheme of Examination *Practical***

Type of Question	Marks allotted
Quantitative estimation	30
Renal calculi	30
Urine examination	20
Total	80

REFERENCE BOOKS

Biochemistry

1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Kaplan – Clinical chemistry
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed
6. DAS(Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.

SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

PATHOLOGY III

Theory – 100 hours

Practical – 80 hours

Topics - Cytology, Automation in cytology, Cytogenetic, Cytochemistry Immuno-hematology and Blood transfusion

A) Cytology

- Normal cell structure, functions, cytologic criteria of malignancy
- Types of specimens, methods of collection & preparation of cell block
- Different fixatives and methods of fixation
- Staining :
 - Papanicolaou's stain- principle , preparation and staining techniques
 - May Grunwald Giemsa stain
 - Shorr's stain
 - Aceto orcin stain

- **Female Genital tract**
 1. Anatomy, Histology, Physiology & normal cytology
 2. Techniques of collection of specimen for cervical cytology study
 3. Hormonal cytology and cytological indices
 4. Cervical cytology screening for malignant and non-malignant conditions , Radiation changes & follow up
 5. Cytology of Endometrium – normal , nonmalignant and in malignant conditions
 6. Cytology in Ovarian cancers

- **Respiratory tract, Gastrointestinal tract and Urinary tract**
 1. Anatomy, Histology and Physiology
 2. Collection of sample, preparation of smears and staining
 3. Cytology of normal, nonmalignant & malignant conditions

- **C S F and Effusions**
 1. Cytology of CSF in inflammatory, nonmalignant & malignant Conditions
 2. Cytology of effusions in nonmalignant and malignant conditions

- **Glands – Breast, Thyroid, Salivary glands and Lymph nodes**
 1. Anatomy , Histology and Physiology
 2. Fine needle aspiration cytology of glands and other soft tissue mass
 3. Cytologic features in nonmalignant and malignant conditions of different glands and nipple discharges

B) Automation in Cytology

1. Flow cytometry
2. Image Analysis
3. Principles, Equipments, procedures & Evaluation

- **Tissue culture and Immunohistochemistry**

1. Equipments for Tissue culture studies
 - (a) Laminar air flow equipment
 - (b) Carbon dioxide incubator
 - (c) Inverted microscope
2. Basic Procedure for preparation of glassware, media etc. for sterilization
 - (a) Dry heat sterilization
 - (b) Autoclaving in an atmosphere of steam
 - (c) Chemical Sterilization
 - (d) Filter sterilization of liquid media, etc
3. Derivation of culture from tissue
 - (a) Enzymatic digestion of tissue using collagenase, protease
 - (b) Plating in tissue culture media
 - (c) Observation of cells in Invertoscope
 - (d) Subculturing & derivation of cell lines
4. Characterization of cell lines
 - (a) Determination of biochemical markers in cells
 - (b) Chromosomal & DNA content of cells
 - © Immunological properties of cells
5. Preservation of Immortalized cell lines
 - (a) Storage in Glycerol in Liquid Nitrogen
 - (b) Storage in Dimethyl sulfoxide in Liquid Nitrogen

- **Cytogenetic**

1. Human Genetics ; an introduction to the subject
2. Terminology, Classification and Nomenclature of human chromosomes
3. Methods of karyotyping analysis
 - (a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts
 - (b) Direct preparation from tumor materials
4. Characterization of human chromosomes by various banding techniques
5. Sex chromatin identification
6. Karyotyping and analysis of Chromosomal Abnormalities
7. Common Chromosomal observations in cancer, mechanism of their production and of oncogenes
8. Photomicrography

- **Immunocytochemistry**

1. Introduction
2. Basics concepts of Immunochemistry
3. Monoclonal antibodies & preparation
4. Fluorescence reactions
5. PAP technique – principle, preparation of reagents and procedure

BLOOD BANKING

- **Immunohematology and Blood transfusion**

1. ABO Blood group system
2. Rh typing and weaker variants in Rh system
3. Subgroups and weaker variants of A and B , and Bombay phenotype
4. Preparation and standardization of antihuman globulin reagent
5. Coomb's test
6. Blood grouping and cross matching in blood bank
7. Investigation of transfusion reaction
8. Care and selection of donors
9. Role of Australia Antigen and Hepatitis C Virus (HCV) in blood transfusion
10. Screening for Australian Antigen and HCV
11. HLA antigens and their significance in blood transfusion
12. Preservation of blood, Principles and its applications in blood banking
13. Component therapy in clinical practice
14. Blood bank administration
15. Screening the blood for infective material

- **Practicals**

1. Papanicolaou's and May Grunwald Geimsa staining
2. Hormonal cytology study
3. Malignant cytology
4. Fine needle aspiration cytology (FNAC)
5. Blood grouping, blood transfusion, immunohematology

Scheme of Examination *Theory*

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

The scheme of examination for Pathology III Practical shall be as follows:

Distribution of marks

Type of Question	Marks Allotted
Pap stain	20
Blood grouping and typing	10
Cross matching	15
Coomb's test	15
Record	10
Spotters	10
Total	80

REFERENCE BOOKS

Pathology –

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

SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

MICROBIOLOGY III

Theory – 100 hours
Practical – 80 hours

Unit 1

Immunology

1. Infection
2. Immunity
Innate Immunity
Acquired immunity (adaptive immunity)
Active & Passive immunity
3. Immune System
Primary Lymphoid organs
Secondary Lymphoid organs
B lymphocytes (general knowledge of their role)
T lymphocytes
Natural Killer cells
4. Immune response
Humoral immunity, Cell mediated immunity
Primary and secondary responses
Monoclonal Antibodies (production and applications)
5. Antigens
6. Antibodies
Properties of Antibodies (immunoglobulins)

- Classes of immunoglobulin
- 7. Antigen Antibody reactions
Precipitation, Agglutination, ELISA, Immunofluorescence and Miscellaneous tests
- 8. Complement system
- 9. Hypersensitivity reactions
Immediate & delayed type
- 10. Autoimmunity, tumor antigens, allograft

Unit 2

Virology

1. General properties of viruses including morphology of virus and Classification
2. Cultivation of viruses
3. Pox virus, Herpes Virus, Adenoviruses
4. Picorna viruses, Orthomyxo viruses
5. Paramyxo viruses, Arbo viruses, Rhabdo viruses
6. Hepatitis Viruses, Oncogenic viruses, HIV,
7. Rotavirus, Norwalk virus, Astro virus, Corona virus

Unit 3

Mycology

1. Introduction to Mycology, Classification
2. Lab diagnosis of Fungal infections
3. Mycoses
 - a. Superficial Mycoses: Malassezia furfur, T. nigra, T. piedra
 - b. Dermatophytes
 - c. Subcutaneous Mycoses Mycetoma, Rhinosporidium, Sporotrichosis, Chromomycosis
 - d. Systemic Mycoses Histoplasmosis, Blastomycosis, Paracoccidiosis
 - e. Opportunistic fungi Aspergillosis, Penicillois, Pneumocystis
 - f. Candida, Cryptococcus
4. Mycotoxins and antifungal agents.

Practicals

80 hours

1. Immunology : Serological Tests:

Principle, procedure, normal values, significant titer, interpretation and limitation of, the following test WIDAL, Brucella, VDRL, TRUST, RPR, ASO, CRP, RF, ELISA

2. Virology:

Demonstration of embryonated egg inoculation/inclusion bodies

Virology exercise

ELISA (HIV, HBV and HCV)

Spot test (Tridot/immuno comb test)

3. Mycology:

KOH mount, fungal stains, Culture media

Slide culture techniques and LPCB mount

Identification of fungal culture –

Macroscopic and Microscopic examination of Candida, Cryptococcus

Dermatophytes, Aspergillus, Rhizopus, Mucor, Penicillium

Scheme of Examination

Internal Assessment - There shall be three IA Exams, each one with theory paper of 60 Marks and the marks average of best two (reduced to 20) is taken as final marks.

Practicals Internal Assessment: There shall be three examinations for 50 marks each and the marks average of best two (reduced to 20) is taken as final marks.

University examination:

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

Type of Questions	No. of Questions	Marks	Sub total
Long Essay (LE)	3 (to attempt 2)	2 X 10	20
Short Essay (SE)	8 (to attempt 6)	6 X 5	30
Short Answers (SA)	12 (to attempt 10)	10 X 3	30
Grand Total			80

Scheme of Examination Practical Microbiology III Practical shall be as follows:

Types of Questions	Marks
Virology exercise	10
Mycology exercise	15
Serology (Widal/brucella/ELISA)	15
Serology (ASO/CRP/RPR/VDRL/TRUST/RF)	10
Spotters	20
Record	20
Total	80

REFERENCE BOOKS

Microbiology

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

SYLLABUS FOR THIRD YEAR B.Sc TECHNICAL PROGRAM

B.Sc in Medical Laboratory Technology

SUBSIDIARY SUBJECTS

1. ETHICS & DATABASE MANAGEMENT

Theory: 20 hours

➤ **Introduction**

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

2. Objectives

- Identify underlying ethical issues and problems in medical practice

➤ **Course contents (Syllabus)**

a. Introduction to medical ethics

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

b. Definition of medical ethics

Major principles of medical ethics.

c. Perspective of medical ethics

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

d. Ethics of the individual

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

e. The ethics of human life

Prenatal sex determination.

f. The family and society in medical ethics

Euthanasia, cancer and terminal care.

g. Death and dying

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

h. Professional Ethics

Contract and confidentiality, malpractice and negligence.

➤ **Teaching/Learning Experience**

- a) Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.
- b) Fostering the development of skills of analysis, decision making and judgment.
- c) Making the students aware of the need to respect the rights of the patient.
- d) Duties and responsibilities of the technologists.

Scheme of Examination for Ethics & Database Management

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

No Practical or Viva voce examination

2 BIO STATISTICS & RESEARCH

Theory: 20 Hours

Course Description:

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

Behavioural Objectives:

Understands statistical terms.

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

Unit – I: Introduction

Meaning, definition, characteristics of statistics.

Importance of the study of statistics.

Branches of statistics.

Statistics and health science including nursing.

Parameters and estimates.

Descriptive and inferential statistics.

Variables and their types.

Measurement scales

Unit – II: Tabulation of Data

Raw data, the array, frequency distribution.

Basic principles of graphical representation.

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

Normal probability curve.

Unit – III: Measure of Central Tendency

Need for measures of central tendency

Definition and calculation of mean - ungrouped and grouped

Meaning, interpretation and calculation of median ungrouped and grouped.

Meaning and calculation of mode.

Comparison of the mean, and mode.

Guidelines for the use of various measures of central tendency.

Unit – IV: Measure of Variability

Need for measure of dispersion. The

range, the average deviation. The

variance and standard deviation.

Calculation of variance and standard deviation ungrouped and grouped.

Properties and uses of variance and SO

Unit –V : Probability and Standard Distributions.

Meaning of probability of standard distribution. The Binominal distribution.

The normal distribution.

Divergence from normality - skewness, kurtosis.

Unit – VI: Sampling Techniques

Need for sampling - Criteria for good samples.

Application of sampling in Community.

Procedures of sampling and sampling designs errors.

Sampling variation and tests of significance.

Unit - VII: Health Indicator

Importance of health Indicator.

Indicators of population, morbidity, mortality, health services.

Calculation of rates and rations of health.

Recommended Books.

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

Scheme of Examination for *MEDICAL ELECTRONICS including COMPUTER APPLICATIONS*

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

No Practical or Viva voce examination

3 BASICS IN COMPUTER APPLICATIONS

Theory: 10 hours

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

Introduction to Data processing:

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

Hardware Concepts:

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

Concept of Software.

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

Principles of programming

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

Data processing

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

Scheme of Examination for Bio Statistics & Research

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

No Practical or Viva voce examination
