



BLDE University, Bijapur

M.Sc. Medical Courses

Regulations & Syllabus

**(Common to Anatomy, Physiology, Biochemistry
and Microbiology)**

2010-11



B.L.D.E. UNIVERSITY

[Declared as Deemed-to-be- University u/s 3 of UGC Act, 1956 vide Government of India Notification No. F.9-37/2007-U.3(A)]

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

BLDEU/REG/M.Sc./2010-11/169

May 18, 2010

NOTIFICATION

Sub: Curriculum of M.Sc. Medical Programme in Anatomy, Physiology, Biochemistry and Microbiology

- Ref: 1. Minutes of the meeting of the 5th Academic Council of the University held on March 17, 2010.
2. Minutes of the meeting of the 8th BoM of the University held on March 27, 2010.

The Board of Management of the University is pleased to approve the Curriculum of **M.Sc. Medical in Anatomy, Physiology, Biochemistry and Microbiology** at its 8th meeting held on March 27, 2010.

The Curriculum of the **M.Sc. Medical Programmes** shall be effective from the Academic Session 2010-11 onwards, in the constituent College of the University viz. Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura.


REGISTRAR
REGISTRAR.
BLDE University, Bijapur

To,
The Dean, Faculty of Medicine and Principal
BLDEU's Shri B. M. Patil Medical College, Hospital and
Research Centre, Bijapur

Copy to:

- The Secretary, UGC, New Delhi
- The Vice Principal
- The Controller of Examinations
- The Coordinator, IQAC
- The Prof. & HoDs of Pre, Para and Clinical Departments
- PS to the Hon'ble Vice-Chancellor

Smt. Bangaramma Sajjan Campus, Sholapur Road, Bijapur – 586103, Karnataka, India.

Regulations governing the Master of Science (medical) degree programme

1. Title of the programme

The programme shall be called Master of Science (medical) - M.Sc.
(medical)

2. Areas of speciality

- a) Anatomy
- b) Physiology
- c) Biochemistry
- d) Microbiology

3. Eligibility for admission

A candidate seeking admission into this course shall have one of the following qualifications

- a) B.Sc. Degree with life sciences as one of the optionals
- b) M.B.B.S.

4. Duration of the programme

The programme shall extend for a period of three academic years. However, it will be two years for M.B.B.S. graduates.

5. Courses of study

- (a) The programme shall consist of two parts; the preliminary part of one year and the final part of two years.
- (b) The preliminary part, which consists of Anatomy, Physiology and Biochemistry, shall be common for all the M. Sc.(Medical) programmes, viz., anatomy, physiology, biochemistry & microbiology. However, M.B.B.S graduates are exempt from the preliminary part.
- (c) The final part shall consist of two years
- (d) The course includes a dissertation

6. Syllabus

The respective Boards of studies shall prepare syllabus

7. Admission

- a) Based on entrance examination to be conducted by the institute.
- b) Commencement of Course: August every year

8. Attendance

- a) A candidate shall be considered to have satisfied the requirement of attendance for each year if he/she attends not less than 75% of the number of classes actually held upto the end of the academic year in each of the subjects.
- b) A candidate who does not satisfy the requirements of attendance even in one subject shall not be permitted to appear for the whole university examination of that year and he shall be required to repeat all the subjects in a subsequent year.

9. Scheme of examination:

- The examination for the degree shall consist of written papers, practical and oral.
- There shall be two examinations viz. Preliminary and final. The preliminary examination shall be taken at the end of the first year. The final examination shall be taken at the end of third year.
- The examination shall be conducted ordinarily twice a year, viz. July/August and January/February.

Preliminary examination (common to all specialities):

This consists of theory, practical and oral. There will be a separate paper for Anatomy, Physiology & Biochemistry. Examination pattern for each subject will be as follows:

	<u>Duration</u>	<u>Marks</u>	<u>IA*</u>	<u>Total</u>
Theory#	3 hours	80	20	100
Practical		60	15	75
Oral		25	-	25

		Total		200

*Internal assessment. #Each theory paper shall have two sections A and B. Practical & oral exam will be on the same day

Final Examination

This consists of theory, practical, dissertation and oral. The division of syllabus for the theory and practicals shall be made by respective board of studies.

	<u>Duration</u>	<u>Marks</u>	<u>IA*</u>	<u>Total</u>
Theory paper-1#	3 hours	100	25	125
Theory paper-2#	3 hours	100	25	125
Theory paper-3#	3 hours	100	25	125
Practicals		150	50	200
Records			25	25
Viva-voce including Dissertation		100	-	100
		Total		700

Internal assessment Each theory paper shall have two sections A and B. Practical and viva-voce examination will be of two days duration.

Dissertation

The student should complete dissertation six months before the final examination. The student shall be assessed for the accepted dissertation work at the time of orals by all the examiners.

10. Internal assessment

- There shall be at least three tests for each theory paper and the average of best two assessments shall be taken to calculate the internal assessment
- There shall be at least three tests for each practical paper and the average of best two assessments shall be taken to calculate the internal assessment.

- c) The marks of internal assessment shall be communicated to the university at least fifteen days before the commencement of the University examinations and the university shall have access to the records.

11. Minimum for a pass

- a) No candidate shall be declared to have passed the Preliminary examination unless he/she obtains 40% marks in written and practical separately (University examination) in each subject and 50% marks in the aggregate of written (University examination), internal assessment of theory and oral (University examination) put together and 50% in the aggregate of practical (University examination) and internal assessment of practical put together.
- b) No candidate shall be declared to have passed the Final examination unless he/she obtains 40% marks in each written and practical examination (University examination) and 50% marks in the aggregate of written (University examination), internal assessment of theory and oral (University examination) put together and 50% in the aggregate of practical (University examination), dissertation and internal assessment of practical put together.

12. Classification of successful candidates

- a) Class shall be declared for both Preliminary and Final examinations.
- b) Only those who pass in all the subjects in the first attempt shall be eligible for First Class with Distinction or First Class or Second Class.
- c) Class for the degree shall be declared on the basis of the marks obtained in the final examination.

Percentage of Marks for declaring Class:

Distinction	- Not less than 75% of the aggregate marks.
First Class	- Not less than 65% of the aggregate marks.
Second Class	- Not less than 50% of the aggregate marks.
Pass Class	- Successful Repeater Candidates.

13. Panel of examiners

- a) There shall be a panel of eight external examiners as advised by the Head of the department and approved by the Hon'ble Vice Chancellor.
- b) Theory paper setting to be done by the examiners from outside the state of Karnataka not involved in the concerned Practical examination.
- c) No. of Examiners Required - Four
No. of Internal Examiners. - Two
No. of External Examiners. - Two

At least one of the examiners should be from outside the state of Karnataka

14. Reappearance

- a) A candidate who fails to get the minimum of marks as indicated in item no. 11, in any one of the subjects, viz. Anatomy, physiology and Biochemistry may be permitted to appear for the Preliminary examination in that subject only.

15. Carry-over Provision

No candidate shall be permitted to appear to the final part unless he passes all the subjects of the preliminary examination.

M.Sc. HUMAN ANATOMY SYLLABUS

GENERAL ANATOMY

A. General Anatomy:	12 Hrs
1. General Introduction:	2 Hrs
a) Definition A subdivisions of Anatomy.	
b) Regions, Cavities A Systems of body.	
c) Anatomical positions A terms.	
2. Introduction to Osteology	2Hrs
a) Definition & sub divisions of skeleton.	
b) Classification of bones with examples.	
c) Common features of a long bone -diaphysis, epiphysis, metaphysic.	
d) Ossification - definition A types.	
e) Blood supply of a long bone.	
3. Introduction to Arthrology	2 Hrs
a) Definition a Classification of joints with examples.	
b) Features of a sy no vial joint - Bursa	
c) Visualization of bones and joints by X-rays	
4. Introduction to Myology	2 Hrs
a) Definition of Skeletal muscle, tendon fascia, aponeurosis.	
b) Classification of Skeletal muscles with examples.	
c) Definition of origin, insertion, group actions of muscles.	
d) Ultrastructure of skeletal muscle.	
5. Introduction to blood and lymphvascular system	2 Hrs
a) Brief introduction to heart and its chambers, major blood vessels entry and leaving heart.	
b) Circulation of Blood - Pulmonary	
c) Portal	
d) Clasif ication of vessels - arteries.	
e) Components and functions of lymphvascular system, circulation of lymph.	
6. Introduction to Nervous System	2 Hrs
a) Definition, subdivision of nervous system.	
b) Neurons Cell - structure, types, definition of ganglia and nucle	
c) Definition of motor and sensory roots, typical spinal nerve.	
d) Brief course of a typical intercostal nerve.	
e) Plexus – definition, importance.	
B. EMBRYOLOGY	23 Hrs
1. General Embryology	8 Hrs
a) Introduction - Mitosis A Meiosis	1 Hr
b) Gametogenesis	1 Hr
c) Ovarian cycle A Uterine cycle	1 Hr

- d) Fertilization, formation of bilaminar germ disc 1 Hr
- e) Notochord, trilaminar germ disc, embryonic folds 1 Hr
- f) Implantation, foetal membrane Placenta 2 Hrs
- g) Formation of tissues of body 1 Hr

2. Systematic Embryology : 15 Hrs

- a) Pharyngeal arches & Pouches 2 Hrs
- b) Development of face, nose, palate 1 Hr
- c) Development of Tongue
- d) Gastro intestinal tract & glands associated with GIT
- e) Respiratory System
- f) Body Cavities diaphragm
- g) Development of heart, External appearances, Chambers 2 Hrs
- h) Development of blood vessels 2 Hrs
- i) Foetal circulation, circulating changes at birth 1 Hr
- j) Development of Urinary System male genital system, female genital system 1 Hr
- k) Development of nervous system eye, ear 1 Hr
- l) Development of Skeletal system skin 1 Hr

C. HISTOLOGY: 21 Hrs

1. General Histology:

Theory

- a) Introduction, microscopy, cell, Classification of tissues 1 Hr
- b) Epithelial tissue - classification with Examples - Cell junctions, surface Modifications, Electron microscopic view. 3 Hrs
- c) Connective tissue - cells & fibres Classification 1 Hr
- d) Cartilage, Bone - of ground section 1 Hr
- e) Muscular tissue skeletal & cardiac muscle 1 Hr
- f) Nervous tissue - types of nerve cells, nerve fibre, peripheral nerve 1 Hr
- g) Blood vessels - classification large artery A large vein 1 Hr
- h) Lymphoid tissue - lymphnode tonsil, thymus, spleen Systemic 1 Hr

Histology 11 Hrs

- a) Salivary glands 1 Hr
- b) Tongue, esophagus, Stomach 1 Hr
- c) Small intestine, large intestine, pancreas 1 Hr
- d) Liver, Gall Bladder 1 Hr
- e) Respiratory System – Trachea, Lung 1 Hr
- f) Urinary System – Kidney, Ureter, Bladder 1 Hr

g) Male reproductive System – Testis	Epididymus, Vasdeferens Prostate	1 Hr
h) Female reproductive System –	Ovary Uterus Fallopian tube Placenta	1 Hr
i) Endocrine -	Pituitary Thyroid Parathyroid Suprarenal	1 Hr
j) Skin and Eye		1 Hr
k) Spinal cord, cerebral cortex, cerebellum cortex		1 Hr

D. GENETICS :

10 Hrs

Theory

8 Hrs

a) Introduction, Principles of heredity Meiosis	}	1 Hr
b) Structure & Classification of chromosomes		
c) Study of Chromosome		2 Hrs
d) Sex chromatin a Lyon hypothesis		1 Hr
e) Genetics basis of inheritance		1 Hr
f) Modes of inheritance		1 Hr
g) Genetics basis of variation polymorphism &		1 Hr
h) Population genetics		1 Hr

PRACTICALS

2 Hrs

Sex Chromatin
Chromosomes

GENERAL HISTOLOGY PRACTICALS

5 x 2 = 10 Hrs

1. Microscopy Simple epithelia	2 Hrs
2. Stratified epithelia Striated squamous Pseudo stratified	2 Hrs
Ciliated columnar epithelium Goblet cells	2 Hrs
3. Cartilage - Hyaline, elastic. Bone – TS&ALS	2 Hrs
4. Muscular tissue, Skeletal, cardiac Nervous tissue - Types of neurons T.S. of peripheral nerve Blood vessels - Elastic artery – aorta. Large vein	2 Hrs
5. Lymphoid tissues - lymph node tonsil, thymus, spleen	2 Hrs

SYSTEMIC HISTOLOGY PRACTICALS

5 x 2 = 10 Hrs.

- | | | |
|--|---|-------|
| 1. Salivary glands – Parotid | } | 2 Hrs |
| 2. Tongue, Esophagus, Stomach Fundus | | |
| 3. Duodenum Large intestine, appendix, Pancrease,
Liver gall bladder. | | 2 Hrs |
| 4. Trachea, lung, kidney, Urinary bladder. | | 2 Hrs |
| 5. Male & Female reproductive System: | | |
| - Testis, Epididymus, vasdeferens, prostate. | | |
| - Ovary, uterus, fallopian tube, Placenta. | | 2 Hrs |
| 6. Endocrines - Pituitary, thyroid, Parathyroid, Suprarenal | } | 2 Hrs |
| 7. Skin cornea, retina Spinalcord, cerebral cortex, Cerebella cortex. | | |

REGIONAL ANATOMY

1. Upper Limb Theory

10 Hrs

- | | | |
|--|---|---------|
| Osteology | - Clavicle, Scapula humerus | 1 Hr |
| | Radius, Ulna articulated hand | 1 Hr |
| Soft parts | - Muscles, vessels, nerves
(Region wise)
Pectoral region, scapular region
Axilla | } 1 Hr |
| | - Arm - Flex or
- Extensor | |
| | - Foream - Flex or
- Extensor | } 1 Hr |
| | - Palm Hand
- Dorsum | |
| Branchial plexus formation and brief course
Of median, ulnar, radial a auxiliary nerves | | } 2 Hrs |
| Major arteries and their main branches venous
drainage a lymphatic drainage of upper limb | | |
| Joints of upper limb- Shoulder joint in detail X-ray
pictures of upper limb | | } 1 Hr |

PRACTICALS

2 x 2 = 4 Hrs

- | | | |
|-------------------------------------|---|------|
| Demonstration of
Peetoral region | } | 2 Hr |
| | | |

Axilla
scapular region

Arm
Forearm
Hand

}
} 2 Hr

**2. Lower Limb
Theory**

10 Hrs

Osteology - Hipbone
Femur, Patella } 1 Hr

Tibia, fibula,
Articulated foot } 1 Hr

Soft parts - Muscles, Vessels, nerves
(Region wise)

- Front of thigh
Adductor compartment } 1 Hr

- Gluteal region
Back of thigh } 1 Hr

Foot - Dorsum
- Sole } 1 Hr

Lumbar and Lumbo-sacral plexus formation Brief
course of femoral, obturator and Sciatic nerves } 2 Hrs

Major arteries & their main branches venous
Drainage & lymphatic drainage of lower limb } 1 Hr

Joints - Hip and Knee joints
X-rays of lower limb } 2 Hrs

PRACTICALS:

2 x 2 = 4 Hrs

a) Front of thigh
b) Adductor compartment
c) Gluteal region
d) Back of thigh } 2 Hrs

e) Leg - Anterior Compartment
Posterior Compartment
f) Popliteal foss - Lateral compartment } 2 Hrs

g) Foot	-	Dorsum Sole	
3. THORAX			8 Hrs
Osteology	-	Vertebra – Parts of Thoracic Vertebra Ribs- Parts of typical rib, classification sternum formation of bony thoracic cage	1 Hr
Thoracic wall, typical intercostals space Thoracic cavity, Mediastinum, pericardium			1 Hr
Heart – external features, chamber blood supply, aorta pulmonary trunk			2 Hrs
Thachea, bronchi, pleura, lungs esophagus, thoracic duct			2 Hrs
Radiology	-	X-Ray chest, contrast Bronchogram Coronary angiogram Barium swallow esophagus	2 Hrs
PRACTICALS			2 x 2 = 4 Hrs
Thoracic wall, Intercostal space thoracic cavity, Metiastinnm			2 Hrs
Heart, Lungs			2 Hrs
4. ABDOMEN & PELVIS :			
Theory			17 Hrs
Osteology	-	Articulated pelvis Lumbar vertibra Sacrum	1 Hr
Anterior abdominal wall, rectus sheath inguinal canal			2 Hrs
Peritonium			2 Hrs
Liver, extrahepatic biliary apparatus			1 Hr
Stomach, Small intestine, Pancrease, Spleen caecum appendix, Rectum anal canal			2 Hrs
Kidney, Ureter, Bladder, Suprarenals, Diaphragm			2 Hrs

Major blood, vessels, nerves & lymphatic drainage of abdomen		1 Hr
Female reproductive system		1 Hr
Male reproductive system		1 Hr
Major blood vessels, nerves, lymphatic drainage of pelvis		1 Hr
Perineum	- Superficial & deep Perinial pouches pelvic Diaphragm	2 Hrs
Radiology	- Plain X-Ray Contrast X-Ray IVP Barium meal Cholecystography	1 Hr

PRACTICALS **5 x 2 = 10 Hrs**

Anterior abdominal wall, rectus Sjenth Inguinal canal, peritoneum		2 Hr
Liver, Stomach, Small Intestine, Pancreas, Spleen coeliea & superior Mesenteric vessels		2 hrs
Large intestine, Kidney, Ureter, Bladder Supra renal		2 hrs
Major blood vessels, nerves of abdomen & pelvis, diaphragm		2 Hrs
Female & Male reproductive system, perineum		2 Hrs

5. HEAD & NECK

Theory		17 Hrs
Osteology	- Skull as a whole Cranial cavity	1 Hr
	Cervical Vertebra Mandible	1 Hr
Scalp, face lacrimal apparatus		2 Hrs

Tringle of neck, deepfascia lymphatic drainage of head and neck, carotid sheath, cervical plexus	2 Hrs
Salivary glands	1 Hr
Pituitay, thyroid, paprathroid	1 Hr
Temporal & infratemporal fossa	1 Hr
Tongue, Tonsil, Palate	1 Hr
Nose, paranasal airsineses, pharynx	1 Hr
Larynx	1 Hr
Major blood vessels of head & neck, peripheral parasymphetic gangtia, cervical symphetic ahain	2 Hrs
Ear	1 Hr
Radiology- X-Ray's spine, paranasal airsineses carotid angoiogram	2 Hrs

PRACTICALS: 5 x 2= 10 Hrs

Scalp, face	2 hrs
Triangles of neck, blood vessels , nerves	2 Hrs
Cranial cavity, orbit, eyeball	2 Hrs
Temporal & infratemporal fossa, submandigular region	2 Hrs
Nose, pharynx, ear	2 Hrs

6. SPINAL CORD & BRAIN:

Theory:	14 Hrs
Spinal cord - general features, coverings, blood supply	1 Hr
Transverse section - Nuclei	1 Hr
Tracts of spinal cord, Pyramidal, Spino-thalamic	2 Hrs
Medial leminiscious pathway, spino-cerebellar tracts	
Brainstem - Medulla & Pons	1 Hr
Cerebellum	1 Hr
Midbrain & cerebellar Peduncles	1 Hr

Cerebrum - Meninges, subarachnoid cisterns, CSF	2 Hrs
Circulation, External features, sulci, Gyri, Functional areas and blood supply	
White matter of cerebrum, internal capsule -	2 Hrs
Thalamus, Hypothalamus, basal ganglia	
Ventricles of brain	1 Hr
Cranial nerves	2 Hrs

PRACTICAL5: 3 X 2 = 6 Hours

Spinal cord, Brain coverings, sub arachnoid cisterns	-	2 Hrs
External features		
Cerebrum, Sulci, Gyri, functional areas, blood supply	-	2 Hrs
Brain stem		
Cut sections of brain to show internal capsule, thalamus	-	2 Hrs
Hypothalamus, basal nuclei, ventricles of brain		

M.Sc. PRELIMINARY ANATOMY

Duration: One academic year

Distribution of theory & practical hours:

S.No.	Topic	Theory	Practicals
1	General Anatomy	12 Hours	-
2	Embryology	- General - Systemic	-
		8 Hours 15 Hours	
3	Histology	- General - Systemic	10 Hours 10 Hours
		10 Hours 11 Hours	
4	Genetics	8 Hours	2 Hours
5	Regional Anatomy	- Upper limb - Lower limb - Thorax - Abdomen & Pelvis - Head and neck - Spinal cord & brain	4 Hours 4 Hours 4 Hours 10 Hours 10 Hours 6 Hours
		10 Hours 10 Hours 8 Hours 17 Hours 17 Hours 14 Hours	
		140 Hours	60 Hours

Time table:

4 Hours Theory / Week – 4 x 35 weeks = 140 hours. Approx. 9 months

2 Hours Practicals / Week – 2 x 30 weeks = 60 hours. Approx. 8 months

Internal Assessment:

Theory : - 3 Exams . Marks – 20

1st exam - At the end of 3 months syllabus

2nd exam - At the end of 6 months syllabus (covered after 1st exam)

3rd exam - At the end of completing course - Whole syllabus (Final exam)
(15 days before university exam)

Best of two and their average to be taken.

Practicals: 2 exams.

Marks 20

1st - After 2nd internal exam in theory

2nd - Before final University exam and after

3rd theory internal

Distribution of marks: 1) Histology

- 5marks

2) Gross Anatomy

- 5 marks

3) Record

-10 marks

University examination: Theory - 3 Hours. 80 Marks

Paper model: Part-A and Part B for 40 marks each

Each Part contains; 6 marks x 2 questions = 12 marks

4 marks x 5 questions = 20 marks

2 marks x 4 questions = 8 marks

} 8 x5 =40 marks

-
Total = 40 marks

-

More questions for wider coverage of subject.

Emphasis should be to find out their basic knowledge and not in depth.

No clinically oriented or applied questions.

Part-A syllabus:

Limbs - 05 marks

Head & neck, spinal cord & brain - 20 marks

General histology - 05marks

Concerned embryology & histology - 05marks

Part-B syllabus:

General Anatomy, Abdomen A Pelvis	- 25 marks
General Embryology	-04 marks
Genetics	- 04 marks
General anatomy	- 02 marks
Concerned embryology & histology	- 04 marks

- Copy of syllabus and pattern of distribution s
- Concerned systemic embryology & histology can be included along with Regional anatomy questions. There should not be separate question in Systemic embryology.

Practicals'

Marks - 60. 3 Hours

Histology. Spotters - 10 x 1 = 10 marks. 5 + 5 (general & systemic)
Discussion of 2 slides - 10 x 2 = 20 marks 1+ 1 General & systemic equal distribution

Gross Anatomy. Spotters - 10 x 2 = 20 marks

Distribution: Limbs	- 2 marks
Head & neck	- 3 marks
Brain A spinal cord	- 1 mark
Thorax	-1 mark
Abdomen A Pelvis	- 3 marks

Discussion: 2 specimens - Above diaphragm - 5 marks
Bellow diaphragm - 5 marks. Total - 10 marks

Viva: **20 marks**

Osteology & X-rays	- 10 marks
Soft parts & embryology	- 10 marks

Passing minimum:

Theory, Internal Assessment - 50%

University examination - 40 %

Theory + Internal Assessment + viva - 50%

No passing minimum for viva

Practicals: University exam + Internal Assessment - 50% Internal Assessment - 50%

Recommended books:

General Anatomy	- Poddar,G.P.Pal
Genetics	- Gangani
Embryology	- I.B.Singh,Longman
Histology	- I.B.Singh,G.P.Pal, Dr.Gunashekar

Gross Anatomy - A.K.Datta

Reference Books- Gray's Anatomy
Grants Method of Anatomy
Holinshead text book of Anatomy

**M.Sc. MEDICAL HUMAN ANATOMY
SYLLABUS**

UPPER LIMB

Practical / Dissections; 2hrs per day x5days a week =10hrs per week for 5 weeks = 50 hrs

Name of dissection	No Of days
Palm and dorsum of hand	4
Mammary gland	1
Pectoral region-muscles, clavipectoral fascia	1
Axilla and contents-axillary artery, vein, brachial plexus	2
Back- trapezius and structures under cover of it, scapular muscles	2
Deltoid and structures under cover of it	1
Quadrangular and triangular spaces	1
Flexor compartment of arm	1
Extensor compartment of arm	1
Sterno-clavicular and acromio-clavicular joints	1
Shoulder joint	1
Cubital fossa-boundaries and contents	1
Flexor compartment of fore arm	2
Extensor compartment of fore arm	2
Elbow joint	1
Radio-ulnar joints	1
Wrist joint	1
Joints of hand	1

Group Discussions : **3hr per week =15hrs for 5weeks=15hrs**

Topic	No Of hours
Osterology	
Articulated hand & individual bones	1
Clavicle& Sternum	1
Scapula	1
Humerus	1
Radius	1
Ulna	1
Regional anatomy	
Fascial spaces of hand and synovial sheaths	1
Mammary gland	1
Brachial plexus - formation, branches of various cords	2
Sterno-clavicular and Acromio-clavicular joints	1
Shoulder joint, Scapular movements, related radiology	2
Elbow joint, radio-ulnar joints, related radiology	1
Wrist joint, joints of hand and related radiology	1

Seminars of 2 hrs duration each; 8 seminars X 2hrs =16hrs in 5 weeks

Topics for seminars:

1. Palm - aponeurosis, arterial arches, dorsal venous arch, cutaneous innervation of hand, Flexor and extensor retinacula
2. Pectoral & Scapular region -Pectoral muscles, claviopectoral fascia, scapular muscles, movements and arterial anastomosis
3. Axilla- boundaries, contents, axillary artery, its branches, formation of Brachial plexus and its branches
4. Deltoid region - structures under cover of it, Quadrangular and triangular spaces, brachial artery and its branches, arterial anastomosis around elbow, axillary nerve
5. Shoulder joint in detail and muscles producing various movements, their origin, nerve supply, action, course of radial nerve
6. Elbow joint in detail and muscles producing various movements, their origin, nerve supply, and action. Course of median nerve. Cubital fossa
7. Lymphatic drainage and venous drainage of upper limb. Axillary lymph nodes. Surface marking of axillary, brachial, radial arteries, superficial and deep palmar arches
8. Intrinsic muscles of hand, extensor expansion, ulnar nerve, surface marking of median Radial and ulnar nerves.

No. Of dissections during the 5 weeks - - - - -25 x 2hrs = 50hrs

No. Of theory classes during the 5 weeks are- - -15 x 1hrs = 15hrs No. Of

seminars during the 5 weeks are - - - - 8 x 2hrs =16hrs

TOTAL HOURS FOR UPPER LIMB IN 5 WEEKS- - - - - 81 HRS

LOWER LIMB

Practical / Dissections; 2hrs per day x5days a week =10hrs per week for 5weeks=50hrs

Name of dissection	No. of days
Sole and dorsum of foot	5
Front of thigh and medial side of thigh	5
Gluteal region, back of thigh	3
Hip joint	1
Popliteal fossa, anastomosis around knee	1
Flexor compartment of leg	1
Lateral compartment of leg	1
Anterior compartment of leg	1
Knee joint	1
Tibio-fibular joints	1
Ankle joint	1
Arches of foot	2
Joints of foot	2

Group Discussions : **3hrs per week =15hrs for 5weeks=15hrs**

Topic	No. of hours
Osteology	
Articulated foot, tarsal and metatarsal bones	1
Hipbone	1
Femur and patella	1
Tibia	1
Fibula	1
Regional anatomy	
Lumbar plexus and its branches	1
Venous drainage of lower limb	1
Lymphatic drainage and lymph nodes of lower limb	1
Lumbo-sacral plexus and its branches	1
Hip joint, related radiology	1
Knee joint, related radiology	1
Tibio-fibular joints, related radiology'	1
Ankle joint, related radiology	1
Arches of foot, Joints of foot, related radiology	2

Seminars of 2 hrs duration each; 8 seminars X 2hrs =16hrs in 5 weeks

Topics for seminars:

1. Foot- plantar aponeurosis, layers of sole muscles, vessels, nerves, arterial arches, retinacula around ankle, cutaneous innervation of dorsum of foot.
2. Front of thigh- deep fascia, femoral triangle, femoral sheath, adductor canal.
3. Femoral artery and its branches, femoral vein and its tributaries, femoral nerve, adductor muscles, obturator nerve and vessels.
4. Gluteal muscles, lateral rotators of hip, hamstring muscles, arterial anastomoses in thigh, sciatic nerve.
5. Politeal fossa, genicular anastomosis, posterior compartment of leg, venous drainage of lower limb.
6. Tibial and common peroneal nerves, anterior and lateral compartments of leg, knee joint
7. Subtalar joints, inversion and eversion movements, arches of foot
8. Surface anatomy of great saphenous vein, femoral artery, popliteal artery, dorsalis pedis artery, sciatic nerve

No. Of dissections during the 5 weeks - - - - -25 x 2hrs = 50hrs

No. Of theory classes during the 5 weeks are - -15 x 1hrs = 15hrs No. Of

seminars during the 5 weeks are - - - - 8 x 2hrs =16hrs

TOTAL HOURS FOR LOWER LIMB IN 5 WEEKS- - - - - 81 MRS

THORAX

Practical / Dissections; 2hrs per day x5days a week =10hrs per week for 3weeks=30hrs

Name of dissection	No. Of days
Thoracic wall, intercostals space	2
Thoracic cavity, mediastinum	2
Heart - pericardium, external features, vessels insitu study	2
Pleura, trachea, bronchi in situ	1
Heart - chambers in detail	2
Heart - blood supply, cardiac plexus	1
Aorta, pulmonary trunk,	1
Pleura, lungs, pulmonary plexus	1
Trachea, bronchopulmonary segments	1
Thoracic duct, lymphatic drainage of thorax. Oesophagus	1
Sympathetic chain, superior venacava, Azygos veins	

Group Dicussions Shrs per week =15hrs for 3weeks=15hrs

Topic	No. of hours
Osteology	
Thoracic vertebra, ribs, sternum, thoracic cage	3
Joints in relation with thorax,	2
Regional anatomy	
Thoracic wall, intercostals space, nerves, vessels	2
Mediastinum	1
Perricardium, heart, chambers, blood supply, conducting system	3
Arch of aorta, superiorvenacava, azygosveins	1
Pleura, trachea, bronchi, bronchopulmonary segments, lungs	2
Radiology, surface markings of heart, lungs	1

No. Of dissections during the 3 weeks - - - - -15 x 2hrs = 30hrs

No. Of theory classes during the 3 weeks are - -15 x 1hrs = 15hrs **TOTAL HOURS FOR**

THORAX IN 3 WEEKS- - - - - 45 HRS

ABDOMEN AND PELVIS

Practical / Dissections; 2hrs per day x5days a week =10hrs per week for 6weeks=60hrs

Name of dissection	No Of day;
Anterior abdominal wall	2
Rectus sheath	1
Inguinal canal	1
Kidney exposure from back	2
External genitalia - scrotum, testis, coverings	1
Peritoneal reflections, folds, insitu location of viscera	3
Liver, stomach, celiac trunk	2
Duodenum, pancreas, spleen	2
Extra hepatic biliary apparatus, small intestine, superior mesenteric vessels	1
Caecum, appendix, colon, inferior mesenteric vessels	1
Rectum and anal canal	1
Abdominal aorta, portal vein, splanchnic nerves	1
Kidney, ureter	1
Posterior abdominal wall, nerve plexuses	2
Diaphragm	2
Male pelvis and bladder	1
Female pelvis	1
Nerves and vessels of pelvis	1
Pelvic diaphragm	1
Perineum, ischiorectal fossa	1
	3

Group Discussions : Shrs per week =30hrs for 6weeks=30hrs No.of hours

Topic	No.of hours
Osteology	
Lumbar vertebra, sacrum, articulated pelvis	2
Regional anatomy	
Anterior abdominal wall	1
Rectus sheath	1
Inguinal canal	1
Thoraco-lumbar fascia	1
Scrotum, coverings of testis	1
Peritoneum	3
Liver, extra hepatic biliary apparatus	1
Duodenum, pancreas, spleen	2
Caecum, appendix	1
Rectum and anal canal	1
Abdominal aorta and its branches	1
Portal vein	1
Kidney, ureter, bladder	2
Male reproductive organs	2

Female reproductive organs	2
Pelvic vessels and nerves	1
Pelvic diaphragm	1
Perineum, ischio rectal fossa	2
Lumbar and lumbo sacral plexuses	2
Radiology-plain and contrast	1

Surface anatomy to be taught along with viscera

No. Of dissections during the 6 weeks - - - - -30 x 2hrs = 60hrs

No. Of theory classes during the 6 weeks are- - -30 x 1hrs = 30hrs TOTAL HOURS FOR

ABDOMEN & PELVIS IN 6 WEEKS- - - - - 90 HRS

HEAD AND NECK

Practical/Dissections; 2hrs per day x5days a week =10hrs per week for 6 1/2weeks=64hi

Name of dissection	No Of days
Scalp	1
Face-muscles, vessels, nerves, lacrimal apparatus	4
Parotid gland	1
Midline of neck	1
Posterior triangle of neck	2
Anterior triangles of neck	2
Back, suboccipital triangle	2
Erector group of muscles, removal of spinal cord	2
Removal of brain,	1
Dural folds, dural venous sinuses, cranial cavity	3
Orbit	2
Temporal & infra temporal fossa, temporomandibular joint	3
Submandibular salivary gland, hyoglossus relations	1
Thyroid gland, deep dissection of neck	1
Tongue, tonsil, palate	1
Nasal cavity, paranasal air sinuses	1
Pharynx	1

Group Discussions : 6hrs per week =39hrs for 6 1/2weeks=39hrs

Larynx	1	
Ear		2

Topic	No. of hours
Osteology	
Skull, Normas	
Cranial fosse	
Individual skull bones	
Mandible, hyoid	
Cervical vertebra	
Regional Anatomy	
Scalp	1
Muscles of facial expression, Facial artery	
Lacrimal apparatus	1
Parotid gland, extra cranial course of facial nerve	1
Lymphatic and venous drainage of head and neck	1
Deep fascia of neck,	1
Ansa cervicalis, cervical plexus. Cutaneous innervation of head and neck	1
Dural folds and dural venous sinuses	1
Pituitary gland	1
Thyroid gland	1
Muscles of mastication, maxillary artery, mandibular nerve	2
Temperomandibular joint	1
Peripheral parasympathetic ganglia, sympathetic chain	1
Submandibular gland, ganglion, hyoglossus relations	1
Tongue, tonsil, palate	2
Nasal cavity- lateral wall, septum & Para nasal air sinuses	2
Pharynx	1
Larynx	2
Extra ocular muscles of eye ball	1
Ear	2
Radiology	2
Surface anatomy	1

No. Of dissections during the 6 1/2 weeks - - - - -32 x 2hrs = 64hrs

No. Of theory classes during the 6 1/2 weeks are- - -39 x 1hrs = 39hrs

TOTAL HOURS FOR HEAD AND NECK IN 6 1/2 WEEKS- - - - -

103 HRS

SPINAL CORD, BRAIN, EYEBALL

Practical / Dissections; 2hrs per day x5days a week =10hrs per week for 4weeks=40hrs

Name of dissection	No Of day
Spinal cord-external features, coverings	1
Spinal cord sections, tracts	1
Cerebrum-external, appearance, coverings, subarachnoid cisterns	2
Brain stem	2
Cerebellum, fourth ventricle, cerebellar peduncles	1
Study of cut sections of brain stem	1
Cerebrum-sulci, gyri, functional areas, blood supply	1
White matter	1
Third ventricle	1
Lateral ventricle	1
Sections of cerebrum for Internal capsule	1
Sections of cerebrum for Basal ganglia	1
Sections of cerebrum for hippocampus formation	1
Study of thalamus	2
Study of hypothalamus, epithalamus	
Eyeball	

Group Discussions : 6hrs per week =24hrs for 4weeks=24hrs Topic	No Of hrs
Spinal cord-external appearance, nuclei, tracts	5
Brain stem -external appearance, sections	2
Cerebellum-external appearance, nuclei, fibres, Cerebellar peduncles, fourth ventricle	2
Cerebrum-sulci, gyri, functional areas, blood supply	1
White matter	1
Basal ganglia	1
Thalamus	1
Hypothalamus.epithalamus	1
Limbic system	1
Third and fourth ventricles	3
Reticular formation	1
Cranial nerves	1
Autonomic nervous system	1
Eyeball	

No. Of dissections during the 4 weeks - - - - -20 x 2hrs = 40hrs

No. Of theory classes during the 4 weeks are- -24 x 1hrs = 24hrs

TOTAL HOURS FOR SPINAL CORD, BRAIN&EYEBALL IN 4 WEEKS- - 64 HRS

HISTOLOGY

1 hr per week =22hrs

GENERAL HISTOLOGY

Group Discussions :

	No Of hour:
Principles of Microscopy	2
Cell-intra cellular organelles, cell adhesions Epithelial	2
tissue-buccal mucosa preparation Connective tissue -cells,	2
fibres, teased preparation of fibres	2
Cartilage-fresh preparation	1
Bone-Ground section preparation	1
Development of bone-	1
Nervous tissue- cells, fibres, teasing of a nerve.	2
Peripheral nerve, ganglia, sensory receptors	2
Muscular tissue-classification, sarcomere, teasing of muscle	2
fibre	1
Blood vessels	2
T ₁ Lymphoid tissue- immune system	

Practicals; Each of 2 hrs duration x 1 per week = 11weeks=22hrs

Name of slides	No.Of practicals
Epithelia-simple, stratified, surface specializations	2
Connective tissue teasing for fibres.	1
Specialized connective tissue-adipose, mucoid, areolar	1
Cartilage-hyaline, elastic white fibro, fresh cartilage preparation	1
Bone-T.S , L.S, ground section preparation	1
Intramembranous and intracartilagenous ossification, decalcification,	1
Nervous tissue- shapes of neurons, teased preparation of nerve fibre,	1
T S o peripheral nerve, spinal and sympathetic ganglia Sensory eceptors	2
Muscular tissue- skeletal, cardiac, smooth-teasing of muscle	1
Blood vessels-elastic, musculararteries, large and small veins	1

SYSTEMIC HISTOLOGY

1 hr per week =28hrs

Group Discussions

Topic	No. of hours
Salivary glands-parotid, submandibular, sublingual	1
Tooth	1
General plan of GIT- tongue, oesophagus,	1
Stomach fundus and pylorus	1
Duodenu, jejunum, ileum, large intestine, appendix	1
Liver, gall bladder	1
Pancreas	1
Trachea, lung	2
Kidney, ureter, bladder	2
Female reproductive system-ovary, tube, uterus.	

Vaginal wall, mammary gland, placenta, umbilical cord	
Male reproductive system-testis, epididymis, vasdeferens.	
Prostate, seminal vesicle, penis	3
Endocrine glands-pituitary, thyroid, parathyroid, suprarenal	2
Nervous system- Spinal cord- various levels	
Brain stem various levels, cerebral cortex, cerebellar cortex	3
Special senses: Eyeball-cornea, retina, scleo-corneal junction.	
Optic nerve, eyelid, lacrimal gland.	
Ear, Skin, olfactory mucosa, taste buds	6

Practicals; Each of 2 hrs duration x 1 per week = 15weeks=30hrs

Name of slides	No.of practicals
Salivary glands- parotid, submandibular, sub lingual	1
Tooth- preparation of ground section	1
Tongue, oesophagus, stomach fundus and pylorus	1
Duodenum, jejunum, ileum, large intestine, appendix	1
Liver, gall bladder, pancreas	1
Trachea, lung	1
Kidney, ureter, bladder	1
Female reproductive system-ovary, corpus luteum, uterine tube.	
Uterus different phases, vaginal wall,	
Lactating and non - lactating mammary gland,	
Placenta, umbilical cord	2
Male reproductive system-testis, epididymis, vas deferens	
Prostate, seminal vesicle, penis	1
Endocrine glands-pituitary, thyroid, parathyroid, supra renal	1
Skin-hairy, nonhairy, ear, olfactory mucosa, tste buds	1
Eyeball-cornea, retina, sclero-corneal junction, optic nerve, eyelid,	
Lacrimal gland	1
Spinal cord, brainstem sections. Cerebral and cerebellar cortex	2

HISTOLOGICAL, EMBALMING AND MUSEUM TECHNIQUES, EMBRYOLOGY SLIDES

Theory classes /didactic lectures; 20hrs

Topic	No of hours
Fixation of tissue, various fixatives	1
Dehydration, clearing	1
Embedding	1
Section cutting, microtomes	1
Staining a slide, different stains	1
Mounting and mounting media	1
Special fixatives and stains,	1
Special preparation for electron microscopy	1
Embryology slides-interpretation	1
Embalming - history, fluids, procedure, types, embalming in special situations	4

Legal aspects, health hazards, embalming room	1
Dissection -technique, finishing the dissection, mounting,	3
General principles of anatomical illustrationsA, resin casting, wax, embedding	3

Practical Work:

Preparation of histology slides doing various stages one tissue	
Using special stains like, orcein, vangieson's, iron-haematoxylin Masson's trichrome, PAS	
Embryo preservation	
Preparation of museum specimens	5 specimens
Drawing charts for museum display	5 charts
Embalming cadaver	5 cadavers

GENETICS

Theory classes /didactic lectures; 14hrs

Topic	No Of hour
Chromosomal basis of inheritance	2
Genetic basis of inheritance	2
Modes of inheritance	2
Population genetics	2
Immuno genetics	1
Developmental genetics	1
Medical genetics	2
Clinical genetics	2
Practicals -10 x2 hrs = 20 hrs	
Sex chromatin, dermatoglyphics chart, chromosomal spread, preparation of pedigree charts	

EMBRYOLOGY

GENERAL EMBRYOLOGY

Group Discussions : 1hr per week =25hrs

Topic	No.of hours
Gametogenesis	1
Ovarian cycle	1
Uterine cycle	1
Fertilization	1
Cleavage	1
Bilaminar germ disc	1
Trilaminar germ disc	1
Notochord and foldings of embryo	1
Foetal membranes and placenta	1
Multiple births and twinning	1
Congenital malformations	1
Formation of tissues of body	1
Measurement of size of embryo, foetus-CR, CH, Foot lengths	1
Staging of embryo& role of ultrasound in embryology	1
Comparative embryology- cleavage, morula, blastula, gastrulation, neurulation, embryonic converges	3
Experimental embryology- Nuclear transplantation, embryonic cell and tissue cultures, determination, differentiation, developmental regulation, cell and tissue interaction, signalling, morphogenesis, molecular control of morphology of embryo	5

SYSTEMIC EMBRYOLOGY

Group Discussions : 1 hr per week = 50 hrs

Topic	No. of hours
Pharyngeal arches & evolution	3
Face, nose, palate	3
GIT	5
Development of coelomic cavities	2
Development of respiratory system	2
Development of Heart & evolution	6
Development of blood vessels and lymphatic system	6
Development of urinary system and its evolution	4

Development of male reproductive system	3
Development of female reproductive system	3
Development of nervous system	5
Development of special senses-eye, ear, skin, mammary gland	3
Development of muscles	2
Development of bones	3
BIostatistics	
Basic principles and application for biological work	10
RESEARCH METHODOLOGY	
Data collection, journal reference, planning experiments, analysis,	10
Writing dissertation, writing for projects	

M.Sc. Final Anatomy

Duration: Two academic Years

Distribution of theory and practical hours:

S.No	Topic	Theory	Practical	Seminars
1.	Regional Anatomy			
	Upper limb	15	50	8
	Lower limb	15	50	8
	Thorax	15	30	8
	Abdomen&pelvis	30	60	8
	Head & neck	39	64	8
	Brain, Spinal cord, eyeball	24	40	8
2.	Embryology			
	General	25		4
	Systemic	50		6
3.	Histology			
	General	22	22	4
	Systemic	28	30	6
4.	Genetics	14	20	4
5.	Techniques-	20	**	8
	Histology, embalming, museum			
6.	Bio statistics		10	**
7.	Research methodology	10	**	
		317	366	80

** During two years course

Histological techniques- Section cutting, staining a given slide followed by discussion

Marks distribution; Total =75

For Histology- $5 \times 5 = 25$

Genetics $1 \times 5 = 5$

Embryology $2 \times 5 = 10$

Microanatomy $2 \times 5 = 10$

For Section cutting- 10

For staining - 15

Day II

Peda gogy- Teaching a selected topic given on previous day -10marks

Dissertation - 30 marks

Discussion on dissertation- 20 marks

Grand viva -40 marks

Embryology,

Radiology,

Osteology

Soft parts

Internal Assessment marks

Theory - 3 internal assess ments in 2 years period of each 25 marks

Total internal assessment marks - $3 \times 25 = 75$

Practicals - 2×25 Marks in 2 years period -

Total internal assessment for practicals - 50

Record - 25 marks -Gross anatomy and histology records to be drawn by the student during the 2 years period.

BLDE UNIVERSITY, BIJAPUR

M.Sc. MEDICAL PHYSIOLOGY SYLLABUS

DIGESTION

1. Introduction - Anatomy of G.I. Tract. Salivary secretion. Types of salivary glands, Innervation, composition of saliva, regulation, functions.
2. Gastric secretion- Structure of gastric mucosa. Innervation, Origin, composition and functions of gastric juice. Mechanism of secretion of HCl. Functions
3. Regulation of gastric secretion. Methods of study. Phases of gastric secretion. Factors influencing gastric secretion, Peptic ulcer.
4. Pancreatic secretion - structure of Pancreas. Innervation of origin, composition and functions of pancreatic juice. Mechanism of secretion, Regulation, Tests for pancreatic exocrine function.
5. Liver and gall bladder - Functions of liver structure, Composition and functions of bile. Regulation, functions of gall bladder. Filling and emptying, Regulation, Cholecystectomy, Gall stones.
6. Small intestine - structure, composition and functions of succus entericus, regulation, Large intestine - structure, functions, secretion
7. Gastro-intestinal movements: Stages of deglutition. Mechanism Disturbances, Gastric motility. Types of movement. Gastric emptying regulation.
8. Movements of small intestine - Types, Regulation, Ileo-caecal valve functions, movements of colon, Defecation.
9. Gastro-intestinal hormones and their actions. Digestion of Carbohydrates Proteins and fats.
10. Absorption of carbohydrates, Proteins, fats, vitamins, water and electrolytes.

CENTRAL NERVOUS SYSTEM

1. Synapse, definition, types of synapse, synaptic transmission. Properties of synapse.
2. Receptors, definition, Classification, properties.
3. Reflexes - Monosynaptic and poly synaptic reflexes.
4. Organization of CNS
Cross section of spinal cord - location of Ascending and Descending tracts Composition and functions of Posterior nerve root and anterior nerve root. Effect of lesions of Posterior Nerve root and anterior nerve root.
5. Description of posterior column tract, Lateral spinothalamic tract (Neo and paleo), ventral spinothalamic tract. Tracts for carrying all modalities of sensation from face region.
6. Referred pain, Theories, Central inhibition of pain, Trigeminal, syringomyelia.
7. Complete section of spinal cord and effects of hemisection.
8. Corticospinal tract in detail., including lesions at different levels of the tract. Effects of Upper motor neuron and lower motor neuron lesion.
9. Naming the extrapyramidal tracts and their functions
10. Brain stem.
Major components of brain stem and their functions Reticular formation, location and functions - EEG.
11. Cerebellum :
Brief description of gross anatomy and histology of cerebellum. Major connections and functions of spino-cerebellum, Cerebrocerebellum and vestibulocerebellum, effects of lesions of cerebellum.
12. Hypothalamus : Major nuclei, major afferent and efferent connections and functions.
13. Thalamus: Major afferent and efferent connections and function, thalamic syndrome.
14. Basal ganglia: Components, major circuits, functions and Parkinson's disease.
15. Limbic lobe - components, major connections and functions.
16. Cerebral cortex: brief description of gross anatomy, functions of each lobe and higher functions of cerebral cortex.
17. CSF: formation, composition, circulation and functions.

18. Autonomic nervous system.

SPECIAL SENSES

05 Hrs

1. Smell Structure of olfactory mucous membrane and olfactory tract.
2. Taste Structure of Taste bud. Basic taste modalities. Taste pathway.
3. Ear Structure of the ear (E.M. & internal)
 components and functions of middle ear
 structure of organ of corti
 Physiological of hearing
 Auditory pathway
 Theories of hearing
 Deafness
 Turning fork tests
 Vestibular apparatus
4. Structure Visual pathway, physiology of vision
 Field of vision, effects of lesion at different levels
 In visual pathway, Light reflexes and accommodation, reflexes and
 accommodation, reflexes principles of optics. Common errors of
 refraction. Dark and light adaptation Photo chemical changes. Colour
 vision, colour blindness.

NERVE MUSCLE PHYSIOLOGY

05 Hrs

1. Types of neurons, Glia, with examples.
2. Structure of multipolar neurone and functions of each part
3. Types of nerve injuries, Wallerian degeneration. Retrograde degeneration, Chromatolysis, Regeneration of nerve fiber, factors affecting regeneration, Reaction of degeneration.
4. Properties of Nerve fiber :
 - a) Excitability. Electrotonic potentials, RMP Monophasic action potential, Ionic basis of RMP and AP, All or None Law, strength duration curve. Compound action potential.
 - b) Conduction - Classification of nerve fibers. Mechanism of conduction in myelinated and non-myelinated nerve fiber. Factors affecting conduction Orthodromic and antidromic conduction Susceptibility of Nerve fiber to various conduction blockers
5. Differences between 3 types of muscles Light microscopic and Electron microscopic structure of skeletal muscle. Sarcotubular system — Sarcomere.
6. Excitation contraction coupling.
7. Properties of skeletal muscle, factors affecting excitability and contractility. Treppe, Isometric and Isotonic contraction, Summation (wave and quanta!, tetanus, clonus). Energy sources for muscle contraction. Types of skeletal muscle, occurrence and differences.
8. N.M.J. structure, (electron microscopic). Transmission of impulse across the NMJ.

BLOOD AND BODY FLUIDS

10 Hrs

1. Introduction, Fluid, compartments, composition of body fluids. Homeostasis -Definition, Composition and functions of blood.
2. Plasma Protein - Types, Normal values, Origin, Functions, Variations in health and disease.
3. Red Blood cells. - Erythropoiesis, Definition. Sites and stages of erythropoiesis: Regulation
4. Morphology of RBC, Functions, Normal values, variations, PCV and ESR, Determination. Normal values, Anemias, Clinical significance.
5. Haemoglobin - Structure, Functions, Types, Derivatives. Methods of estimation Normal values, Anemias, Types and features.
6. Life span and destruction of RBC, Reticuloendothelial system. Functions, Jaundice, Types.
7. Leucocytes - Leucopoiesis, Sites of Granulopoiesis, Lymphopoiesis and Monocytopoiesis.
8. Morphology of different types of leucocytes, Functions, Variations, Immunity, Transplantation of tissues and organs.
9. Platelets - Thrombopoiesis, Sites, Stages, Morphology, Functions, Normal values, Variations.
10. Homeostasis and Blood coagulation - Definition Clotting factors Mechanism of clotting.
11. Clot retraction, Fibrinolysis. Bleeding disorders Tests for clotting. Anticoagulants, Actions and uses.
12. Blood groups - ABO system and Rh factor. Blood Typing. Significance.
13. Blood transfusion - Indications, Types, Reactions, Lymph - Origin. Circulation Functions of lymph and Lymph nodes.

CARDIO VASULAR SYSTEM

15 Hrs

1. Functional anatomy of heart, blood vessels. Conducting system, systemic and pulmonary circulation.
2. Innervation of the heart and Blood vessels, VMC.
3. Haemodynamics.
4. Properties of cardiac muscle.
5. Cardiac cycle.
6. Heart rate and regulation of heart rate.
7. Cardiac out put definitions, variations. Method of determination, Regulation.
8. Blood pressure.
9. Shock.
10. Regional circulation
11. Cardio vascular changes during muscular exercise.

RESPIRATION

10 Hrs

1. Introduction - Functional anatomy of respiratory tract. Pulmonary ventilation Mechanism of ventilation. Muscles, pressure changes, Pressure volume inte relationship, compliance. Airway resistance.
2. Surfactant - Source. Chemical nature. Functions. Lung volumes and capacitie Definition. Determination. Normal values. Significane
3. Alveolar ventilation - Dead space. Significance. Pulmonary circulation Ventilation, Perfusion Ratio & its significance
4. Respiratory membrane. Partial pressure of gases. Diffusion of gases. Discussion capacity. Factors affecting diffusion of gas.
5. Oxygen transport – Forms of transport O₂ – Hb dissociation affecting it. Myoglobin.
6. CO₂ Transport – forms of transport. CO₂ dissociation curve. Chloride shift. Haldane effect.

7. Regulation of respiration - Organization of respiratory centers. Neural regulation. Chemical regulation.
8. Non-chemical regulation. Respiration and Acid Base balance.
9. Hypoxia types, effects, voluntary Hyperventilation, Periodic breathing.
10. Dyspnoea, Asphyxia, Cyanosis Decompression sickness. Artificial Respiration, Methods
11. Pulmonary function tests. Respiratory adjustments during muscular exercise.

KIDNEY, SKIN AND TEMPERATURE REGULATION

10 Hrs

1. Functional anatomy of kidney, Renal blood flow, its determination, regulation and peculiarities.
2. G.F.R. Definition, Measurement: filtration membrane, forces involved, Control of GFR.
3. Tubular function - reabsorption, secretion and concentration mechanism.
4. Nerve supply to urinary bladder Micturition, Non excretory functions of kidney.
5. Renal function tests. Skin and its functions
6. Temperature control.

ENDOCRINES

15 Hours

1. Introduction to Endocrinology. Classification, General properties and mechanism of action of hormones.
2. Pituitary gland :
 - a) Anterior pituitary hormones, their actions, control and disorders.
 - b) Actions, control and disorders of posterior pituitary hormones.
3. Thyroid gland :
 - a) Synthesis, actions of iodine containing thyroid hormones.
 - b) Control of secretion, Thyroid function tests and disorders.
4. Calcium

> Functions	
> Control ->	Parathormone, Calcitonin & 1 -
Disorders	25 (OH) 2 D 3

5. Endocrine Pancreas - Insulin & glucagons.
a) Source b) Actions c) Regulation d) Clinical disorders.

6. Adrenal gland :

a) Adrenal cortex - Nomenclature, Actions, Control, disorders

b) Adrenal medullary hormones - Synthesis, actions and control

REPRODUCTION:

1. Introduction
2. Male reproductive system.
3. Female reproduction system
 - a) Menstrual cycle.
 - b) Pregnancy and parturition
 - c) Lactation and family planning.

I M.Sc., (PRELIMINARY) –PHYSIOLOGY

SPECIFICATION TABLE

DURATION OF THE PAPER: 3 Hours

S.No.	Title of the Chapter
1.	DIGESTION
2.	C.N.S.
3.	SPECIAL SENSES
4.	NERVE MUSCLE
5.	BLOOD
6.	C.V.S.
7.	RESPIRATORY SYSTEM
8.	RENAL PHYSIOLOGY, SKIN AND TEMPERATURE REGULATION
9.	ENDOCRINES REPRODUCTION

Total theory hours: 110

Total Practical : 25 classes (each practical class 2 hours)

PHYSIOLOGY SYLLABUS

FINAL PART

**PAPER- I GENERAL PHYSIOLOGY, NERVOUS SYSTEM, INCLUDING NERVE
MUSCLE PHYSIOLOGY AND SPECIAL SENSES**

1. General Physiology : Mammalian Cell - structure and functions, Functional cell specializations, Membrane transport, Cell division, Fundamentals of Genetics, Genetic control of protein synthesis and other cellular functions, organization of tissues of the body Membrane Physiology - physico chemical principles of transport of molecules across the membrane and membrane potential. Physiology of Muscle and Nerve Neuromuscular transmission and its applied physiology.
2. Nervous System : Structure and properties of neuron and synapse. Organization of nervous system, Reflex action and regulation of posture and equilibrium - movements -Sensory Physiology, Visceral and somatic Sensibilities and pathways involved Control of voluntary movements - pyramidal, extra pyramidal and cerebellar control - Neural basis of instincts, behaviour and emotions, EEG. Sleep and arousal mechanisms, Autonomic nervous system and homeostasis, Neurotransmitters, cortical and subcortical integrative mechanisms and higher functions, Cerebral blood flow, CSF and brain metabolism. Principles of modern tools of investigation of 'Brain' function viz P.E.T. etc.
3. Special senses: Physiology of smell, taste, hearing and vision including study of their respective afferent pathways, reflexes, pathophysiology of special senses.

**PAPER - II BLOOD AND BODY FLUIDS, CARDIOVASCULAR SYSTEM,
RESPIRATORY SYSTEM, RENAL PHYSIOLOGY, SKIN AND
TEMPERATURE REGULATION.**

4. Blood and Body fluids: Body fluids, composition and measurement. Fundamentals of Homeostatic mechanisms, Blood - study of formed elements, Hemopoieses, plasma and its constituents, pathophysiology of Immune system, Hemostasis, blood grouping, transfusion and organ transplantation
5. Circulation : General features of circulation and Heart muscle - excitation of myocardium and ECG, Events in cardiac cycle, heart sounds, Systemic circulation - cardiovascular dynamics, cardiac output, venous return, arterial blood pressure and its regulation, control of blood flow through tissues including special circulations, circulatory shock, pathophysiology of cardiac function, Microcirculation - formation of tissue fluids and lymph. Pathophysiology of lymphatic system, Neural and Humoral regulation of cardiovascular functions.
6. Respiration: Structure and function of respiratory apparatus, pulmonary circulation and pulmonary capillary dynamics, Mechanics of respiration, Pathophysiology of pulmonary ventilation and circulation, gas exchange through respiratory membrane and tissues, gas transport and chemical and non-chemical regulation of respiration. Role of respiration in Acid - base equilibrium, artificial respiration, Pulmonary function tests.

Respiration under unusual environments - High altitude Physiology, Space Physiology, deep Sea Diving and Polluted atmosphere, Physiology of Muscular exercise, Work Physiology. Oxygen therapy

7. Excretory system : Structure and functions of skin and kidney, renal and cutaneous circulation, functions of nephron, composition, Physical and chemical characteristics of urine, endocrine control of renal functions, endocrine functions of the kidney, renal control of acid base balance, ECF volume and ionic balance. Renal function tests, Pathophysiology and renal disorders, Neural control of micturition, cystometrogram. Regulation of body temperature and its abnormalities.

PAPER - III GASTROINTESTINAL TRACT, ENDOCRINOLOGY

INCLUDING REPRODUCTION

8. GI Physiology: Structure and functions of various components of digestive tract, splanchnic circulation. Secretory mechanism of digestive juices, movements of GI tract - their study and regulation, GI hormones, digestion and absorption, metabolism of various dietary components, Liver and pancreatic functions and function tests, Pathophysiology of GI disorders. Methods of investigation of GI functions.
9. Endocrinology: Methods of study of endocrine glands. Structure and functions of various endocrine
10. Reproduction: Sex differentiation and development. Structure of Male and Female reproductive organs, Oogenesis and spermatogenesis, Menstrual cycle and Hormonal control of reproductive functions, Pathophysiology of reproductive disorders Physiology of pregnancy, Parturition and lactation, Fetal and neonatal physiology, Physiological basis of different contraceptive methods.

Recommended Text Books :

1. Best and Taylor's physiological basis of Medical Practice : Ed. John B. West -12th Edition, Williams and Wilkins, Baltimore, 1990
2. Text book of Medical Physiology, Arthur C Guyton, 9th Edition, W.B. Saunders company, 1991.
3. Review of Medical Physiology, William F. Ganong, 18th Edition, Prentice Hall, 1991.
4. Vander - Human Physiology
5. Berne and Levy.
6. Principles of 'Neural Science' Kendal Schwartz.

Glands, nature of the hormones, Pathophysiology and regulation of secretion of hormones, Endocrine function tests.

PRACTICAL SYLLABUS FINAL M.Sc (MEDICAL PHYSIOLOGY)

- I. Haematology Expts.
- II. Amphibian Expts
- III. Mammalian Expts.
- IV. Human Expts.

I. HAEMATOLOGY

1. Study of the microscope.
2. Haemoglobin estimation and packed cell volume estimation.
3. Study of haemocytometer and Red Cell Count.
4. Blood indices.
5. Rouleaux formation and Erythrocyte sedimentation rate.
6. Behaviour of RBCs in different tonicities of sodium chloride solution and osmotic fragility.
7. Construction of price - jones curve.
8. Determination of blood group, major and minor cross matching ; Determination of agglutinin titre.
9. White cell count.
10. Preparation and staining of a peripheral smear; Differential leucocyte count
11. Arneth count; Sex differences in neutrophil.
12. Absolute eosinophil count.
13. Reticulocyte count.
14. Platelet count.
15. Laboratory tests for haemostasis; Bleeding time, clotting time, prothrombin time clot retraction

II. AMPHIBIAN EXPERIMENTS

A. Muscle Nerve

1. Common electrical and mechanical appliances.
2. Muscle - nerve preparation.
3. Simple muscle curve.
4. Effect of two successive stimuli on skeletal muscle contraction.
5. Effect of varying temperature on simple muscle curve
6. Effect of fatigue on muscle - nerve preparation. Demonstration of neuromuscular transmission.
7. Determination of velocity of nerve conduction of sciatic nerve in frog.
8. The effect of load on the simple muscle curve.
9. Genesis of tetanus and clonus.
10. Recording of isometric contraction.
11. Effects of various agents on the contraction of smooth muscles of frog's rectum.

B. Cardiovascular System :

1. Recording of normal cardiogram of frog's heart.
2. Effect of cold and warm saline on sinus venosus and ventricle of frog's heart.
3. Effect of 1st and 2nd Stannius ligatures on frog's heart.
4. Demonstration of all or none phenomena, treppe and summation of sublimina stimuli in quiescent frog's heart (properties of CM).
5. Refractory period in a beating heart.
6. Demonstration of the effects of stimulation of vagus and white crescentric line 01 the frog's heart
7. Fixation of autonomic pathway to the frog's heart
8. Perfusion of isolated frog's heart, study of the effect of ions and drugs.

C. Respiratory System:

1. Pulmonary function tests : Recording of normal spirogram, FEV, MBC, MEFR.
2. To record the chest movements by a stethograph and to study the effects c speech, swallowing, coughing, breathholding and hyperventilation.
3. Clinical examination of respiratory system.
4. Artificial respiration and cardio pulmonary resuscitation (CPR)

D. Muscle nerve :

1. Electromyography and its recording.
2. Genesis of fatigue using Mosso's ergograph.

E. Energy balance, metabolism, nutrition :

1. Determination of BMR F.

Central nervous system :

1. Clinical examination of nervous system, including cranial nerves.

PRACTICAL DEMONSTRATION

A) Central nervous system :

1. Preparation of spinal frog and study of properties of reflexes. 02) Audiometry.

B) Energy balance, metabolism, nutrition

1. Mechanical efficiency at different grades of exercise

C) Reproductive system

1. Pregnancy diagnostic tests (immunological test).
2. Determination of sperm count, motility and morphology in a sample of human semen.

E) Miscellaneous :

1. Principles of Radio-immuno assay (RIA)

III. MAMMALIAN EXPERIMENTS

A. Isolated organ batch / perfusion studies :

1. To study the motropic and chronotropic functions in isolated perfused rabbit's heart.
2. Intestinal motility (rat/rabbit); effects of various agents on the contraction of smooth muscles of intestine.

B. Dog Experiments :

1. Recording of blood pressure and respiration in anaesthetized dog to study the eff
 - a) Carotid occlusion.
 - b) Stimulation of vagus; cutting and stimulation of peripheral and central cut
 - c) Stimulation of splanchnic nerve.
 - d) Injection of catecholamines and Acetyl-chohne,
2. Splenic oncometry; effect of drugs and splanchnic nerve stimulation.

IV. HUMAN EXPERIMENTS

A. Cardio vascular system :

1. Recording of arterial pulse.
2. Sphygmomanometry.
3. Electrocardiography.
4. Effects of posture on BP and HR.
5. Clinical examination of cardiovascular system.

BLDE UNIVERSITY, BIJAPUR

M.Sc. (MEDICAL BIOCHEMISTRY)

SYLLABUS

Goal

The broad goal of the teaching and training of post graduate students in Medical Biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems. At the end of his/her training be capable to take up a career in teaching institution or in diagnostic laboratory or in research.

OBJECTIVES

a) KNOWLEDGE:

At the end of the course the student shall be able to

- 1 Explain the structure, function and inter-relationships of biomolecules and the deviation from normal and its consequences.
- 2 Summarize the fundamental aspects of enzymology and alteration in enzymatic activity with reference to clinical application.
- 3 Explain the molecular and biochemical basis of inherited disorders with their associated sequelae.
- 4 Explain the mechanisms involved in maintenance of body fluids and pH homeostasis.
- 5 Integrate the various aspects of metabolism and their regulatory pathways.
- 6 Outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine.
- 7 Explain the molecular concept of body defences and their application in medicine.
- 8 Explain the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis.
- 9 Familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.
- 10 Effectively organise and supervise diagnostic laboratory to ensure quality control / Assurance.

b) SKILLS

At the end of the course, the student shall be able to

- 1 Make use of conventional techniques/ instruments to perform biochemical analysis relevant to clinical screening and diagnosis.
- 2 Analyze and interpret investigative data.
- 3 Demonstrate the skills of solving scientific and clinical problems and decision making.
- 4 Develop skills as a self-directed learner, recognize continuing educational needs; select and use appropriate learning resources.
- 5 Demonstrate competence in basis concepts of research methodology and be able to critically analyse relevant published research literature.

c) INTEGRATION

The knowledge acquired in biochemistry shall help the students to integrate molecular events with structure and function of the human body in health and disease.

PRELIMINARYPART- BIOCHEMISTRY
(Common to all specialties)

THEORY

1. H⁺, Acids, Bases, Buffers :
Equilibrium constant, dissociation of water, H⁺ concentration, pH, acids-strong and weak, bases, titration behavior, Henderson-Hasselbach equation, buffers, pH measurement, physiological buffers.
2. Chemistry of Carbohydrates:
Classification, important monosaccharides, stereoisomerism, anomerism. Reaction with acids, amines, oxidizing agents, reducing agents. Osazones, Disaccharides, polysaccharides. Ground substance network.
3. Chemistry of lipids:
Definition, classification, nature of fatty acids, triacyl glycerol, saponification and iodine number, rancidity, antioxidants, complex lipids, steroids. Introduction to steroid hormones and bile acids, prostaglandins.
4. Chemistry of amino acids, peptides, proteins:
Structure of 20 amino acids, grouping isomerism, charge properties, ninhydrin reaction, peptide bond, examples of peptides, proteins – classification, structure-primary, secondary, tertiary and quaternary forms, complexes, denaturation.
5. Chemistry of Nucleic Acids:
Bases, nucleosides, nucleotides. DNA and gene. Types of RNAs, Nucleotides coenzymes.
6. Membrane and Cell:
Organelles, functions, membrane structure, transport across membranes, ionophores, membrane proteins, transporters.
7. Enzymes:
Classification, specificity, basic account of mechanism of action. Effect of substrate, pH, temperature, cofactor. Inhibitors – competitive, non-competitive, examples. Coenzymes, proenzymes, isoenzymes, Allosteric regulation and feedback control, clinical enzymology.
8. Vitamins:
Vitamins A, D, E and K. B-complex vitamins – thiamine, riboflavin, niacin, pyridoxine, folic acid, pantothenic acid, biotin, B-12, VitaminC. Brief account of chemistry, source, requirements, deficiency diseases, biochemical functions, Hypervitaminosis.
9. Digestion and Absorption:
Digestion & absorption of Carbohydrates, lipids, proteins and nucleic acids.
10. Biological Oxidation:

Free energy, heat, entropy, oxidation/reduction potential. High energy compounds, Mitochondrial electron transport. Oxidative phosphorylation-theories (brief). Inhibitors and uncouplers.

11. Carbohydrates Metabolism:

Glycolysis, Pyruvate oxidation, TCA cycle, energetics of glucose oxidation. HMP-shunt, Glycogenesis, glycogenolysis, gluconeogenesis and their regulations. glycogen storage disease, hormonal regulation of blood sugar. Diabetes mellitus and complications.

12. Lipid Metabolism:

Beta oxidation, energetics of fatty acid oxidation, Fatty acid biosynthesis. Lipogenesis. Ketosis. Cholesterol biosynthesis. Basic idea on formation of bile salts and steroid hormones. Plasma lipoproteins. Starvation, obesity, fatty liver.

13. Metabolism of Amino Acids:

Deamination, decarboxylation and transamination. Urea formation. Essential & non-essential amino acids. Metabolism of glycine, glutamic acid, aspartic acid, methionine and cysteine, phenylalanine, tyrosine and tryptophan.

14. Purine and Pyrimidine Metabolism:

Pyrimidine & purine biosynthesis. Purine & Pyrimidine degradation, disorders of purine and pyrimidine metabolism.

15. Protein Biosynthesis:

DNA replication. Transcription. Genetic code. amino acid activation and translation, inhibitors. Post-translational modifications. mutation.

16. Porphyrins and bile pigments:

Chemistry of porphyrins, biosynthesis of heme, catabolism of heme. Disorders of porphyrin metabolism, hemoglobinopathies.

17. Mineral metabolism:

Bulk and trace elements. Calcium/Phosphorous, Iron. Brief account of iodine, magnesium, copper, zinc, fluoride, manganese, selenium and molybdenum. Heavy metal toxicity.

18. Water, Electrolyte and Acid-base Balance:

Body water, osmolarity, hormonal influence. Metabolism of sodium and potassium. Acid production in body. Buffer systems. Isohydric principle, chloride shift. Role of lung. Role of kidney. Disturbances in acid-base balance and their compensation.

19. Detoxication:

Types with examples, toxic principles in diet.

20. Energy Metabolism and Nutrition

Basal metabolism, specific dynamic action, energy requirements under different conditions. Nitrogen balance, Protein quality, Kwashiorkar and Marasmus. Protein supplementation, Recommended dietary allowance.

PRACTICALS

1. Reactions of monosaccharides.
2. Reactions of disaccharides.
3. Reactions of polysaccharides.
4. Identification of unknown carbohydrate.
5. Colour reactions of proteins and amino acids.
6. Precipitation reactions of proteins.
7. Identification of unknown proteins.
8. Reactions of non-protein nitrogenous compounds
9. General identification of unknown compounds.
10. Normal urine analysis
11. Analysis of abnormal urine.
12. Analysis of milk
13. Principles of colorimetry(demonstration).
14. Determination of blood sugar
15. Determination of blood urea.
16. Determination of total protein in serum
17. Determination of albumin in serum
18. Determination of cholesterol in serum.
19. Determination of serum & urine creatinine.
20. chromatography & electrophoresis (demonstration).

FINAL PART - BIOCHEMISTRY

THEORY- PAPER-1 (Metabolism & nutrition)

UNIT I- Chemistry & Enzymes

- A. CHEISTRY of carbohydrates, lipids & proteins
- B. ENZYMES: classification, efficiency, specificity, mechanism of action. factors influencing the activity, enzyme inhibition, coenzymes, proenzymes, isoenzymes, Allosteric regulation and feedback control. Concept of chemotherapy, enzyme induction/repression. Covalent modification. Clinical enzymology. Enzyme kinetic studies

UNIT II- Metabolism

- A. BIOENERGENETICS: Free energy, heat, entropy, oxidation/reduction potential. High energy compounds, Mitochondrial electron transport. Oxidative phosphorylation-theories Inhibitors and uncouplers. Transport of reducing equivalents across mitochondrial membrane, O₂ toxicity, oxygenases, catalase, superoxide dismutase, microsomal hydroxylation (Mixed function oxidases).
- B. CARBOHYDRATES : Fate of glucose in body-phosphorylation , glycolysis, energetics of glucose oxidation, HMP shunt pathway and significance, uronic acid pathway and significance, Metabolism of other Hexoses, Glycogen –synthesis & break down , regulation of blood glucose, role of liver and hormones, glycosuria. in born errors of metatabolism
- C. LIPIDS: Synthesis and catabolism of fatty acids, cholesterol, phospholipids and triacylglycerols; metabolism of unsaturated fatty acids & eicosanoids, Plasma lipids ,fate of fat after absorption, adipose tissue, relation of liver of fat metabolism, fatty liver- lipotropic factors, ketone bodies. in born errors of metabolism. Atheroaclerosis, alcoholism.
- D. PROTEINS: Amino acid pool, essential amino acids, catabolism of amino acid nitrogen, synthesis & catabolism of amino acids, special products formed from amino acids and their role, in-born errors of metabolism.
- E. METABOLIC INTERRELATIONSHIPS: Fate of pyruvate, citric acid cycle, fate of Acetyl CoA, one carbon metabolism, regulatory mechanisms, integration of carbohydrate lipid and protein metabolisms.

UNIT III - Nutrition

- A. VITAMINS: Vitamins A, D, E, K., B-complex vitamins and VitaminC. - chemistry, sources, requirements, biochemical functions, deficiency diseases, Hypervitaminosis, Relation between vitamin and coenzyme
- B. NUTRITION : Basal metabolism, specific dynamic action, energy metabolism, energy requirements under different conditions. Nitrogen balance, Protein quality, Kwashiorkar and Marasmus. Protein supplementation, Recommended dietary allowance. Nutrients & their requirements, Nutritional imbalance & assessment, nutritional support.

THEORY- PAPER - 2
(Clinical Biochemistry & techniques)

UNIT I- Basics of clinical chemistry laboratory

- A. GENERAL LABORATORY TECHNIQUES & PROCEDURES : Water, reference materials, glass ware & plastic ware, volumetric equipment, centrifuges, solutions, mixers & homogenizers, filtration & concentration, balances, units, buffers, safety,
- B. SPECIMEN COLLECTION & PROCESSING : Collection of blood, urine and body fluids, . handling of specimens,
- C. PREANALYTICAL VARIATION : Biological variation, specimen collection related variation, post collection variation.

UNIT II- Analytical techniques & instrumentation

- A. PHOTOMETRY: Beer's law, spectrophotometry, flame photometry, atomic absorption spectrophotometry, fluometry, nephelometry, turbidimetry.
- B. ELECTROCHEMISTRY : Potentiometry, voltammetry, amperometry, coulometry, conductometry, biosensors
- C. OSMOMETRY : Osmosis and osmometers
- D. ELECTROPHORESIS : Basics, method, types, clinical applications,
- E. CHROMATOGRAPHY : Basics, method, types, clinical applications,
- F. IMMUNOASSAYS: Basics, gel diffusion, immunoelectrophoresis, ligand binding immunoassays including RIA, ELISA, FIA & CLIA.

UNIT III- Clinical Biochemistry

- A. FUNCTION TESTS liver function tests renal function tests, gastrointestinal & pancreatic function tests
- B. MUSCLE & BONE: Biochemistry of muscular contraction, metabolism of calcium & phosphorus.
- C. NERVOUS SYSTEM : CSF, Neurotransmitters,
- D. ENDOCRINE SYSTEM : chemistry of hormones, mechanism of action - signal transduction, relation to diseases, regulation, hormones secreted by hypothalamic pituitary axis, thyroid, pancreas, adrenal, gonads, associated pathological conditions and function tests.
- E. BLOOD : Structure & function of hemoglobin, hemoglobinopathies, plasma proteins & their functions, coagulation mechanisms
- F. WATER & ELECTROLYTE BALANCE : Body water compartments, osmotic pressure, regulation of body fluid osmolarity and volume, metabolism of water, sodium, potassium and chloride along with associated disorders.
- G. ACID –BASE BALANCE : Acids & bases, oxygen and carbon dioxide homeostasis, acid-base balance, acidosis, alkalosis.
- H. TRACE ELEMENTS : Definition, classification, functions and associated disorders.
- I. IRON & PORPHYRINS : Iron metabolism & regulation, deficiency and overload, synthesis & catabolism of Heme, porphyrias,
- J. TOXICOLOGY: Definitions, mechanisms of toxicity, factors influencing toxicity, detoxification, antidotes, drug interactions, medicolegal aspects.
- K. NEOPLASIA : Carcinogenesis, oncogenes, tumour markers, anticancer drugs

THEORY - PAPER - 3

(Advanced Biochemistry)

UNIT I- Immunology

- A. **BASICS** : Innate & acquired immunity, humoral & cell mediated immunity, antigen & antibodies
- B. **RECOGNITION OF ANTIGENS**: Primary interaction, antigen processing & presentation
- C. **IMMUNE RESPONSE** : Lymphocyte maturation, activation of T & B lymphocytes, immunologic tolerance, hypersensitivity, autoimmunity, immunodeficiencies.

UNIT II- Molecular Design of the cell

- A. **STRUCTURAL DESIGN**: cell membrane, membrane channels & pumps, cytoskeleton, extracellular matrix.
- B. **INFORMATIONAL MACROMOLECULES**: Structure & function of nucleotides, DNA and RNA; Synthesis and catabolism of purines and pyrimidines along with inborn errors, DNA organization & replication, protein synthesis including transcription, translation and modifications, regulation of gene expression, Bioinformatics
- C. **SPECIAL MOLECULES**: Cytokines, eicosanoids, nitric oxide, free radicals and others.

UNIT III- Biotechnology

Radioactive isotopes, blotting techniques, rDNA technology, PCR, DNA sequencing, cloning, cell fractionation, monoclonal antibodies,

UNIT IV- Laboratory management

- A. **BIOSTATISTICS**: Fundamental concepts, sampling distributions, measures of central tendencies and variation, parametric and non parametric comparisons, regression and correlation.
- B. **ANALYTICAL GOALS**: Precision and accuracy, bias, sensitivity and specificity.
- C. **METHOD EVALUATION**: Purpose, selection of method, laboratory evaluation, example study.
- D. **TOTAL QUALITY MANAGEMENT** : fundamental concepts, control of preanalytical, analytical and postanalytical variables, internal and external quality control programs.
- E. **AUTOMATION** : definition, Instrumental concepts, autoanalysers, selection of instruments, trends in automation.
- F. **COMPUTERS IN CLINICAL CHEMISTRY** : Laboratory information systems.

PRACTICAL

1. WEIGHING OF SUBSTANCES
2. PREPARATION OF SOLUTIONS
1N HCl, 2/3 N H₂SO₄, 0.9% normal saline,
3. PREPARATION OF BUFFERS
Phosphate buffer, Tris buffer, PBS,
4. MEASUREMENT OF pH
5. PREPARATION OF REAGENTS.
Benedict's reagent, BCG
6. END POINT ASSAYS
Lipid profile, Total & Conjugated Bilirubin, calcium, Phosphorous, Uric Acid, Creatinine clearance, Urinary & CSF protein, Microalbumin, chloride, Iron & TIBC, Magnesium,
7. KINETIC ASSAYS
CPK, CK-MB, LDH, ACP, SGOT, SGPT, Alkaline phosphatase, Amylase,
8. SPECIAL TECHNIQUES
Flame photometry, Ion selective electrodes. ABG
9. ESTIMATION OF
Amino acids by Ninhydrin method, protein by Lowry method, Glycosylated Haemoglobin,
10. SEPARATION TECHNIQUES
Chromatography: Paper chromatography of amino acids, TLC of amino acids, carbohydrates and lipids. Gel chromatography of proteins. HPLC (demonstration)
Electrophoresis : Paper electrophoresis of serum proteins, PAGE.: Isoenzymes of LDH
11. IMMUNO ASSAYS
T3, T4, TSH, CEA, AFP, HCG, PSA by ELISA
12. QUALITY ASSURANCE
Method evaluation experiments- within run precision, day to day precision, recovery and method comparison Quality Control - levy jenning's chart
13. COMPUTERS & STATISTICAL ANALYSIS
Calculation of mean, median, mode, standard deviation, correlation, linear and nonlinear regression, tests of significance, nonparametric tests, Basics of computers, MS office, Demonstration of statistical software - EPI-INFO, advanced statistical analysis using SPSS, Curve fitting software. Information retrieval & use of internet.

Practical - Preliminary

- | | |
|----------------------------|----|
| 1. Qualitative experiment | 20 |
| 2. Quantitative experiment | 30 |
| 3. Spotters | 10 |

Practical - Final

- | | |
|---|----|
| 1. Experiment 1
One end point assay, one kinetic assay
and one special technique assay | 45 |
| 2. Experiment 2
Assay of hormone/tumor marker by EILSA
Or
Method evaluation experiment
(precision/recovery/method comparison) | 30 |
| 3. Experiment 3
preparation of a buufer/reagent/solution | 15 |
| 4. Experiment 4
Chrmatography experiment
Or
Electrophoresis experiment | 40 |
| 5. Experiment 5
Data analysis using excel spread sheet | 20 |

BLDE UNIVERSITY, BIJAPUR

M.Sc. (MEDICAL MICROBIOLOGY)

SYLLABUS

MEDICAL MICROBIOLOGY

Preliminary part (at the end of first year): Anatomy, Physiology and Biochemistry

Final part (at the end of third year)

Paper I : General Bacteriology and Immunology

Paper II : Systematic Bacteriology.

Paper III : Parasitology and Mycology

Paper IV : Virology and Clinical Microbiology

GENERAL BACTERIOLOGY (PAPER I)

15 Hrs

History of Microbiology.

Principles, mechanisms of different types of microscopes and their uses.

Morphology, Physiology and anatomy of bacteria.

Bacterial taxonomy and classification.

Sterilization and disinfection

Growth and nutrition of bacteria.

Cultivation of bacteria and methods of cultivation.

Isolation and identification of bacteria.

Bacterial genetics and variations.

Normal bacterial flora, zoonoses, epidemiology and transmission.

Bacteriological examination of water, food, air and milk.

Care, management, method of inoculations and uses of experimental animals.

Antimicrobial chemotherapy.

IMMUNOLOGY (Paper I)

20 Hrs

Anatomy, development and functions of immune system.

Host and parasite relationship. Biology of immune response.

Microbiol pathogenicity and host immune response.

Infection and immunity.

Antigen and antibodies.

Toxins, antitoxins

Complement

Antigen-antibody reactions

Hypersensitivity

Vaccine and immunization

Immunodeficiency diseases

Autoimmunity, immunology of transplantation and malignancy

Immunohaematology

SYSTEMATIC BACTERIOLOGY (PAPER II)

35 Hrs

Properties, epidemiology, transmission, methods of isolation, identification Pathogenesis, toxins and enzymes production, antigen structures, clinical importance and laboratory diagnosis of the following bacterial infections: Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Bacillus, Clostridium, Non-sporing anaerobes, Enterobacteriaceae, Vibrio Pseudomonas, Yersinia, Pasteurella, Francisella, Haemophilus, Bordetella, Mycobacterium, Spirochetes, Mycoplasma, Immunology of bacterial infections.

PARASITOLOGY (Paper III)

25 hrs

Taxonomy and classification, transmission, clinical features and prophylaxis of medically important parasites.

Protozoa:- Amoeba: Entamoeba, non-pathogenic amoeba, Naeglaria, Leishmania, Trypanosome, Giardia, Trichomonas, plasmodium, Toxoplasma, Cryptosporidium, Pneumocystis, Babesia, Isospora, Sarcocystis.

Helminthology: - Classification.

Cestoidea - T.solium, T.saginata, Echinococcus, Diphylobothrium latum, Sparganum, H.nana

Trematoda:- Schistosomes, Clonorchis, Fasciola, Paragonimus Gastrodiscoides.

Nematoda:- Ascaris, Ancylostoma, Necator americanus, Trichinella, Strongyloides, Trichuris trichiura, Enterobius, W.bancrofti, B.malayi, Loa loa, Onchocercia, Dirofilaria, Dipetalonema, Mansonella, Dracunculus.

Immunology of parasitic diseases.

MYCOLOGY (Paper III)

10 Hrs

Morphology, cultivation epidemiology, transmission, clinical importance and lab diagnosis of Yeasts, Yeast-like, molds and dimorphic fungus. Superficial and deep fungal infections opportunistic fungal infection, Fungal laboratory contaminants and mycotoxin.

Immunology of Mycotic infections

Dermatophytosis, Candidiasis, Mycotic mycetoma, Chromoblastomycosis, Sporotrichosis, Rhinosporidiosis, Phycomycosis, Cryptococcosis, Blastomycosis, Paracoccidioidomycosis, Coccidioidomycosis, Histoplasmosis. Aspergillosis, Penicilloles, Mucor mycosis, Otomycosis, Oculomycosis, Fusarium, Basidia, Rhizopus, Curvularia, Alternaria.

VIROLOGY (PAPER IV)

25 Hrs

General properties, cultivation, interferon and interference of virus. Pox, Herpes, Adeno, Picorna, Myxo, Arbo, Rhabdo, Hepatitis, Miscellaneous viruses.

Bacteriophage, Oncogenic viruses and HIV.

Immunology of viral infections.

CLINICAL MICROBIOLOGY (Paper IV)

10 Hrs

Hospital infection.

Quality control in Microbiology.

Laboratory control of antimicrobial therapy.

Collection of specimens for bacteriological investigation.

Methods of culture, techniques and organisms encountered in: CSF, Blood culture, sputum, pus, urine, stool, UTI, Endocarditis, bone and joint infections.

Laboratory diagnosis of Sore throat, PUO, tuberculosis, leprosy, meningitis, Enteric fever, Cholera, diarrheal, Food poisoning, dental infections, Swine flu, Arboviral infections, HIV / AIDS and other sexually transmitted infections, Eye infections, Zoonotic and Rickettsial infections, Respiratory tract infections,

Blood transfusion and associated infections.

Immunoprophylaxis against diseases.

Rapid diagnostic methods in Microbiology, including molecular techniques. Recent advances in Microbiology.

* * *

PRACTICALS

Microscopy in bacteriology

Postings in various sections like: 1. Sterilization, 2. media section and in 3. Bacteriology service laboratory 4. Serology Laboratory 5. Diagnostic Microbiology - urine, blood, CSF serology, pus, mycology, anaerobic section.

Cleaning of glassware, use and control of various instruments in media section.

Preparation of common culture media including the various media used for identification of bacteria and fungus.

Staining and identification methods for bacteria, fungi and inclusion bodies Processing of clinical materials like sputum, CSF, urine, blood and other exudates; identification of isolated organism and its antibiogram. Serological tests for in the lab routinely in the diagnosis of infectious diseases including ELISA.

Care, inoculation and autopsy of laboratory animals: mice, guinea-pig, rabbit

Preparation of antisera against *S.typhi*

Evaluation of disinfectants.

Anaerobic methods of cultivation and identification of anaerobic organism.

Egg inoculation for viruses.

Fungus culture, its identification, study of laboratory contents and slide culture.

Examination of stool for parasitic ova and cyst including concentration technique.

Exercise on isolation and identification of pure and mixture of bacteria Presumptive coliform count of drinking water important slides for identification simulated animal experiments.

Dissertation/Research Project Work: The M.Sc. student would be allotted research project under guidance of eligible faculty for Research Orientation in biomedical research field. The student should successfully complete the dissertation/project work to become eligible for the examination.

Examinations: At the end of 1st year University examination on Theory & Practicals in Anatomy, Physiology and Biochemistry.

Microbiology-- University Theory examination: At the end of III year after spending 2 years in Microbiology department having:

Paper I : General Bacteriology and Immunology

Paper II : Systematic Bacteriology.

Paper III : Parasitology and Mycology

Paper IV : Virology and Clinical Microbiology

Microbiology-- University practical examination

(Total practical 200 marks, Viva +dissertation +pedagogy -100 Marks)

Bacteriology exercise

a) Pure culture and mixture or clinical samples provided with clinical history for isolations identifications and antibiogram.

b) Staining technique and report AFB, Leishman stain, Giemsa stain, Albert stain, Modified ZN Stain.

Mycology-Identification of two fungus: one yeast and one mould preferably rapid grower for slide culture technique.

Animal experiment: Various methods for inoculation of rabbit/Guinea -pigs/Mice.

Serology(Bacterial)-Common serological tests done in laboratory like VDRL test,Widal test,Weil Felix test, Standard tube agglutination test for Brucellosis etc.

Virology - Serological exercises used for diagnosis of viral infections such as HIV rapid,HBsAg test,Chikungunya rapid,Dengue card test etc.

Parasitology: Stool examination for ova and cyst including concentration techniques for stool.

Slides: For identification and report.

Viva-Voce is compulsory.

MSc Microbiology Practical Examination Exercises and Marks

Sl. No	Section	Exercises	Maximum Marks
A	Bacteriology	Mixed Culture	50 Marks
		Pure Culture	20 Marks
B	Staining Technique		20 Marks
C	Stool Examination/ Concentration Technique		20 Marks
D	Mycology		20 Marks
E	Serology Exercise		20 Marks
F	Virology/ Viral serology		20 Marks
G	Animal handling/ Use/ Care		10 Marks
H	Slide Identification/ Discussion		20 Marks
Total Practical Marks			200 Marks
I	Pedagogy		20 Marks
J	Grand Viva and Dissertation/ Project work		80 Marks
Viva and Dissertation/ Project including pedagogy			100 Marks