



SHRI  
DHARMASTHALA  
MANJUNATHESHWARA  
UNIVERSITY

ORDINANCE GOVERNING  
B.SC. IN ALLIED HEALTH SCIENCES  
**BACHELOR OF SCIENCE IN**  
**MEDICAL LABORATORY TECHNOLOGY**  
CURRICULUM 2020-21

**SHRI DHARMASTHALA MANJUNATHESHWARA UNIVERSITY**

(A State Private University established under the Shri Dharmasthala Manjunatheshwara University  
Act No 19 of 2018 of Government of Karnataka and Notification No. ED 261 URC 2018 dated 19th December 2018)

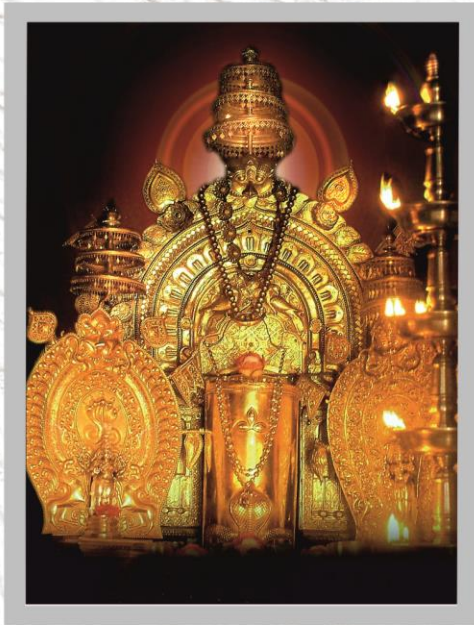
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|| Om Shri Manjunathaya Namaha ||



Shree Kshethra Dharmasthala

**Edition Year : 2020-21**

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**Published by**


**Registrar**


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## THE LOGO

Poojya Dr D. Veerendra Heggade, Hon'ble Chancellor of the University, while searching for an appropriate Logo for the University, saw a photograph picked from Temple Architecture showing Wings of a Bird, sculpted in Indian style and wanted it to be incorporated in the logo for the University, as the Wings symbolize 'Spreading of Knowledge beyond Boundaries'. Further it was felt that the Central theme of the logo should be 'Rudra' (The Linga) with wings on each side. In this way, the logo of the University was conceptualized.

Hence:

1. The central part represents **Rudra** who Demolishes Darkness.
2. The Three **horizontal lines on The Linga** stand for Samyak Darshan (Right Belief), Samyak Gyan (Right Knowledge) and Samyak Charitra (Right Conduct).
3. The **Wings** symbolize spreading of Knowledge across the boundaries.
4. Base line "**Truth Liberates**" highlights the Purpose of Education: to liberate oneself unconditionally. It shows that it is not discipline, nor knowledge nor the efforts to freedom that liberate but Truth is what liberates you from all your conditioning and ignorance.

The overall significance of Shri Dharmasthala Manjunatheshwara University's Logo is:

**Darkness of ignorance is destroyed by the flow of knowledge to bring Liberty to everyone, by realizing the truth. And, it should spread globally without the boundaries as hindrance.**



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## VISION

Shri Dharmasthala Manjunatheshwara University will set the highest standards of teaching and learning by awakening the intelligence of the students and nurturing the creativity hidden in them by creating an environment where the ancient wisdom blends with modern science, to transform them into whole human beings to face the challenges.

## MISSION

- ▶ To ensure that the journey of education is inspiring, pleasant and enjoyable.
- ▶ Attract the best of teachers and students.
- ▶ Achieve high principles of trust, love and spirituality in the students.
- ▶ Create a collaborative, diverse and exclusive community.
- ▶ Transform the student of today to be a leader of tomorrow and a better human being.
- ▶ Produce passionate teachers.
- ▶ Evolve innovative teaching techniques.
- ▶ Create a peaceful environment.
- ▶ Prepare the student to face the social challenges.
- ▶ Create a University of which the Nation is proud of.
- ▶ Be an effective partner in Nation Building.
- ▶ Create an Eco-friendly University.
- ▶ Create a University based on the principles of beauty, love and justice.

||Om Shanti! Om Shanti! Om Shanti||



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MANJUNATHESHWARA  
UNIVERSITY

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Fax: +91836 246 3400  
Email: registrar@sdmuniversity.edu.in

SDMU/ACD/DEN/CRM/369A/2019

Date: 28-08-2019

## NOTIFICATION

### Ordinance governing Curricula of Medical Allied Sciences - 2019

- Ref:
1. Minutes of the 1<sup>st</sup> Meeting of Academic Council held on 20<sup>th</sup> March 2019  
(Letter No: SDMU/AC/M-01/D93/2019; Dated:21-03-2019)
  2. Minutes of the 1<sup>st</sup> Meeting of Joint Faculties held on 19<sup>th</sup> March 2019  
(Letter No: SDMU/JF/85/2019; Dated:21-03-2019)
  3. Minutes of the 1<sup>st</sup> Meeting of Board of Studies (Allied Health Sciences) held on 19<sup>th</sup> March 2019 (Letter dated:20-03-2019)

In exercise of the powers conferred under Statutes 1.4(Powers and functions - Para ix & x), 1.5b(Powers and functions - Para b & c) & 1.8(Powers and functions - Para i) of Shri Dharmasthala Manjunatheshwara University, the Academic Council is pleased to approve and notify the Ordinance governing Regulations and Curricula of the below listed Medical Allied Sciences as shown in the annexure appended herewith.

1	BSc Medical lab Technology
2	BSc Medical Imaging Technology
3	BSc in Renal Dialysis Technology
4	BSc Optometry

The ordinance shall be effective for the students joining the courses during the academic year 2019-20 and onwards.

  
REGISTRAR  
REGISTRAR,  
Shri Dharmasthala Manjunatheshwara  
University, Dharwad

To: The Principal, SDM College of Medical Sciences & Hospital.

**Copy for kind information to:**

1. Hon'ble Vice Chancellor - Shri Dharmasthala Manjunatheshwara University.
2. Pro Vice Chancellor (Academics) - Shri Dharmasthala Manjunatheshwara University.
3. Controller of Examinations - Shri Dharmasthala Manjunatheshwara University.

## B.SC. IN ALLIED HEALTH SCIENCES

### COURSE NAME: BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY (BSc MLT)

1. Title of the course	<b>Bachelor of Science in Medical Laboratory Technology: B. Sc. MLT</b>
2. Eligibility for Admission	<p>A candidate seeking admission to the Bachelor of Science Degree Courses in the BSc MLT course shall have studied English as one of the principal subjects during the tenure of the course and for those seeking admission to the Bachelor of Science Degree Courses in the Allied Health Sciences courses</p> <p>Two-year Pre-University examination Physics, Chemistry and Biology as principal subjects of study</p> <p style="text-align: center;">OR</p> <p>Candidates with two years diploma from a recognized Government Board in a subject for which the candidate desires to enrol, in the respective Allied Health Sciences mentioned course shall have passed plus2 [10+2] with Physics, Chemistry and Biology, as principal subjects</p> <p style="text-align: center;">OR</p> <p>Candidates with 3 years diploma from a recognized Government Board in a subject for which the candidate desires to enrol, in the respective Allied Health Sciences course mentioned should have studied Physics, Biology and Chemistry as principal subjects during the tenure of the course.</p>
3. Intake	20 seats per year
4. Lateral entry	Lateral entry to second year for allied health science courses for candidates who have passed diploma program from the Government Boards and recognized by SDMU, Dharwad, are eligible to take admission on lateral entry system only in the same subject studied at diploma level.
5. Duration of Course	<b>4 Years including 1year Internship</b>
6. Medium of Instruction	<b>English</b>
7. Attendance & Eligibility to appear final exam	Every candidate should have attended at least <b>80%</b> of the total number of classes conducted in an academic year and <b>35% IA marks</b> obtained in the average of Two IA exams from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year <b>separately in theory and practical.</b>

	<p>Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject</p>																																																																				
<p><b>8. Internal Assessment</b></p>	<p>There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two tests will be calculated and sent to the university. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests. The marks of the internal assessment must be displayed on the notice board of the respective colleges with in a fortnight from the date test is held.</p> <p><b>For eligibility to appear for university exams students should score 35% IA marks</b> obtained in the average of Two IA exams from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year <b>separately in theory and practical.</b></p> <p>If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.</p>																																																																				
<p><b>9. Subjects and hours of teaching for theory and practicals I/II/III Year</b></p>	<table border="1" data-bbox="371 1106 1292 1721"> <thead> <tr> <th data-bbox="371 1106 526 1382" rowspan="6" style="writing-mode: vertical-rl; transform: rotate(180deg);">I Year B. Sc. MLT</th> <th data-bbox="526 1106 714 1191">Subjects</th> <th data-bbox="714 1106 845 1191">Theory</th> <th data-bbox="845 1106 989 1191">Practical</th> <th data-bbox="989 1106 1133 1191">Postings</th> <th colspan="2" data-bbox="1133 1106 1292 1191">Total</th> </tr> </thead> <tbody> <tr> <td data-bbox="526 1191 714 1239">Anatomy</td> <td data-bbox="714 1191 845 1239">70 Hrs</td> <td data-bbox="845 1191 989 1239">30 Hrs</td> <td data-bbox="989 1191 1133 1239">-</td> <td colspan="2" data-bbox="1133 1191 1292 1239">100 hrs</td> </tr> <tr> <td data-bbox="526 1239 714 1287">Physiology</td> <td data-bbox="714 1239 845 1287">70 Hrs</td> <td data-bbox="845 1239 989 1287">30 Hrs</td> <td data-bbox="989 1239 1133 1287">-</td> <td colspan="2" data-bbox="1133 1239 1292 1287">100 hrs</td> </tr> <tr> <td data-bbox="526 1287 714 1334">Biochemistry</td> <td data-bbox="714 1287 845 1334">70 Hrs</td> <td data-bbox="845 1287 989 1334">30 Hrs</td> <td data-bbox="989 1287 1133 1334">-</td> <td colspan="2" data-bbox="1133 1287 1292 1334">100 hrs</td> </tr> <tr> <td data-bbox="526 1334 714 1382">Pathology</td> <td data-bbox="714 1334 845 1382">70 Hrs</td> <td data-bbox="845 1334 989 1382">30 Hrs</td> <td data-bbox="989 1334 1133 1382">-</td> <td colspan="2" data-bbox="1133 1334 1292 1382">100 hrs</td> </tr> <tr> <td data-bbox="526 1382 714 1429">Microbiology</td> <td data-bbox="714 1382 845 1429">70 Hrs</td> <td data-bbox="845 1382 989 1429">30 Hrs</td> <td data-bbox="989 1382 1133 1429">-</td> <td colspan="2" data-bbox="1133 1382 1292 1429">100hrs</td> </tr> <tr> <th data-bbox="371 1429 526 1620" rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);">II Year B. Sc. MLT</th> <th data-bbox="526 1429 714 1477">Subjects</th> <th data-bbox="714 1429 845 1477">Theory</th> <th data-bbox="845 1429 989 1477">Practical</th> <th data-bbox="989 1429 1133 1477">Postings</th> <th colspan="2" data-bbox="1133 1429 1292 1477">Total</th> </tr> <tr> <td data-bbox="526 1477 714 1525">Biochemistry</td> <td data-bbox="714 1477 845 1525">100 Hrs</td> <td data-bbox="845 1477 989 1525">50 Hrs</td> <td data-bbox="989 1477 1133 1525">150</td> <td colspan="2" data-bbox="1133 1477 1292 1525">300 hrs</td> </tr> <tr> <td data-bbox="526 1525 714 1572">Pathology</td> <td data-bbox="714 1525 845 1572">100 Hrs</td> <td data-bbox="845 1525 989 1572">30 Hrs</td> <td data-bbox="989 1525 1133 1572">170</td> <td colspan="2" data-bbox="1133 1525 1292 1572">300 hrs</td> </tr> <tr> <td data-bbox="526 1572 714 1620">Microbiology</td> <td data-bbox="714 1572 845 1620">100 Hrs</td> <td data-bbox="845 1572 989 1620">30 Hrs</td> <td data-bbox="989 1572 1133 1620">120</td> <td colspan="2" data-bbox="1133 1572 1292 1620">250 hrs</td> </tr> </tbody> </table>							I Year B. Sc. MLT	Subjects	Theory	Practical	Postings	Total		Anatomy	70 Hrs	30 Hrs	-	100 hrs		Physiology	70 Hrs	30 Hrs	-	100 hrs		Biochemistry	70 Hrs	30 Hrs	-	100 hrs		Pathology	70 Hrs	30 Hrs	-	100 hrs		Microbiology	70 Hrs	30 Hrs	-	100hrs		II Year B. Sc. MLT	Subjects	Theory	Practical	Postings	Total		Biochemistry	100 Hrs	50 Hrs	150	300 hrs		Pathology	100 Hrs	30 Hrs	170	300 hrs		Microbiology	100 Hrs	30 Hrs	120	250 hrs	
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	III Year B. Sc. MLT	Subjects	Theory	Practical	Postings	Total
		Biochemistry	100 Hrs	50 Hrs	150	300 hrs
		Pathology	100 Hrs	30 Hrs	170	300 hrs
		Microbiology	100 Hrs	30 Hrs	120	250 hrs
<b>10. Schedule of Examination</b>	The university shall conduct annual examinations as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Head of the institution along with the application for examination and the prescribed fee. The students who are failed in previous university examination can appear Supplementary examination for the failed subjects.					
<b>11. Scheme of examination (Total marks &amp; distribution of type of questions and marks)</b>	<b>THEORY</b>					
	<b>For 100Marks</b>					
	<b>Type of Question</b>		<b>No. of Questions</b>		<b>Marks</b>	
	Essay Type		3 (2 × 10)		20	
	Short essay type		12(10×5)		50	
	Short Answer type		12 (10×3)		30	
	<b>For 70Marks</b>					
	<b>Type of Question</b>		<b>No. of Questions</b>		<b>Marks</b>	
	Essay Type		3(2×10)		20	
	Short essay type		8(6×5)		30	
Short Answer type		10 × 2		20		
<b>12. Pass Criteria</b>	A candidate is declared to have passed the Examination in a subject if he/she secures 40% of the marks in theory and 40% in practical separately. For a pass in theory & Practical, a candidate has to secure a minimum of 50% marks in the University conducted written examination in aggregate including internal assessment and Viva-Voce.					
<b>13. Carry over benefit</b>	Students who appear for annual examination and failed will be promoted to the next year, irrespective of results, up to supplementary exam results. The candidate should clear all the remaining failed subjects of the previous year in forth coming supplementary exam. If candidate is failing to clear all the failed subjects of previous year in the supplementary exam, He/she will not be allowed for 2 <sup>nd</sup> year annual examination. Supplementary exam for failed candidates shall be conducted within 60 days after the announcement of annual					

	examination results. The candidates who all are unable to pass in all subjects of the previous year, He/ She will not be promoted to the next year
<b>14. Eligibility for award of degree</b>	A candidate shall have passed in all the subjects of first, second third year and One Year internship to be eligible for award of degree.

**FIRST YEAR  
BACHALORE OF SCIENCE  
IN  
MEDICAL LABORATORY TECHNOLOGY  
(1<sup>ST</sup> B. Sc. MLT)**

<b>I Year B. Sc. MLT</b>	<b>Subjects</b>	<b>Theory</b>	<b>Practical</b>	<b>Postings</b>	<b>Total</b>
	<b>Anatomy</b>	70 Hrs	30 Hrs	-	100 hrs
	<b>Physiology</b>	70 Hrs	30 Hrs	-	100 hrs
	<b>Biochemistry</b>	70 Hrs	30 Hrs	-	100 hrs
	<b>Pathology</b>	70 Hrs	30 Hrs	-	100 hrs
	<b>Microbiology</b>	70 Hrs	30 Hrs	-	100hrs

<b>For 70Marks</b>		
<b>Type of Question</b>	<b>No. of Questions</b>	<b>Marks</b>
Essay Type	3(2×10)	20
Short essay type	8(6×5)	30
Short Answer type	10 × 2	20

## BSC MLT – FIRST YEAR COURSE CONTENT

### SUBJECT- ANATOMY

Theory - 70 hours + Practical's - 30 hours: Total teaching hours 100

THEORY-70 hours

Sl. No.	CONTENT	Hours
1.	<b>General Anatomy:</b> Introduction to anatomical terms, positions, planes and movements and organization of the human body. Tissues- definitions, types, characteristics, classification, locations, functions and formation	6
2	<b>Systemic Anatomy:</b> <b>Musculoskeletal system-</b> Bones- Types, structure, axial and appendicular skeleton, bone formation, and growth Joints- classification & structure. Movements at the joints & muscles producing movements Muscles- types and structure of muscles with examples	6
3.	<b>Nervous System:</b> Neurons-Classification and structure of neuroglia and neurons, parts and functions of neurons and neuroglial cells CNS- Parts of brain and structure of spinal cord, Functions of brain and spinal cord, formation and circulation of CSF PNS- Cranial nerves and spinal nerves ANS- Sympathetic and parasympathetic system- location, structure and functions	6
4.	<b>Cardiovascular System:</b> Heart-Structure and functions Types of circulations- Systemic circulation, Pulmonary circulation Blood vascular system- arteries, veins, capillaries- structure and functions	5
5.	<b>Lymphatic system:</b> Lymph vascular system- Lymph Vessels-Thoracic duct, Right lymphatic duct Lymphoid organs- gross and microscopic structure of lymphoid organs and their functions	4

6.	<p><b>Respiratory System:</b>  Parts, gross anatomy of nose, nasopharynx, oropharynx, larynx, trachea with structure and functions  Gross anatomy of lungs- Pleura, lobes and bronchopulmonary segments of right &amp; left lungs, blood supply, nerve supply, lymphatic drainage and functions and common diseases of lung.  Histology of trachea and lung.  Structure and functions of Thoraco abdominal diaphragm</p>	6
7.	<p><b>Digestive system:</b>  Parts- structure and functions of teeth, tongue, palate, pharynx, oesophagus, stomach, small intestine, large intestine, Liver, gall bladder, pancreas.  Common diseases affecting digestive system.  Peritoneum,  Histology of tongue, oesophagus, stomach, duodenum, jejunum, ileum, vermiform appendix, colon, liver, gall bladder, pancreas.</p>	8
8.	<p><b>Urinary System:</b>  Parts of urinary system. Structure and functions of Kidneys, Ureters, Urinary bladder and Urethra  Common diseases of urinary system- renal failure and dialysis, kidney transplantation  Histology of Kidney, Ureter, Urinary bladder</p>	6
9.	<p><b>Reproductive System:</b>  Male Reproductive System: Parts, structure and functions of Scrotum, Testis, Epididymis, Vas deferens, Seminal vesicles, Ejaculatory ducts, Prostate, Common diseases of male genital system.  Histology of testis, epididymis, vas deferens, prostate.  Female Reproductive System: Parts, structure and functions of Vagina, Uterus, Fallopian tubes, Ovaries.  Common diseases of female genital system.  Histology of uterus, fallopian tube, ovary.</p>	6
10.	<p><b>Endocrine System:</b>  Name the endocrine organs  Gross anatomy and histology of Pituitary, Thyroid, Parathyroid, Adrenal glands.  Diseases of endocrine glands</p>	4
11.	<p><b>Special Senses:</b>  Structure and functions of special sensory organs, eyes (vision), nose (smell), ears (hearing), skin (sensations), tongue (taste).</p>	5

	Common diseases affecting them.	
<b>12.</b>	<b>Anatomical techniques-:</b> Embalming of human cadaver. Museum specimen's preparation techniques. Histological techniques- Instruments used in histology, tissue processing, and tissue section cutting, preparation procedure of H & E stains. Haematoxylin & Eosin staining, mounting. Special stains used in histology.	8
	<b>Total theory teaching hours</b>	<b>70</b>

### **PRACTICALS- Teaching - 30 hours**

1. Demonstration of human skeleton, individual bones. - 3 hours
2. Demonstration of individual organs of all the systems -9 hours
3. Demonstration of Instruments used in histology. - 2hours
4. Preparation of Haematoxylin & Eosin stains - 2 hours
5. Tissue processing - 2 hours
6. Section cutting - 2 hours
7. H & E staining & mounting - 4 hours
8. Study of histology slides of all the systems- 6 hours

### **TEACHING LEARNING ACTIVITIES**

The course contents in Anatomy will be covered by

- 1 Didactic lectures
- 2 Practical's
- 3 Demonstration of dissected parts
- 4 Demonstration of museum specimens
- 5 Demonstration of charts and models
- 6 Demonstration of histology slides
- 7 Demonstration of human skeleton and individual bones
- 8 Assignments -Practical record book

## EXAMINATION PATTERN

Section	Maximum marks	Duration
Theory examination 1 paper	70	3 hours
Practical examination	40	3 hours
Viva voce	10	--
Internal Assessment- Theory	20	
Internal Assessment- Practical's	10	
Total marks -Theory + Viva + IA Theory	100	
Practical's + IA Practical's	50	
Grand Total	150	

## PATTERN OF THEORY QUESTION PAPER

LONG ESSAYS (ANSWER ANY 2 OUT OF 3) 2X10 = 20 marks

SHORT ESSAYS (ANSWER ANY 6 OUT OF 8) 6X5 = 30 marks

SHORT ANSWERS (ANSWER ALL) 10X2 = 20 marks

**TOTAL** **70 marks**

Examiner: One internal and external examiner for university examinations

## TEXT BOOKS RECOMMENDED (LATEST EDITIONS)

1. Human Anatomy by B. D. Chaurasia, 8th edition Vol-1, 2, 3, 4
2. B. D. Chaurasia's Hand book of General Anatomy, 6th edition
3. Text book of Anatomy & Physiology for nurses – P. R. Asha Lata & G Deepa, 3rd edition
4. Inderbir Singh's Text book of Human Histology with colour atlas and Practical Guide, 2016
5. Principles and Techniques in Histology Microscopy and Photomicrography 2nd edition 2018 by D R Singh



## SUBJECT – PHYSIOLOGY

**Teaching hours;** Theory: 70 Hrs. Practical: 30 Hrs = Total: 100 hrs

**THEORY: 70 Hrs**

Sl. No.	CONTENT	Teaching hours
1	<p><b>General Physiology-</b> Homeostasis. Cell- structure, organelles, cell junctions, stem cells, cell aging and death.</p>	3 hours
2	<p><b>BLOOD:</b> <b>Composition and function of blood</b> Red blood cells – Erythropoiesis, stages of differentiation, function, count, physiological Variation. Haemoglobin –structure, function, concentration, physiological variation, Methods of Estimation of Hb. White blood cells – Production, function, life span, count, differential count Platelets – Origin, normal count, morphology functions. Plasma Proteins – Production, concentration, types, albumin, globulin, Fibrinogen, prothrombin functions. <b>Haemostasis &amp; Blood coagulation</b> Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors. <b>Blood Bank</b> Blood groups – ABO system, Rh system Blood grouping &amp; typing. Cross matching Rh system – Rh factor, Rh incompatibility. Blood transfusion – Indication, universal donor and recipient concept. Selection criteria of a blood donor. Transfusion reactions Anticoagulants – Classification, examples and uses Anaemia: Classification – morphological and etiological. Effects of anaemia on body Blood indices – Colour index, MCH, MCV, MCHC Erythrocyte sedimentation Rate (ESR) and Packed cell volume Normal values, Definition. Determination Blood Volume -Normal value, determination of blood volume and regulation of blood volume. Body fluid– pH, normal value, regulation and variation Lymph – lymphoid tissue formation, circulation, composition and function of lymph</p>	14 hours

3	<p><b>MUSCLE:</b>  Classification of muscle, structure of skeletal muscle, Sarcomere, contractile proteins, Neuromuscular junction. Transmission across Neuromuscular junction. Excitation contraction coupling.  Mechanism of muscle contraction, muscle tone, fatigue. Rigor mortis.</p>	3 hours
4	<p><b>GASTRO INTESTINAL TRACT:</b>  Physiological anatomy of Gastro intestinal tract  Functions of digestive system.  Salivary glands - Structure and functions.  Deglutition –stages and regulation  Stomach – structure and functions.  Gastric secretion – Composition, function, regulation of gastric juice secretion.  Pancreas – structure, function, composition, regulation of pancreatic juice  Liver – functions of liver.  Bile- secretion, composition, function, regulation of bile secretion.  Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice- types, significance.  Gall bladder – functions.  Intestine – small intestine and large intestine.  Small intestine –Functions- Digestion, absorption, movements.  Large intestine – Functions, Digestion and absorption of Carbohydrates, Proteins, Fats, Lipids. Defecation.</p>	6 hours
5	<p><b>EXCRETORY SYSTEM:</b>  Excretory organs-  Kidneys: Functions of kidneys. Structural and functional unit nephron, vasa recta, cortical and juxta medullary nephrons – Comparison, Juxta Glomerular Apparatus –Structure and function.  Renal circulation peculiarities.  Mechanism of Urine formation: Ultrafiltration- criteria for filtration, GFR, Plasma, fraction, EFP, factors affecting GFR. Determination of GFR  Selective reabsorption– sites of reabsorption, substance reabsorbed, mechanisms of reabsorption Glucose, urea, H + Cl, amino acids etc. TMG, Tubular load, Renal threshold % of reabsorption of different substances.  Selective secretion.  Properties and composition of normal urine, urine output. Abnormal constituents in urine. Mechanism of urine concentration.</p>	6 hours

	Counter – Current Mechanisms: Micturition, Innervation of Bladder, Cystourethrogram. Diuretics: Water, Diuretics, osmotic diuretics, Artificial kidney. Renal function tests – plasma clearance. Actions of ADH, Aldosterone and PTH on kidneys.	
6	<p><b>ENDOCRINE SYSTEM:</b></p> <p>Definition, Classification of Endocrine glands &amp; their Hormones. Properties of Hormones.</p> <p>Thyroid gland hormone – Physiological, Anatomy, Hormones secreted, Physiological function, regulation of secretion.</p> <p>Disorders – hypo and hyper secretion of hormone</p> <p>Adrenal gland- Adrenal cortex- Physiologic anatomy of adrenal gland, Adrenal cortex, cortical hormones – functions and regulation</p> <p>Adrenal medulla – Hormones, regulation and secretion. Functions of Adrenaline and Nor Adrenaline</p> <p>Pituitary hormones – Anterior and posterior pituitary hormones, secretion, function.</p> <p>Pancreas – Hormones of pancreas. Insulin – secretion, regulation, function and action.</p> <p>Diabetes mellitus – Regulation of blood glucose level.</p> <p>Parathyroid gland – function, action, regulation of secretion of parathyroid hormone.</p> <p>Calcitonin – function and action</p>	6 hours
7	<p><b>REPRODUCTIVE SYSTEM:</b></p> <p>Function of Reproductive system, Puberty</p> <p>Male reproductive system- Functions of testes, spermatogenesis site, stages and factors influencing semen. Endocrine functions of testes</p> <p>Androgens – Testosterone structure and functions.</p> <p>Female reproductive system. Ovulation, menstrual cycle.</p> <p>Physiological changes during pregnancy, pregnancy test.</p> <p>Lactation: Composition of milk factors controlling lactation.</p>	4 hours
8	<p><b>CARDIO VASCULAR SYSTEM:</b></p> <p>Heart – Physiological Anatomy, Nerve supply</p> <p>Properties of Cardiac muscle, Cardiac cycle-systole, diastole.</p> <p>Intraventricular pressure curves. Cardiac Output – definition, factors affecting.</p> <p>Heart sounds- Normal heart sounds. Areas of auscultation.</p> <p>Blood Pressure – Definition, normal value, clinical measurement of blood pressure.</p> <p>Physiological variations, regulation of heart rate, cardiac shock,</p>	6 hours

	<p>hypotension, hypertension.  Pulse – Jugular, radial pulse, Triple response  Heart sounds – Normal heart sounds, cause, characteristics and significance. Heart rate  Electrocardiogram (ECG) –significance.</p>	
<b>9</b>	<p><b>RESPIRATORY SYSTEM:</b>  Functions, Physiological Anatomy of Respiratory system, Respiratory tract, Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration.</p> <p>Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall.</p> <p>Transportation of Respiratory gases: Transportation of Oxygen: Direction, pressure gradient, Forms of transportation, Oxygenation of Hb. Quantity of Oxygen transported.</p> <p>Lung volumes and capacities - Regulation of respiration. Mechanisms of Regulation- Neural and Chemical regulation. Respiratory centre. Hering Breuer Reflexes.</p> <p>Applied Aspects: Hypoxia, Cyanosis, Asphyxia, Dyspnoea, Dysbarism, Artificial Respiration, and Apnoea.</p>	6 hours
<b>10</b>	<p><b>NERVE, CENTRAL NERVOUS SYSTEM:</b>  Functions of Nervous system, Neuron structure, classification and properties.  Neuroglia, nerve fibre, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting.  Synapse – structure, types, properties.  Receptors – Definition, classification, properties.  Reflex action – unconditioned properties of reflex action. Babinski’s sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts  Pyramidal tracts – Extrapyramidal tracts. Functions of Medulla, pons, Hypothalamic, disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex, Cerebellum, functions of Cerebellum. Basal ganglion-functions. EEG.  Cerebro Spinal Fluid (CSF): formation, circulation, properties, composition and functions lumbar puncture.</p>	8 hours

	Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions and comparison of functions.	
<b>11</b>	<b>SPECIAL SENSES:</b> Vision – structure of eye. Function of different parts. Structure of retina, visual pathway, accommodation, visual acuity, errors of refraction, colour vision. Hearing- structure and function of Ear. Mechanism of hearing, hearing tests. Taste & Smell: receptors, pathways, method of transduction.	6 hours
<b>12</b>	<b>Skin –</b> Structure and function. Body temperature measurement, Physiological variation, Regulation of body Temperature. Role of Hypothalamus, Hypothermia and fever.	2 hours

### **LIST OF PRACTICALS: 30 Hours**

1. Haemoglobinometry.
2. White Blood Cell count.
3. Red Blood Cell count.
4. Determination of Blood Groups.
5. Leishman's staining and Differential WBC count.
6. Determination of packed cell Volume.
7. Erythrocyte sedimentation rate [ESR].
8. Calculation of Blood indices.
9. Determination of Clotting Time, Bleeding Time.
10. Blood pressure Recording- Demo.
11. Auscultation for Heart Sounds- Demo.
12. Artificial Respiration- Demo.
13. Determination of vital capacity- Demo.

### **TEACHING LEARNING ACTIVITIES:**

The course content in Physiology will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Seminars
6. Assignments

## TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Text book of Medical Physiology by Guyton (AC)
2. Chatterjee (CC) Human Physiology. Latest Ed.
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book.
4. Review of Medical Physiology by Ganong.
5. Anatomy & Physiology – Asha Lata

## EXAMINATION PATTERN:

### Distribution of Marks for University Theory and Practical Exam

Theory				Practical			Grand total
Theory	Viva Voce	IA	Sub Total	Practical	IA	Sub Total	
70	10	20	100	40	10	50	150

The practical examination will have the following components

Practical Major: 30 marks

Practical Minor: 10 marks

Examiner: One internal and External examiner for university examinations

## PATTERN OF QUESTION PAPER:

There shall be one theory paper carrying 70 marks. Distribution of type of questions and marks for Physiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay type	3 (attempt 2)	2 x 10	20
Short essay type	8 (attempt 6)	6 x 5	30
Short answer type	10 (no option)	10 x 2	20
<b>GRAND TOTAL</b>			<b>70</b>

## SUBJECT: BIOCHEMISTRY

### BASICS INSTRUMENTS & REAGENTS

**Theory: 70 Hrs. + Practical: 30 Hrs = Total teaching hours: 100**

Sl. no	Content	Hours
1	<b>Specimen collection: Pre-analytical variables:</b> Collection of blood, Collection of CSF & other fluids, Urine collection, Use of preservatives Anticoagulants	05
2.	<b>Introduction to Laboratory apparatus:</b> Pipettes- Calibration of glass pipettes, Burettes, Beakers, Petri dishes, depression plates. Flasks - Volumetric, round bottomed, Erlenmeyer conical etc., Funnels – different types, Conical, Buchner etc. Bottles – Reagent bottles – graduated and common, Wash bottles – different type, Specimen bottles etc.	10
3.	<b>Measuring cylinders, Porcelain dish:</b> 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, Desiccators, Stop watch, scissors, Dispensers – reagent and sample, Glass and plastic ware in Laboratory, use of glass: significance of borosilicate glass; care and cleaning of glass ware, different cleaning solutions of glass, Care and cleaning of plastic ware, different cleaning solutions	10
4.	<b>Instruments:</b> Water bath: Use, care and maintenance, Oven & Incubators: Use, care and maintenance. Water Distillation plant and water deionizers. Use, care and maintenance, Refrigerators, cold box, deep freezers – Use, care and maintenance, Reflux condenser: Use, care and maintenance, Centrifuges - Definition, Principle, Svedberg unit, centrifugal force, centrifugal field rpm, Ref. Conversion of G to rpm and vice versa. Different types of centrifuges - Use care and maintenance of a centrifuge, Laboratory balances - Manual balances: Single pan, double pan, trip balance, Direct read out electrical balances. Use care and maintenance. Guidelines to be followed and precautions to be taken while weighing - Weighing different types of chemicals, liquids, Hygroscopic compounds etc. pH meter - Principle, parts, Types of electrodes, salt bridge solution. Use, care and maintenance of pH meter and electrodes	10
5.	<b>Laboratory Safety and Biomedical waste disposal</b>	02
6.	<b>Conventional and SI units</b>	01

7.	<b>Atomic structure:</b> 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 uncertainty principle. Preparation of molar, normal solution etc. Percent solutions, Preparation of different solutions – v/v, w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution	05
8.	<b>Dilutions:</b> Diluting solutions: e.g. Preparation of 0.1 N NaCl from 1 N NaCl from 2 N HCl 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 e.g.: Glucose, urea, etc., Significance of volumetric flask in preparing standard solutions. Volumetric flasks of different sizes, Preparation of standard solutions of deliquescent compounds (CaCl <sub>2</sub> , potassium carbonate, sodium hydroxide etc.,) Preparation of standards using conventional and SI units	05
9.	<b>Acids, bases, salts and indicators:</b> Acids and Bases: Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowry – Bronsted theory of acids and bases classification of acids and bases <b>Acid- base indicators:</b> 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 <b>Acid Base Titration</b> Regulation of Acid Base status: Henderson Hasselbach 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	10
10.	Water and electrolyte balance, Functions of sodium, potassium and chloride and associated disturbances, Basic principles and estimation of Electrolytes	05
11.	Nutrition, Nutritional support with special emphasis on parental nutrition, Caloric Value Nitrogen Balance, Respiratory Quotient, Basal metabolic rate, Dietary Fibers, Nutritional importance of lipids, carbohydrates and proteins	07



## Practical: 30 Hours

1. Lab safety and Biomedical waste disposal
2. Analytical balance
3. Glass wares
4. Centrifugation: Principle, types & applications
5. pH determination using colorimetric methods and using pH meter.
6. Na & K by Flame Photometer, Blood gas Analyzer
7. Preparation and standard solution, molar solution General reactions and identification of carbohydrates glucose, fructose, maltose, lactose and starch
8. General reaction of proteins, colour reaction and precipitation of proteins albumin, casein.
9. Verification of Beer-Lambert Law.

## EXAMINATION PATTERN

Section	Maximum marks	Duration
Theory examination 1 paper	70	3 hours
Practical examination	40	3 hours
Viva voce	10	--
Internal Assessment- Theory	20	
Internal Assessment- Practicals	10	
Total marks -Theory + Viva + IA Theory	100	
Practicals + IA Practicals	50	
<b>Grand Total</b>	<b>150</b>	

## PATTERN OF THEORY QUESTION PAPER

LONG ESSAYS (ANSWER ANY 2 OUT OF 3) 2X10 = 20 marks

SHORT ESSAYS (ANSWER ANY 6 OUT OF 8) 6X5 = 30 marks

SHORT ANSWERS (ANSWER ALL) 10X2 =20 marks

**TOTAL** -----  
**70 marks**

### **THEORY IA – 20 MARKS**

#### **PATTERN OF PRACTICAL:**

Spotter	<b>10</b>
Identification of Unknown substance	<b>20</b>
Preparation of reagent/ buffer/normal/molar solutions/ standard solutions	<b>10</b>
<b>Total</b>	<b>40</b>

### **PRACTICAL IA – 10 MARKS**

Examiner: One internal and External examiner for university examinations

#### **Recommended books**

1. TEITZ – Clinical chemistry
2. Marshall - Clinical chemistry
3. Godkar – Text book of Medical Laboratory Technology
4. Vasudevan, Sreekumari -Text book of Biochemistry for Medical students ,Latest Ed
5. DAS – Debajyothi – Biochemistry
6. Satyanarayan – Biochemistry
7. Talwar G. P, Srivastava L M – Text book of Biochemistry & Human Biology

## **SUBJECT - PATHOLOGY**

**Theory: 70 Hrs. + Practical: 30 Hrs: Total teaching hours 100**

<b>Sl. no</b>	<b>Content</b>	<b>Hours</b>
	<b>HistoPathology - Theory</b>	<b>20</b>
<b>1.</b>	<ul style="list-style-type: none"><li>- Introduction to Histo Pathology</li><li>- Receiving of Specimen in the laboratory</li><li>- Grossing Techniques</li><li>- Mounting Techniques – various Mountants</li><li>- Maintenance of records and filing of the slides.</li><li>- Use &amp; care of Microscope</li><li>- Various Fixatives, Mode of action, Preparation and Indication.</li><li>- Bio-Medical waste management</li><li>- Section Cutting</li><li>- Tissue processing for routine paraffin sections</li><li>- Decalcification of Tissues.</li><li>- Staining of tissues - H&amp; E Staining</li><li>- Bio-Medical waste management</li></ul>	
	<b>Clinical Pathology – Theory</b>	<b>20</b>
<b>2.</b>	<ul style="list-style-type: none"><li>- Introduction to Clinical Pathology</li><li>- Collection, Transport, Preservation, and Processing of various clinical specimens</li><li>- Urine Examination – Collection and Preservation of urine. Physical, chemical, Microscopic Examination</li><li>- Examination of body fluids.</li><li>- Examination of cerebro spinal fluid (CSF)</li><li>- Sputum Examination.</li><li>- Examination of feces</li></ul>	
	<b>Haematology – Theory</b>	<b>20</b>
<b>3.</b>	<ul style="list-style-type: none"><li>- Introduction to Haematology</li><li>- Normal constituents of Blood, their structure and function.</li><li>- Collection of Blood samples</li><li>- Various Anticoagulants used in Haematology</li><li>- Various instruments and glassware used in Haematology, Preparation and use of glassware</li><li>- Laboratory safety guidelines</li><li>- SI units and conventional units in Hospital Laboratory</li></ul>	

	- Hb,PCV - ESR - Normal Haemostasis Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.	
	<b>Blood Bank</b>	<b>10</b>
<b>4.</b>	Introduction Blood grouping and Rh Types Cross matching	

### **PRACTICALS: 30Hours**

- 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

### **EXAMINATION PATTERN**

<b>Section</b>	<b>Maximum marks</b>	<b>Duration</b>
Theory examination 1 paper	70	3 hours
Practical examination	40	3 hours
Viva voce	10	--
Internal Assessment- Theory	20	
Internal Assessment- Practicals	10	
Total marks -Theory + Viva + IA Theory	100	
Practicals + IA Practicals	50	
Grand Total	150	

## **PATTERN OF THEORY QUESTION PAPER**

LONG ESSAYS (ANSWER ANY 2 OUT OF 3)	2X10	= 20 marks
SHORT ESSAYS (ANSWER ANY 6 OUT OF 8)	6X5	= 30 marks
SHORT ANSWERS (ANSWER ALL)	10X2	=20 marks
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TOTAL		70 marks
THEORY IA – 20 MARKS		

Examiner: One internal and External examiner for university examinations

## **PRACTICAL EXAM – 40 MARKS**

PRACTICAL IA – 10 MARKS

## **REFERENCE BOOKS**

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

## MEDICAL MICROBIOLOGY-I

Theory: 70 Hrs. & Practical: 30 Hrs.

Sl No	TOPIC	HOURS
<b>General Microbiology (45 Hours)</b>		
1	Definitions: infection, infectious disease, parasite, host, vector, fomite, contagious disease, epidemic, endemic, pandemic, zoonosis, epizootic. Normal flora of the human body. Routes of infection and spread; endogenous and exogenous infections; source at reservoir of infections.	10
2	Bacterial cell. Morphology limited to recognizing bacteria in clinical samples Shape, motility and arrangement. Structures, which are virulence, associated. Physiology: Essentials of bacterial growth requirements. Microscope	15
3	Sterilization, disinfection Antimicrobials: Mode of action, interpretation of susceptibility tests, resistance spectrum of activity.	10
4	Culture media, culture methods and antimicrobial sensitivity test	10
<b>Immunology (25 hours)</b>		
1	Basic principles of immunity, Structure and function of immune system and immune response, measurement of immune response	5
2	Antigen, antibody, complement system	5
3	Antigen-antibody reactions, serological diagnosis, Immunization	10
4	Hypersensitivity	5

**Practical: 30 hours**

<b>Sl. no</b>	<b>Content</b>	<b>Hours</b>
<b>1</b>	Microscopy - Parts and Types of Microscope	<b>2</b>
<b>2</b>	Handling and care of Microscopes	<b>2</b>
<b>3</b>	Using of Autoclave, Hot air oven, other common laboratory equipment etc.	<b>2</b>
<b>4</b>	Disinfection	<b>2</b>
<b>5</b>	Hand washing & PPE	<b>2</b>
<b>6</b>	Biosafety in Microbiology	<b>2</b>
<b>7</b>	Washing of materials used in microbiology	<b>2</b>
<b>8</b>	Packing of materials used in microbiology	<b>2</b>
<b>9</b>	Preparation of swabs/sterile tubes & bottles	<b>2</b>
<b>10</b>	Preparation of stains - Gram stain	<b>2</b>
<b>11</b>	Preparation of stains- Ziehl Neelsen stain	<b>2</b>
<b>12</b>	Preparation of smears	<b>2</b>
<b>13</b>	Simple stain	<b>2</b>
<b>14</b>	Gram stain	<b>2</b>
<b>15</b>	Ziehl Neelsen stain	<b>2</b>

## EXAMINATION PATTERN

Section	Maximum marks	Duration
Theory examination 1 paper	70	3 hours
Practical examination	40	3 hours
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Internal Assessment- Theory	20	
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Total marks -Theory + Viva + IA Theory	100	
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Grand Total	150	

### PATTERN OF THEORY QUESTION PAPER

LONG ESSAYS (ANSWER ANY 2 OUT OF 3) 2X10 = 20 marks

SHORT ESSAYS (ANSWER ANY 6 OUT OF 8) 6X5 = 30 marks

SHORT ANSWERS (ANSWER ALL) 10X2 =20 marks

TOTAL -----  
70 marks

THEORY IA – 20 MARKS

**PRACTICAL EXAM** – 40 MARKS

PRACTICAL IA – 10 MARKS



## **REFERENCE BOOKS**

1. Anathanarayana & Panikar Medical Microbiology
2. Roberty 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 – Rajesh Karyakarte, Ajit Damle

## **SUBSIDIARY SUBJECTS (OPTIONAL)**

ENVIRONMENTAL SCIENCE & HEALTH CARE : 20 HOURS

RESEARCH & BIostatISTICS : 20 HOURS

COMPUTER APPLICATION : 10 HOURS

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TOTAL : 50 Hours

Note: No University Examination for subsidiary Subjects

### **Subsidiary Subjects**

#### **FIRST YEAR**

<b>SI No</b>	<b>Subject</b>	<b>Teaching hours</b>
1	Computer basics	20
2	English and Communication Skills	20
3	Health care	20
4	Basic Science with Skill Development Training and Hospital Procedure and Records	40

#### **FIRST YEAR**

### **I. COMPUTER BASICS**

#### **Teaching Hours: 20**

1. Introduction to Computers
2. Definition: Input. Output & CPU
3. Input and output devices: types
4. Basis of computer system: Switching on & off, what is Bias? And computer generations
5. Keyboard practices
6. Definitions of terms: Desktop & Software
7. Computer systems: Hardware & software definitions
8. Windows operating system (win7, 8, 10 etc): Definition & Why, Calculator - Word pad - Short cuts - Start menu - Media player - Note pad - Win amp - Paint - Control panel
9. Microsoft word: Opening, saving, deleting, typing, print , Page border,

- spelling, table, grammar, margin, Clip art, BIU, word art, Colour text & background, Picture drawing using word
- 10. Excel: Formulas - Design charts- Format tables
- 11. PowerPoint: Designing a presentation - Inserting some animation with sound
- 12. Internet & its applications: Interconnection to HTML, E- mailing – Browsing - Chatting

## **II. ENGLISH AND COMMUNICATION SKILLS**

**Teaching Hours: 20**

### **ENGLISH**

1. Functional English –Grammar: Components of a sentence – Verb - Transformation of sentences – Voice - Reported speech - Positive/negative -Statement/ Interrogative - Subject verb agreement - Common errors – Exercises
2. Vocabulary: Synonyms and antonyms - Idioms and phrases – Similies - Words denoting assemblage
3. Writing skills: Note making – Summarizing - Report writing - Letter writing - Expansion of an idea  
- Comprehension
4. Reading: What is efficient and fast reading? - What is Awareness of existing reading habits - Tested techniques for improving speed - Improving concentration and comprehension through systematic study

### **COMMUNICATION**

5. Introduction: Communication process - Elements of communication - Barriers of communication and how to overcome them.
6. Speaking: Importance of speaking efficiently - Voice culture - Preparation of speech - secrets of good delivery - Audience psychology handling - Presentation skills - Conference/Interview technique
7. Listening: Importance of listening - Self-awareness about listening -Action plan execution - Barriers in listening - Good and persuasive listening
8. Nonverbal Communication: Basics of nonverbal communication
9. Memory: What is memory, Brain- mind potential? - Systems for memorizing  
- Summary page  
- Building positive mental habits
10. Self-awareness: Self-image - Self talk – Relaxation - Personality development

### III HEALTH CARE

#### Teaching Hours: 20

1. **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
2. **Introduction to Nursing**
  - Nursing principles. Inter-Personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application. Nursing Position, Bed making, prone, lateral, dorsal, dorsal recumbent, 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
3. **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
2. Text Book of P & SM by Park and Park
3. Counseling & Communicate skills for medical and health, Bayne- Orient Longman Pvt. Ltd.

### **III. BASIC SCIENCE WITH SKILL DEVELOPMENT TRAINING AND HOSPITAL PROCEDURE AND RECORDS**

**Teaching Hours: 40**

#### **1. Basic science with skill development training**

- Medical ethics & the relevant medico legal aspects
- Responsibilities & duties
- Ethical behaviour & conduct
- Medico-legal aspects and its relation to consumer protection act
- Biomedical waste & Its management
- Cardiopulmonary resuscitation- basic cardiac life support & advanced cardiac life support
- Critical care nephrology - management of renal failure in ICU
- Basic principles of blood transfusion & fluid therapy
- Sterilization - material & methods
- Biochemistry, Microbiology, Pathology & other related instrumentation: Basic principles of commonly used instruments, care & maintenance

#### **2. Infection control**

- The cycle of infection
- Infectious organisms
- The reservoir of infection
- The susceptible host Transmission of disease Practical asepsis
- Handling linen
- Disposal of contaminated waste
- Environmental asepsis
- Isolation technique
- The isolation patient in radiology dept.
- Precaution for the comprised patient Surgical asepsis

#### **3. Medication and their administration (nursing classes)**

- The role of the radiographer Medication information
- The topical route
- The oral route
- The parenteral route Preparation of injection
- The intravenous route Charting

#### **4. Dealing with acute situations (emergency medicine classes)**

- Accident victims: Head injury/ Fractures/ Burns
- Life threatening emergencies: Respiratory arrests, Heart attacks and cardiac arrests, Shocks
- Other emergencies - Epitaxis, Postural hypotension and vertigo  
Seizures, Diabetic coma and insulin reaction Asthma

## **5. CARDIOPULPONARY RESUSCITATION (C.P.R)**

- Basics of CPR - How to give CPR? Precautions during CPR
- Basic cardiac life support & advanced cardiac life support

## **6. HOSPITAL PROCEDURE AND RECORDS**

General idea about the role, importance and procedures of the following within the hospital set up -

- Medical records
- Medical photography
- Computer networking system
- Laboratory services
- Sample collection and transport
- Biomedical waste disposal

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**SECOND YEAR  
BACHALORE OF SCIENCE  
IN  
MEDICAL LABORATORY TECHNOLOGY  
(2<sup>ND</sup> B. Sc. MLT)**

## II YEAR B.Sc. MLT

<b>II Year B. Sc. MLT</b>	<b>Subjects</b>	<b>Theory</b>	<b>Practical</b>	<b>Postings</b>	<b>Total</b>
	<b>Biochemistry</b>	<b>100 Hrs</b>	<b>80 Hrs</b>	<b>120</b>	<b>300 hrs</b>
	<b>Pathology</b>	<b>100 Hrs</b>	<b>30 Hrs</b>	<b>170</b>	<b>300 hrs</b>
	<b>Microbiology</b>	<b>100 Hrs</b>	<b>30 Hrs</b>	<b>170</b>	<b>300 hrs</b>

Paper	Subjects	Theory				Practical's			Grand Total
		Theory	Viva-voce	IA	Sub Total	Practical's	I.A.	Sub Total I	
<b>I</b>	<b>Biochemistry II</b>	100	30	20	150	80	20	100	250
<b>II</b>	<b>Microbiology II</b>	100	30	20	150	80	20	100	250
<b>III</b>	<b>Pathology II</b>	100	30	20	150	80	20	100	250

<b>THEORY</b>		
<b>For 100 Marks</b>		
<b>Type of Question</b>	<b>No. of Questions</b>	<b>Marks</b>
Essay Type	3 (2 × 10)	20
Short essay type	12(10×5)	50
Short Answer type	12 (10×3)	30
<b>Theory + Viva Voce+ IA</b>	<b>100+30+20</b>	<b>150</b>
<b>Practical + IA</b>	<b>80+20</b>	<b>100</b>
<b>Total</b>		<b>250</b>



**BSC MLT - SECOND YEAR**  
**BIOCHEMISTRY II- Chemistry, Metabolism & Techniques**  
**Theory: 100 Hrs. & Practical: 80 Hrs. Posting: 120 Hrs**  
**THEORY**

Sl. no	Content	Hours
1	<b>Chemistry &amp; Metabolism of Carbohydrates</b> – Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism: Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.	15
2.	<b>Amino acids</b> - Definition, classification, essential & nonessential amino acids. <b>Chemistry &amp; Metabolism of Proteins</b> - Introduction, definition, classification, biomedical importance. Metabolism: Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, important products obtained from Phenylalanine, Tyrosine & Tryptophan; Glycine	15
3.	<b>Chemistry &amp; Metabolism of Lipids</b> - Introduction, definition, classification, biomedical importance, essential fatty acids, Energy producing pathways : Beta oxidation of fatty acids, ketone body metabolism, Ketosis, Cholesterol & it's clinical significance, Lipoproteins - composition & their functions, fatty liver, Atherosclerosis. Lipid profile	15
4.	<b>Vitamins</b> - Fat & water soluble vitamins - Sources, requirement, deficiency disorders & biochemical functions, method of estimation, reference ranges.	12
5.	<b>Minerals</b> – Sources, requirement, deficiency disorders & biochemical functions, method of estimation, reference ranges of - Sodium, Potassium, Chloride, Calcium, Phosphorous, Iron, Copper, Zinc, Magnesium, Manganese, Iodine.	12
6.	<b>Enzymes</b> - Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, Enzyme inhibition, Diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.	10
7.	<b>Blood Glucose Homeostasis</b> – Hyperglycemia, Diabetes mellitus - definition, types, features, gestation diabetes mellitus , glucose tolerance test, glycosuria's, Hypoglycemia & its causes	06

8.	<b>Electrophoresis:</b> Theory and types of electrophoresis, description of technique, principles and applications of Electrophoresis – Paper, Agarose Gel, Cellulose Acetate and PAGE and quantification. Role of electrophoretic technique in clinical biochemistry.	<b>07</b>
9.	<b>Molecular biology techniques</b> - Polymerase Chain Reaction, Recombinant DNA Technology, Blotting Technique	<b>08</b>

## **PRACTICAL**

1. Composition of urine & Analysis of Normal Urine
2. Urine examination for detection of abnormal constituents
3. Agarose gel Serum protein electrophoresis
4. Screening tests for Hemoglobinopathies, Hb electrophoresis
5. Demonstration of PAGE, Western Blotting and quantitation (gel documentation)
6. Estimation of Glucose, Urea, Creatinine, Total protein by colorimetric method
7. Estimation of Phosphorus
8. Estimation of Calcium
9. Demonstration - Estimation of Magnesium
10. Demonstration - Estimation of Iron, TIBC, Transferrin
11. Demonstration – Estimation of Vitamin A, Vitamin C
12. Demonstration - CSF Analysis- Protein and glucose
13. Demonstration - Glucose tolerance test & Glycosylated haemoglobin
14. Demonstration – Determination of Enzyme activity and study of kinetics
15. Demonstration of Protein extraction – from tissues/cells
16. Demonstration – Protein Purification and quantitation
17. Genomic DNA extraction from whole blood.
18. Demonstration of PCR

Examiner: One internal and External examiner for university examinations

## PATHOLOGY II

### **Theory:-**

Histopathology and Hematology

### **Histopathology**

Instrumentation : (a) Automated Tissue Processor (b) Microtomes, Knives, Knife sharpners

and Ultramicrotome (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 Flurescent microscope

Museum technology

Microphotography and its applications

Maintenance of records and filing of slides

ICDS Classification and coding

Application of computers in Pathology

### **Hematology**

Hemopoiesis, Stem cells, formed elements and their functions

Anticoagulants used in various hematological studies

Routine hematological tests and normal values:

(a) Determination of Hemoglobin and Hematocrit

(b) Enumeration of RBC, WBC & Platelets

(c) Absolute Eosinophil count

(d) Reticulocyte count

(e) Calculation of Red cell Indices

(f) Preperation 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) Hemoglobin Electrophoresis
- (e) Investigation of G6PD deficiency
- (f) Plasma haptoglobin and demonstration of hemosiderin in urine
- (g) Tests for Autoimmune hemolytic anemia
- (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**

- (a) B12 and Folate assay and Schilling test
- (b) Estimation of serum iron and iron binding capacity

### **Bone marrow biopsy study**

- (a) Needle aspiration and surgical biopsy technique
- (b) Preparation of smears and staining
  - Demonstration of LE cells
  - Cytochemistry
  - Administration in Hematology and Quality control

### **Practical's:**

1. Paraffin section cutting
2. Staining by Hematoxylin & 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/PCV/micro ESR
12. Determination of BT, CT, Whole blood clotting time
13. Determination of PT and PTT (manual with technician)
14. Blood smear preparation and staining
15. Osmotic fragility test
16. Sickling test
17. LE cell preparation
18. LBC – Demo & Hands on
19. Cytospin
20. IHC – Demo & Hands on
21. IF Staining
22. Frozen Sections
23. Urine analysis by stripe method
24. Spotters & Charts
25. Blood grouping by gel card method
26. DCT, ICT & cross matching

Examiner: One internal and External examiner for university examinations

## MEDICAL MICROBIOLOGY-II

**Theory: 100 Hrs. & Practical: 30 Hrs. Laboratory Posting: 120 Hrs**

SI No	TOPIC	HOURS
<b>Diagnostic Microbiology (30 hours)</b>		
1	Sample collection, preservation of samples	3
2	Processing of various samples	3
3	Automation in Culture & Serology	2
4	Quality control in Microbiology	2
5	Antibiotic susceptibility tests, Antibiotic susceptibility tests - Disk Diffusion, Broth Dilution, E Test, Vitek-2 , Antibiotic resistance and testing methods	10
6	Antigen-antibody reactions, serological diagnosis, Immunization	10
<b>Bacteriology [30 Hours]</b>		
7	Staphylococci	2
8	Streptococci including pneumococci, Enterococci	3
9	C. diphtheriae, Listeria monocytogenes	2
10	Bacillus anthracis, Bacillus cereus	2
11	Clostridium tetani, Cl. Botulinum	2
12	Cl. perfringens, Cl. difficile, Non-sporing anaerobes	3
13	Gram negative bacteria – Enterobacteriaceae - <i>E. coli</i> , Klebsiella, Proteus	3
14	Salmonella	2
15	Shigella, Vibrio	2
16	Pseudomonas, Acinetobacter	2
17	Campylobacter and Helicobacter	2
18	Mycobacteria: Tuberculosis	3
<b>General Virology [15 Hours]</b>		
19	General properties of viruses, laboratory diagnosis of viral infections	6
20	Pathogenesis and pathology of viral infections	3
21	HIV infections	3
22	HBV infections	3
<b>Mycology [15 Hours]</b>		
23	General properties of fungi, sample collection, laboratory diagnosis,	6

SI No	TOPIC	HOURS
	antifungal agents	
24	Subcutaneous and Deep mycoses	4
25	Opportunistic infections	5
<b>Hospital Infection [10 Hours]</b>		
26	Nosocomial infections and Universal safety precautions	5
27	Standard biosafety precautions, biomedical waste management and PPE	5

**Practical: 30 hours**

Sl. no	Content	Hours
1	Sample collection and transport	2
2	Simple stain	1
3	Hanging Drop preparation	2
4	Negative Staining	2
5	Gram's stain	2
6	Ziehl Neelsen stain & Modified ZN	2
7	Albert's stain	2
8	Sample processing	2
9	Inoculation techniques	2
10	Antibiotic sensitivity testing	2
11	Serological tests - Brucella agglutination test, VDRL, Widal, Typhidot	2
12	Serological tests - RA, CRP, LAT, ASO, Coombs	2
13	ELISA & Rapid Simple Tests for Viral Infections	2
14	Spill management	2
15	Operation & Maintenance of Microbiology Equipment	2
16	Recording of laboratory data and use of computers	1

Examiner: One internal and External examiner for university examinations

## SECOND YEAR Subsidiary subjects

SI No	Subject	Teaching hours
1	Indian constitution	20
2	Sociology	20
3	Environment science and health	20
4	Clinical psychology	20

### I. INDIAN CONSTITUTION

#### Teaching Hours: 20

1. Meaning of the term 'Constitution' Making of the Indian Constitution 1946-1950
2. The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.
3. Fundamental Rights and Duties their content and significance
4. Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.
5. Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.
6. Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India
7. The Election Commission and State Public Service commissions
8. Method of amending the Constitution
9. Enforcing rights through Writs:
10. Constitution and Sustainable Development in India

#### Reference 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.



## **II. SOCIOLOGY**

**Teaching Hours: 20**

### **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.

#### **1. 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

#### **2. Social Factors in Health and Disease:**

Meaning of social factors, Role of social factors in health and disease

#### **3. Socialization:**

Meaning and nature of socialization, Primary, Secondary and Anticipatory socialization, Agencies of socialization

#### **4. Social Groups:**

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

#### **5. 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

#### **6. 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 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

**7. Social Security:** Social Security and social legislation in relation to the disabled

**8. 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

### **III. ENVIRONMENT SCIENCE AND HEALTH**

#### **Teaching hours: 20**

1. Introduction to Environment and Health
2. Sources, health hazards and control of environmental pollution
3. Water
4. The concept of safe and wholesome water.
5. The requirements of sanitary sources of water.
6. 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.
7. Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.
8. Awareness of standards of housing and the effect of poor housing on health.
9. 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.

### **IV. CLINICAL PSYCHOLOGY**

#### **Total teaching hours: 20**

1. Introduction to psychology
2. Intelligence, Learning, Memory, Personality, Motivation
3. Body integrity- one's body image
4. Patient in his Milan
5. Self-concept of the therapist, Therapist patient relationship-some guidelines
6. Illness and its impact on the patients
7. Maladies of the age and their impact on the patient's own and others concept of his body image
8. Adapting changes in vision
9. Why Medical Psychology needs / demands commitment?

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**THIRD YEAR  
BACHALORE OF SCIENCE  
IN  
MEDICAL LABORATORY TECHNOLOGY  
(3<sup>RD</sup> B. Sc. MLT)**

### BSC MLT - THIRD YEAR

<b>II Year B. Sc. MLT</b>	<b>Subjects</b>	<b>Theory</b>	<b>Practical</b>	<b>Postings</b>	<b>Total</b>
	<b>Biochemistry</b>	<b>100 Hrs</b>	<b>50 Hrs</b>	<b>150</b>	<b>300 hrs</b>
	<b>Pathology</b>	<b>100 Hrs</b>	<b>30 Hrs</b>	<b>170</b>	<b>300 hrs</b>
	<b>Microbiology</b>	<b>100 Hrs</b>	<b>30 Hrs</b>	<b>170</b>	<b>300 hrs</b>

<b>Paper</b>	<b>Subjects</b>	<b>Theory</b>				<b>Practicals</b>			<b>Grand Total</b>
		<b>Theory</b>	<b>Viva-voca</b>	<b>IA</b>	<b>Sub Total</b>	<b>Practicals</b>	<b>I.A.</b>	<b>Sub Total</b>	
<b>I</b>	<b>Biochemistry III</b>	100	30	20	150	80	20	100	250
<b>II</b>	<b>Microbiology III</b>	100	30	20	150	80	20	100	250
<b>III</b>	<b>Pathology III</b>	100	30	20	150	80	20	100	250

<b>THEORY</b>		
<b>For 100Marks</b>		
<u>Type of Question</u>	<u>No. of Questions</u>	<u>Marks</u>
Essay Type	3 (2 × 10)	20
Short essay type	12(10×5)	50
Short Answer type	12 (10×3)	30
<b>Theory + Viva Voce + IA</b>	<b>100 + 30 + 20</b>	<b>250</b>
<b>Practical + IA</b>	<b>80+20</b>	<b>100</b>
<b>Total</b>		<b>250</b>

**BIOCHEMISTRY III**  
**CLINICAL BIOCHEMISTRY, ENDOCRINOLOGY & AUTOMATION**

Theory: 100 Hrs. & Practical: 50 Hrs. Posting: 150 Hrs

**THEORY**

Sl. no	Content	Hours
1	<b>ORGAN FUNCTION TESTS –</b> 1. Liver Function tests 2. Renal Function tests 3. Cardiac Function tests 4. Thyroid Function tests 5. Fertility Profile tests 6. Tumor markers & other special investigations	20
2.	<b>ENDOCRINOLOGY:</b> 1. <b>Hormones</b> – Classification & Mechanism of Hormone action 2. <b>Functions &amp; Laboratory Investigations of;</b> <ul style="list-style-type: none"> <li>• Thyroid Gland</li> <li>• Pituitary Gland &amp; Hypothalamus</li> <li>• Adrenal Gland</li> <li>• Hormones of Gonads</li> </ul>	15
3.	<b>Chromatography:</b> Principles, types and applications of Chromatography - Paper Chromatography, TLC, Ion Exchange, Affinity Gel, Filtration, Gas Chromatography and HPLC.	05
4.	<b>AUTOMATION –</b> 1. Automation in clinical lab 2. Types of chemistry analyzers 3. Auto analyzers based on immunoassay techniques, Micro particle enzyme Immunoassay (MEIA) 4. The Heterogeneous Immunoassay module components 5. Latest trends in Automation, Biochips, and Lab on a chip (LoC), 6. Nano sensors - advantages, and disadvantages, PCR & its applications. 7. ELISA - Types and Applications	20
5.	<b>LABORATORY QUALITY MANAGEMENT –</b> 1. Quality control 2. Total quality management - Quality laboratory processes, Quality assurance, Quality assessment, Quality control, Quality planning and Quality improvement	40

	<ol style="list-style-type: none"> <li>3. Internal and external quality control, basic steps, sources of error and their correction methods, CAPA - corrective action &amp; preventive action</li> <li>4. Quality control charts, Levy- Jennings and Cusum charts, West guard Rules</li> <li>5. Quality control program, intrinsic and extrinsic and random errors</li> <li>6. Current trends in laboratory accreditation, ISO certification</li> <li>7. Costs of conformance and nonconformance, appraisal costs, prevention costs</li> <li>8. Biostatistics – Application of statistical principles in history Presentation of data, calculation of mean, median and mode, range and standard deviation and their significance. Significance of ' T ' test, <math>\chi^2</math> values.</li> </ol>	
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## **PRACTICALS**

1. Urine screening for IEM
2. Paper Chromatography of amino acids, calculation of Rf values
3. Thin Layer Chromatography – Amino acids/ Carbohydrates, identification of spots in urine sample using standards and Rf value.
4. Demonstration - HPLC
5. Urinary calculus Analysis
6. Estimation of Glucose, total protein/Albumin, Urea using standard curve
7. Estimation of Serum Alkaline Phosphatase, Acid Phosphatase and serum Amylase activity by spectrophotometry & Semi-automated Analyzer (end point and Kinetic)
8. Estimations by fully automated analysers
  - a. Estimation of Glucose
  - b. Estimation of Uric acid
  - c. Estimation of Acid Phosphatase
  - d. Estimation of LDH
  - e. Estimation of Electrolytes
  - f. Lipid profile
  - g. LFT
  - h. RFT
  - i. Cardiac function test - Estimation of Total CK, CK-MB, Troponins
  - j. TFT
9. Demonstration - ELISA
10. Demonstration – Vector designing & Cloning, Basics of Cell culture techniques
11. Demonstration – Karyotyping

Examiner: One internal and External examiner for university examinations



## **PATHOLOGY III**

### **Cytology, Automation in cytology, Cytogenetics, Cytochemistry**

#### **Immunohematology and Blood transfusion**

#### **Cytology**

1. Normal cell structure, functions, cytologic criteria of malignancy
2. Types of specimens, methods of collection & preparation of cell block
3. Different fixatives and methods of fixation
4. Staining : (a) Papanicolaou's stain- principle , Preparation and staining techniques  
(c) May Grunwald Giemsa stain  
(d) Shorr's stain  
(e) 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 nonmalignant 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

## **Automation in Cytology**

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

## **Tissue culture and Immunohistochemistry**

1. Equipment's for Tissue culture studies
  - (a) Laminar air flow equipment
  - (b) Carbon dioxide incubator
  - (c) Inverted microscope
2. 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
3. Characterization of cell lines
  - (a) Determination of biochemical markers in cells
  - (b) Chromosomal & DNA content of cells
  - (c) Immunological properties of cells
4. Preservation of Immortalized cell lines
  - (a) Storage in Glycerol in Liquid Nitrogen
  - (b) Storage in Dimethyl sulfoxide in Liquid Nitrogen

## **Cytogenetics**

1. Introduction to cytogenetics, terminology , classification and nomenclature of human chromosomes
2. Methods of karyotypic analysis
  - (a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts
  - (b) Direct preparation from tumor materials
3. Characterization of human chromosomes by various banding techniques
4. Sex chromatin identification
5. Chromosomes in neoplasia and oncogenes

## **Immunocytochemistry**

1. Basics concepts, monoclonal antibodies & preparation
2. Flurescence reactions

## **Immunoematology and Blood transfusion**

1. ABO Blood group and Rh system
2. Subgroups of A and B , Other blood groups and Bombay group
3. HLA antigens and their significance
4. Principles of Blood transfusion:
  - (a) Blood donor selection
  - (b) Methods of bleeding donors
  - (c) Blood containers, anticoagulants and storage of blood
  - (d) Coomb's test and its significance
  - (e) Screening of blood for infective material
  - (f) Blood components, preparation & component therapy
  - (g) Autologous transfusion
  - (h) Transfusion reactions and work up
  - (i) Blood bank organization, standards, procedures, techniques and quality control

## **Practicals**

1. Preparation of various cytology smears and fixation
2. Papanicolaou's and May Grunwald Geimsa staining
3. Hormonal cytology study
4. Blood grouping and Rh typing
5. Cross matching techniques
6. Screening of Donor's blood for infective agents
7. Transfusion reaction work up
8. Preparation of blood components

Examiner: One internal and External examiner for university examinations

### MEDICAL MICROBIOLOGY-III

**Theory: 100 Hrs. & Practical: 30 Hrs. Laboratory Posting: 120 Hrs**

SI No	TOPIC	HOURS
<b>Bacteriology [15 Hours]</b>		
1	M. leprae & Non-tuberculous mycobacteria	3
2	Spirochetes	3
3	Anaerobes	2
4	Rickettsia, Orientia, Coxiella	2
5	Chlamydia & Chlamydophila	2
<b>Parasitology [20 Hours]</b>		
6	Introduction to Parasitology	3
7	Entamoeba histiolytica	2
8	Trichomonas and Giardia	2
9	Malaria	3
10	Cestodes (Taenia & Echinococcus)	4
11	Nematodes - 1 (Round worm, Hook worm)	3
12	Nematodes - 2 (Pinworm, Thread worm)	3
<b>Mycology [5 Hours]</b>		
13	Dermatophytes	3
14	Opportunistic fungus	2
<b>Diagnostic Microbiology [20 Hours]</b>		
15	Bacteriology of Water, Milk & Air	3
16	Molecular Detection of Microorganisms	5
17	Tumor and Transplant immunology	3
18	Automation in Microbiology	3
19	Quality control in Microbiology	2
20	Laboratory acquired infections	4
<b>Hospital Infection [20 Hours]</b>		
21	Infection prevention & control	5
22	Personal protective equipments, Universal precautions, Hand rubs	4
23	Biomedical Waste management	3
24	Biosafety - Levels of Biosafety, Personal Protective Equipment, Do's and Don'ts in Microbiology Laboratory, Biomedical Waste Management	3
25	Prevention of transmitting infections from patients to hospital staff like HIV and Hepatitis B	3
26	Immunisation of Healthcare Workers & Laboratory Technicians	2

**Practical: 30 hours**

<b>Sl. no</b>	<b>Content</b>	<b>Hours</b>
<b>1</b>	Sample collection and transport	<b>2</b>
<b>2</b>	Gram's stain	<b>2</b>
<b>3</b>	Ziehl Neelsen stain & Modified ZN	<b>2</b>
<b>4</b>	Inoculation techniques	<b>2</b>
<b>5</b>	Preparation of Biochemical Reactions & Reagents	<b>1</b>
<b>6</b>	Identification of Bacteria	<b>2</b>
<b>7</b>	Vitek 2 system for ID & Sensitivity	<b>2</b>
<b>8</b>	Wet mount	<b>2</b>
<b>9</b>	Stool concentration Technique.	<b>1</b>
<b>10</b>	Stool for Ova and cysts	<b>2</b>
<b>11</b>	KOH & Calcoflour	<b>2</b>
<b>12</b>	Slide Culture Technique & LPCB	<b>2</b>
<b>13</b>	QBC	<b>1</b>
<b>14</b>	Rapid diagnostic tests	<b>1</b>
<b>15</b>	Serological tests - Brucella agglutination test, VDRL, Widal, Typhidot	<b>2</b>
<b>16</b>	Serological tests - RA, CRP, LAT, ASO, Coombs, ELISA	<b>2</b>
<b>17</b>	Virology Culture Methods	<b>2</b>

Examiner: One internal and External examiner for university examinations

## Subsidiary Subjects

### THIRD YEAR

SI No	Subject	Teaching hours
1	Research methodology	20
2	Biostatistics	20

### THIRD YEAR

#### I. RESEARCH METHODOLOGY

Teaching hours:20

##### 1. Introduction: Research Methodology

- Research process
- Steps involved in research process
- Research methods and methodology

##### 2. Variables and scales of measurements

- Definitions and examples of qualitative, quantitative, continuous discrete, dependent and independent variable
- Definitions, properties and examples of nominal, ordinal, interval and ratio scales of measurements.

##### 3. Sampling

- Population, sample, sampling, reasons for sampling, probability and non-probability sampling.
- Methods of probability sampling – simple random, stratified, systematic- procedure
- Merits and demerits.
- Use of random number table.

##### 4. Organization of data

- Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie chart

##### 5. Measures of location

- Arithmetic mean, median, mode, quartiles and percentiles – definition
- Computation (for raw data), merits, demerits and applications

##### 6. Measures of variation

- Range, inter-quartile range, variance, standard deviation, coefficient of variation- definition
- Computation (for raw data), merits, demerits and applications

## II. BIO-STATISTICS

Teaching hours:20

### 1. Introduction I: Biostatistics

- Definition
- Role of statistics in health science and health care delivery system

### 2. Normal distribution

- Concept, graphical form, properties, examples
- Concept of Skewness and Kurtosis

### 3. Correlation

- Scatter diagram
- Concept and properties of correlation coefficient, examples [No computation]

### 4. Health Information System

- Definition, requirement, component and uses of health information system.
- Sources of health information system- Census, Registration of vital events, Sample registration system (SRS), Notification of diseases, Hospital records, Disease registries, Record linkage, Epidemiological surveillance, Population survey

### 5. Vital statistics and hospital statistics

- Rate, ratio, proportion, Incidence, Prevalence. Common morbidity, mortality and

### 6. Fertility statistics – Definition and computation.

### 7. Hypothesis

- What is hypothesis
- Formulation of hypothesis
- Characteristics of good hypothesis.

### 8. Epidemiology

- Concept of health and disease
- Definition and aims of Epidemiology,
- Descriptive Epidemiology- methods and uses.

### 9. Concept of reliability & validity

## **RECOMMENDED BOOKS**

1. Methods in Biostatistics for medical students & Research workers, Mahajan B.K. - 6<sup>th</sup> edition
2. Research methodology – Methods & techniques, Kothari. C.R
3. Introduction to Biostatistics: A manual for students in health sciences, Sundar Rao PSS, Richard. J
4. Text book of Preventive and social medicine, Park. E. Park

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## **INTERNSHIP**

Twelve-month compulsory rotational postings during which students have to work under the supervision of experienced staff in the following areas:

1. Clinical Pathology
2. Haematology
3. Clinical Biochemistry
4. Clinical Microbiology
5. Blood bank
6. Phlebotomy
7. Serology
8. Histopathology
9. Cytology

**NOTE:** At the end of internship there will be a practical exam, conducted by one Internal and one External examiner.



SDM College of Medical Sciences & Hospital



SDM College of Dental Sciences & Hospital



SDM College of Physiotherapy &  
SDM Institute of Nursing Sciences



Shri Dharmasthala Manjunatheshwara University



SDM Research Institute for Biomedical Sciences



Panoramic View of Campus