Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A $^{+}$' Grade

CIRCULAR NO.SU/ Sci./College/NEP-2020/73/2025

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/ Ad-hoc Boards/Committee and recommended by the Dean, Faculty of Science & Technology, the Academic Council at its meeting held on 09 May 2025 has been accepted **the following B.Sc. Course Structure & Curriculum** under the Faculty of Science & Technology as per National Education Policy – 2020 run at the Affiliated Colleges of Dr. Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	B.Sc. Physics	IIIrd and IVth Semester
2	B.Sc. Electronics	IIIrd and IVth Semester
3	B.Sc. Mathematics	IIIrd and IVth Semester
4	B.Sc. Industrial Chemistry	IIIrd and IVth Semester
5	B.Sc. Agrochemical and Fertilize	IIIrd and IVth Semester
6	B.Sc. Horticulture	IIIrd and IVth Semester
7	B.Sc. Biochemistry	IIIrd and IVth Semester
8	B.Sc. Botany	IIIrd and IVth Semester
9	B.Sc. Zoology	IIIrd and IVth Semester
10	B.Sc. Biotechnology	IIIrd and IVth Semester
11	B.Sc. Microbiology	IIIrd and IVth Semester
12	B.Sc. Diary Science and Technology	IIIrd and IVth Semester
13	B.Sc. Statistics	IIIrd and IVth Semester
14	B.Sc. Computer Science	IIIrd and IVth Semester
15	B.Sc. Geology	IIIrd and IVth Semester
16	B.Sc. Chemistry	IIIrd and IVth Semester
17	B.Sc. Analytical Chemistry	IIIrd and IVth Semester
18	B.Sc. Polymer Chemistry	IIIrd and IVth Semester
19	B.Sc. Environmental Science	IIIrd and IVth Semester
20.	B.Sc. Fisheries Science	IIIrd and IVth Semester

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21.	B.Sc. Home Science	IIIrd and IVth Semester
22.	B.Sc. Data Science	IIIrd and IVth Semester
23.	B.Sc. Information Technology	IIIrd and IVth Semester
24.	B.Sc. Networking and Multimedia	IIIrd and IVth Semester
25.	B.Sc. Automobile Technology	IIIrd and IVth Semester
26.	B.Sc. Forensic Science	IIIrd and IVth Semester
27.	B.Sc. Forensic Science & Cyber Security	IIIrd and IVth Semester
28.	B.Sc. Non-Conventional & Conventional Energy	IIIrd and IVth Semester
29.	B.Sc. Clinical Laboratory Science	IIIrd and IVth Semester
30.	Bachelor of Computer Application	IIIrd and IVth Semester

This is effective from the Academic Year 2025-26 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
Ref.No. SU/Sci./2025/ 827-29
Date:- 26/05/2025

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Deputy Registrar,
Syllabus Section.

Copy forwarded and necessary action to :-

1] **The Principal of all Affiliated Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

JD*26052025/-

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR

B.Sc.Clinical Laboratory Science

(Three Year/Four Years(Hons)/Four Years (Hons with Research)

IIIrd and IVth Semester

As per National Education Policy-2020

Dr. P. P. Dixit

From the Academic Year 2025-26 & Onwards.

second year : THIRD SEMESTER								
Course Type	**Course Code**	**Examination Code (To be given by respective BoS)**	**Course Name**	**Teaching Scheme (Hrs/ Week)**		**Credits Assigned**		**Total Credits**
				Theory	**Pract**	**Theory**	**Pract**	
Major(Core)	CLS/DSC/T/200	SAC00102003T	BIOCHEMISTRY -III	2		2		2+2+2+2=8
Mandatory DSC								
	CLS/DSC/T/201	SAC00102013T	*MICROBIOLOGY -III*	2		2		
	CLS/DSC/P/226	SAC00102263T	*BIOCHEMISTRY III– (PRACTICAL)*		4		2	2+2=04
	CLS/DSC/P/227	SAC00102273P	*MICROBIOLOGY III – (PRACTICALS)*		4		2	
Minor (Choose any two from pool of courses) **It is from different discipline of the same faculty**	CLS/Mn/T/200	SCC00102003T	INTRODUCTION TO MEDICAL LABORATORY I *	2		2		
	CLS/Mn/T/ 201	SCC00102013T	BASICS OF BIOINSTRUMENTATION I*	2		2		2
Generic / Open Elective (GE/OE) (Choose any one from pool of courses)	CLS/GE/OE/T/200	SDC00102003T	DIGNOSTIC ONCOLOGY I *	2		2		
It should be chosen compulsorily from the faculty other than that of Major								
VSC(Vocational Skill Courses)	CLS/VSC/T/200	SEC00102003T	HAEMATOLOGY III	1		1		1+1=02
(Choose any one from CLS/VSC/T/200 and	CLS/VSC/T/ 201	SEC00102013 T	*HISTOPATHOLOGY*	1		1		
CLS/VSC/T/201)and correspondingPracticals								
	CLS/VSC/P/ 226	SEC00102263P	*HAEMATOLOGY III– (PRACTICAL)*		2		1	

	CLS/VSC/P/227	SEC00102273P	*HISTOPATHOLOGY – (PRACTICALS)*		2		1	
AEC, VEC, IKS	CLS/AEC/T/ 200		English (Common for all the faculty)	2		2		2+2=04
	CLS/VEC/T/201		Environmental Studies	2		2		
OJT/**FP**/CEP/CC/RP	CLS/CC/P/ 226		Pathology laboratory and Hospital visits /Cultural Activity/ NSS,NCC (Common for all the faculty)		4		2	2
				15	**14**	**15**	**7**	**22**
Minor Courses for other Discipline CLS/Mn/T/ 200 : This is a 2 credit theory course designed for other discipline (INTRODUCTION TO MEDICAL LABORATORY II) CLS/Mn/T/ 201 : This is a 2 credit theory course designed for other discipline (BASICS OF BIOINSTRUMENTATION II* Generic /Open Elective Courses for other faculty CLS/GE/OE/T/200 : This is a 2 credit theory course designed for other faculty (DIGNOSTIC ONCOLOGY II *)								
* COURSES WITH * MARK ARE DESIGNED FOR ADDITION IN THE SUBJECT BASKET FOR OTHER STUDENTS THAN CLS								

second year : FOURTH SEMESTER									
Course Type	**Course Code**	**Examination Code (To be given by respective BoS)**	**Course Name**	**DESCRIPTION**	**Teaching Scheme (Hrs/ Week)**		**Credits Assigned**		**Total Credits**
					Theory	**Pract**	**Theory**	**Pract**	
Major (Core) Mandatory DSC	CLS/DSC/T/ 250	SAC0010250 4T	BIOCHEMISTRY IV		2		2		2+2+2+2 =8
	CLS/DSC/T/251	SAC0010251 4T	MICROBIOLOGY IV		2		2		
	CLS/DSC/P/276	SAC0010276 4P	BIOCHEMISTRY IV – (PRACTICALS)	Practical based on CLS/DSC/T/250		4		2	
	CLS/DSC/P/ 277	SAC0010277 4P	MICROBIOLOGY IV – (PRACTICALS)	Practical based on CLS/DSC/T/251		4		2	
Minor (Choose any two from pool of courses)	CLS/Mn/T/ 250	SCC0010250 4T	INTRODUCTION TO MEDICAL LABORATORY II *	To be chosen from other discipline of same faculty	2		2		
It is from different discipline of the same faculty	CLS/Mn/T/ 251	SCC0010251 4T	BASICS OF BIOINSTRUMENTATION II*	To be chosen from other discipline of same faculty	2		2		2+2=04
Generic / Open Elective (GE/OE) (Choose any one from pool of courses)	CLS/GE/OE/ T/250	SDC001025	DIGNOSTIC ONCOLOGY II *	To be chosen from other discipline of same faculty	2		2		2
It should be chosen compulsorily from the faculty other than that of Major									
SEC	CLS/SEC/T/ 250	SEC001025 04T	HAEMATOLOGY IV		1		1		
(SkillEnhancement Courses)	CLS/SEC/T/ 251	SEC001025 14T	MOLECULAR BIOLOGY		1		1		
(Choose any one from CLS/SEC/T/250 and	CLS/SEC/P/ 276	SEC001027 64P	HAEMATOLOGY IV – (PRACTICAL)	Practical based on CLS/SEC/T/ 250		2		1	1+1=02
CLS/SEC/T/251)and corresponding Practicals	CLS/SEC/P/ 277	SEC001027 74P	MOLECULAR BIOLOGY – (PRACTICALS)	Practical based on CLS/SEC/T/ 251		2		1	

AEC, VEC,IKS	CLS/AEC/T/ 250		Modern Indian Language (MIL-2) (Choose any one from pool of language courses)		2		2		2
OJT/FP/CEP/CC/RP	CLS/FP/P/ 276		Pathology Laboratory and Hospital Laboratory Practical Training	**Field Project**		4		2	2+2= 04
	CLS/CC/P/ 277		(Fine/ Applied/ Visual/Performing Arts)(Common for ALL THE FACULTY)			4		2	
					13	**18**	**13**	**9**	**22**
Exit Option: Award of UG Diploma in major and minor with 88 credits and an additional 4 credits NSQF course(related to major/minor)/ Internship during summer vacation OR Continue with Major and Minor									
***** COURSES WITH * MARK ARE DESIGNED FOR ADDITION IN THE SUBJECT BASKET FOR OTHER STUDENTS THAN **CLS**									
Minor Courses for other Discipline CLS/Mn/T/ 250 : This is a 2 credit theory course designed for other discipline (INTRODUCTION TO MEDICAL LABORATORY) CLS/Mn/T/ 251 : This is a 2 credit theory course designed for other discipline (BASICS OF BIOINSTRUMENTATION*) Generic /Open Elective Courses for other faculty CLS/GE/OE/T/200 : This is a 2 credit theory course designed for other faculty (DIGNOSTIC ONCOLOGY *)									

BIOCHEMISTRY III – (THEORY)

No. of hrs. / week : 2

Credits : 2

Topics

UNIT I: General Biochemistry	**% Wtg**	**No of Hrs**
	100	**30**
1) Cell membrane chemistry, comparison of human normal cell with		
red blood cell and bacterial cell	**9**	**3**
2) Thermodynamics: Basic concepts. Systems: Open, closed and isolated	**9**	**3**
statements of Laws of Thermodynamics, enthalpy, entropy and Gibbs free energy,		
importance of high-every phosphate compounds (ATP,ADP etc) in metabolism		
4) Water and mineral metabolism: General consideration, body fluid	**12**	**4**
distribution. factors which influence distribution of water,		
mineral metabolism (Sodium, potassium, chlorides, calcium and		
inorganic phosphorus)		
UNIT II: Clinical Biochemistry		
1) Chemistry of lipids (part 1): Definition, importance, properties,		**6**
classification Digestion and absorption of lipids. Beta oxidation of		
fatty acids, general lipid metabolism, cholesterol absorption & synthesis	**18**	
2)Automation in Biochemistry Historical aspects, continuous and discreet types,	12	**4**
semi-automated and fully automated of auto-analyzer, batch and random access analyzers.		
Various techniques used in Biochemistry laboratory: rate of reaction method,		
UNIT III: Clinical Biochemistry of vital organs		
1) Kindly function tests: General consideration, functions of kidneys,	**17**	**3**
Hormonal regulation, Renin-angiotensin system, Acidification of urine, kidney function tests, clinical significance		
2)Liver function tests: General consideration, the liver microscopic anatomy	**18**	**5**
of liver, flow of blood and bile through liver. Liver functions, synthesis & metabolism of bile pigments bile salts, disordered bilirubin metabolism, hepatic, pre-hepatic and post- hepatic conditions, liver function tests, clinical significance.		
3) ELISA technique for the determination of thyroid hormones (T3, T4)	**5**	**2**
	100%	**30**

Reference books:

1) Text book of medical laboratory technology; by Dr. P. B. Godkar
2) Harper's Biochemistry
3) Biochemistry by U. Satyanarayana
4) Schaum's outlines – Biochemistry

Note:

On the first day of the new semester the teacher should provide following information to the students –

1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems

4) Library reference work 5) Attendance requirement

MICROBIOLOGY III – (THEORY)

No. of hrs. / week 2
credits 2

Topics	No. of hrs./wk	% Wtg
UNIT I: Study of Different bacteria I		
Revision of safety in microbiology laboratory and waste disposal.	**2**	**4**
Study of Gram positive Bacteria, The Streptococci and Staphylococci:	**4**	**12**
Non-spore forming Gram-positive Bacilli: Corynebacterium diphtheriae	**3**	**12**
Study of Spore-forming Gram –positive bacilli: Clostridium species:	**3**	**12**
UNIT II: Study of Different bacteria II		
Study of Mycobacterium: Mycobacterium tuberculosis and Mycobacterium leprae:	**7**	**25**
Revision of study of Gram-negative bacteria: E.coli, Salmonella,Shigella sp, Vibrio sp.	**3**	**10**
UNIT III: Diagnostics and safety		
i) Diagnostic serology:	**8**	**25**
Introduction, The immune system, Immunological reaction and related Terms, Antibodies- IgA, IgD, IgE, IgG, IgM. Immunity – natural acquired Passive immunity, Antigen antibody interaction Origin of immune cells T-cell and B-cell, Complement system.		
Serological tests: VDRL and Widal tests		
ii) Revision of safety in microbiology laboratory and waste disposal.	**2**	**4**

Reference book:

1) Microbiology by Dr. Ananthnarayana
2) Jawetz, Melnick and Adelberg's Medical Microbiology
3) Text book of Medical Laboratory Technology by Dr. P.B.Godkar
4) Shaum's outline - Microbiology

On the first day of the new semester the teacher should provide following information to the students

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BIOCHEMISTRY – (PRACTICAL)

No. of hrs. / week 4

Credits 2

Topics

1) Determination of serum creatinine by visible rate of reaction method.
2) Determination of serum urea by Berthelot reaction method.
3) Determination of creatinine clearance.
4) Determination of urea clearance.
5) Determination of serum bilirubin by Malloy-Evelyn's method.
6) Determination of SGPT by rate of reaction method.
7) Determination of SGOT by rate of reaction method.
8) Determination of alkaline phosphates by rate of reaction method.
9) Determination of serum total cholesterol.
10) Determination of HDL-Cholesterol.
11) Determination of serum-triglycerides.
12) Determination of serum sodium, potassium by flame photometry.
13) Determination of serum chlorides.
14) Determination of CSF and urine chlorides.
15) Determination of serum calcium.
16) Determination of inorganic phosphorus.
17) Identification of urine amino acids by paper chromatography.
18) Fractionation of serum proteins by agarose gel electrophoresis.
19) Working of Semi-autoanalyzer.

Ref: Text book: Text book of Medical Laboratory Technology by Dr. P. B. Godkar

- **Laboratory Visits:**

Experiments to be observed: semi automated methods for the determination of Glucose, Urea, Creatinine, Total proteins, Albumin, S.bilirubin, T. cholesterol, HDL- Cholesterol, SGPT, SGOT, Alkaline phosphates, Flame photometry, serum calcium and inorganic phosphorus.

- **Instruction for teacher : <u>Note:</u>**

It is necessary for the teacher to give orientation regarding the following on the first day -

1) Requirements for practicals: Journal, rough note book lab coat, fractional weighed box, other requirements.

2) Writing rough note book, SOP \ and safety requirements.
3) Writing Journals.

MICROBIOLOGY – (PRACTICALS)

No. of hrs. / week 4
Credits 2

Topics

1) Study of following Gram negative bacteria in pure culture: *E. coli*, Salmonella sp.,

2) Study of following Gram positive bacteria in pure culture: *Streptococcus pyogenes, Streptococcus pneumonia*, *Streptococcus aureus*, *Corynebacterium diphtheriae*.

3) Demonstration of culture of anaerobic bacteria in an anaerobic atmosphere.

4) Staining of sputum smear for the defection of *Mycobacterium tuberculosis* by Ziehl -Neelsen (Hot stain) Method for *Mycobacterium leprae*

5) Performing following serology tests of serum.

- Antigen antibody reactions
- Preparation of serial dilutions of serum
- Study of Prozone effect
- Study of flocculation test: VDRL test
- Study of slide agglutination test: Widal test
- Study of Tube agglutination test: Widal test

Reference test books:

1) Text book of Medical Laboratory Technology by Dr. P. B. Godkar.
2) Microbiology by Dr. Ananthnarayana.

- **Instruction for teacher : <u>Note:</u>**

It is necessary for the teacher to give orientation regarding the following on the first day -

1) Requirements for practicals: Journal, rough note book lab coat, fractional weighed box, other requirements.
2) Writing rough note book, SOP \ and safety requirements.
3) Writing Journals.

HAEMATOLOGY III

No. of hrs. / Week 1
Credits 1

Topics

UNIT I	**hrs./wk**	**% Wtg**
1) General aspects of blood cell formation: sites of blood formation, Development of blood cells, stem cells . Erythropoiesis, The erythroid series	**2**	**15**
2) Granulopoiesis, formation of monocytes and macrophages, lymphopoiesis. The lymphoid series	**1**	**5**
3) T and B lymphocytes and thrombopoiesis. The megakaryocytic series	**1**	**7.5**
4) Roll of erythropoetin in the regulation of hemopoiesis. Regulation of hemopoiesis, Regulation of granulopoiesis.		
	1	**7.5**
UNIT II		
1) Structure and metabolism of the red cell. Hemoglobin synthesis. Various factors which affect normal hemoglobin synthesis, Role of iron, vitamins and metallic **i**ons in the synthesis of hemoglobin.	**2**	**15**
2) Anemia: Defination, Clinical features, Morphological classification of anemia	**1**	**10**
Causes of anemia. (only basic information of these topics)		
3) Automation in hematology. Cell counting by impedance measurement. Advantages of automation in hematology. General measurement parameters by Hematological auto analyzer. Study of histograms related to iron deficiency anemia And thalassemia minor.	**2**	**10**
UNIT III		
Hematological special tests for the diagnosis of anemia –	**5**	**30**
• Complete Histogram.		
• Screening test for sickle cell anemia		
• Determination of fetal hemoglobin		
• Osmotic fragility test		
• Preparation of LE cell		
• Determination of G6PD		
• Determination of serum total iron and iron binding capacity		
• Hemoglobin electrophoresis		
	15	**100%**

Reference text books:

1) Text book of Medical Laboratory Technology by Dr. P.B.Godkar
2) Dacie and Lewis practical Hematology
3) Text book of Hematology by Dr. Tejinder singh.

Note:

On the first day of the new semester the teacher should provide following information to the students

1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems

4) Library reference work 5) Attendance requirement

HAEMATOLOGY III PRACTICALS

No. of hrs. / week 2

credits 1

1) Revision of determination of hemoglobin by Cyanmethemoglobin method
2) Revision of preparation of blood smears, staining and microscopic examination.
3) Screening test for sickle cell anemia.
4) Determination of fetal hemoglobin.
5) Determination of osmotic fragility of red blood cells.
6) Determination of G-6PD.
7) Determination of iron and total iron binding capacity (TIBC) in serum
8) Nestrof test.
9) Hemoglobin electrophoresis.
10) Demonstration of working of hemoglobin analyzer. Study of normal histograms and histograms of iron deficiency anemia and Thalassemia minor.

Reference book:

Text book of Medical Laboratory Technology by Dr. P. B. Godkar

- **Instruction for teacher : <u>Note:</u>**

It is necessary for the teacher to give orientation regarding the following on the first day -

1) Requirements for practicals: Journal, rough note book lab coat, fractional weighed box, other requirements.
2) Writing rough note book, SOP \ and safety requirements.
3) Writing Journals.

HISTOPATHOLOGY – (THEORY)

No. of hrs. / week 1

credits 1

UNIT I	hrs./ wk	% Wtg
1) Introduction & orientation to Histopathology and cytological, Techniques.	**1**	**7**
2) The cell- i) Structure ii) cell division iii) Colloidal conception of tissue.	**1**	**6**
3) Methods of examination of tissues and cells.	**1**	**6**
4) Gross examination of organs.	**1**	**7**
5) Fixation - Introduction, aim of fixation. Fixatives – Reagents used, advantages, disadvantages. Gross fixation of different organs.	**1**	**8**
UNIT II		
1) Decalcification – Technique, different types of fluids used.	**1**	**6**
2) Processing of tissue : by manual methods; by using automatic tissue processor.	**1**	**8**
3) Paraffin section cutting.	**1**	**6**
4) Different types of cryostats.	**1**	**6**
5) Theory of staining.; Mountants, basic staining and mounting procedures; Routine staining procedures and frozen section techniques.	**1**	**10**
UNIT III		
6) Special staining techniques.	**1**	**6**
7) Exfoliative cytology techniques.	**1**	**6**
8) Museum techniques.	**1**	**6**
9) Immuno-histochemistry, introduction & technique.	**1**	**6**
10) Electron microscopic techniques & recent advances.	**1**	**6**
	15	100

Reference test books:

1) Histological Techniques, a practical manual by Dr. K. Laxminarayana
2) Text book of Medical Laboratory Technology by Dr. P. B. Godkar

Note:

On the first day of the new semester the teacher should provide following information to the students

1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems 4) Library reference work 5) Attendance requirement

4) Library reference work 5) Attendance requirement

HISTOPATHOLOGY – (PRACTICALS)

No. of hrs. / week 2
Credits 1

1) Orientation and introduction to the Histopathology techniques.
2) Orientation, safety rules and personal care in Histopathology laboratory.
3) Use, care and maintenance of equipment and glassware used in Histopathology laboratory.
4) Gross examination of specimen preparation. Preparation of Histopathology card report.
5) Methods for examination of different specimen.
6) Preparation of different types of fixative.
7) Technique of fixation.
8) Decalcification-Preparation of decalcifying fluid. Different techniques of decalcification.
9) Processing-
Paraffin wax embedding technique.
Manual processing technique.
Automated processing technique.
10) Study of instruments: (By field visits) Automatic tissue processor. Microtome knives. knife sharpening equipments & technique. Different types of microtomes. Cryostat section. Electron microscope and its technique.
11) Paraffin wax embedding section cutting technique.
12) Cryostat section cutting technique.
13) Preparation of different reagents and staining solutions.
14) Haematoxyline and Eosin staining techniques.
15) Other special staining techniques.
16) Cytological specimen collection.
17) Pep staining technique.
18) Museum technique.
19) Immuno- histochemistry technique.

Reference test books:

1) Histological Techniques, a practical manual by Dr. K. Laxminarayana
2) Text book of Medical Laboratory Technology by Dr. P. B. Godkar

- **Instruction for teacher : <u>Note:</u>**

It is necessary for the teacher to give orientation regarding the following on the first day -

1) Requirements for practicals: Journal, rough note book lab coat, fractional weighed box, other requirements.
2) Writing rough note book, SOP \ and safety requirements.
3) Writing Journals.

SEMESTER–IV

BIOCHEMISTRY–(THEORY)

No. of hrs. / week : **2**

Credits: **2**

UNIT I	**Hr/ wK**	**% Wtg**
1) Chemistry of lipids: Part2	**8**	**25**
Lipoprotein metabolisms, metabolism of VLDL, LDL, HDL, characteristic of major apo-proteins. Important enzymes in lipoprotein metabolism, Cholesterol catabolism, Dyslipidemia, Criteria for diagnosis of hyperlipidemia, Primary and secondary dislipidemias, Fredrikson's Classification of lipoproteins.		
2) Various laboratory techniques: Fluorimetry, Radioimmunoassays, ELISA, Chemiluminescence and Bioluminescence	**2**	**10**
UNIT II		
1) Cardiac Profile tests:	**5**	**20**
Blood supply of heart, the cardiac cycle, electrical changes in the heart, Ischemic Heart disease , Atherosclerosis, Risk factors, The response to injury hypothesis, Cardiac profile tests, Cardiac injury panel tests, Biochemical cardiac markers.		
2)Chemistry of bone:	**-5**	**15**
Mineral & Bone metabolism, Calcium and bone metabolism, Role of hormones and vitamins. Metabolic bone disorders, bone profile tests. Spot test for urinary calcium. Iron selective technology for the determination of free calcium ions.		
UNIT III		
1) Acid–base balance:	**5**	15
Introduction, diffusion of gases in the lungs, Action of buffer systems, The hemoglobinbuffers,Bohreffect,Disturbanceinacidbasebalance,Acidosis and Alkalosis , Determination of blood pH and blood gases .		
2) Chemistry of Hormones:	**5**	15
Introduction, Regulation of actions of hormones, General mechanism of action of hormones, Classification of hormones, Actions of secondary messengers, Chemistry of hormones, hormones of thyroid gland, Thyroid disorders, Thyroid profile tests		
	30	**100**

Reference/ Text Book: Textbook of Medical Laboratory Technology by Dr.P.B. Godkar.

Note:

On the first day of the new semester the teacher should provide following information to the students

1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems 4) Library reference work 5) Attendance requirement

MICROBIOLOGY–IV (THEORY)

No. of hrs. / week : **2**

Credits: **2**

Topics

	Hr/ Wk	**% Wtg**
UNIT I: NON MAJOR INFECTIONS		
1)Study of spirochetes: Morphology ,Identification, Pathogenesis, Pathology Clinical findings and related laboratory tests.	**-4**	**-16**
2)Study of Chlamydia, Rickettsia and Mycoplasma: Morphology, Identification Pathogenesis, Pathology, Clinical findings and laboratory tests	**-5**	**-10**
UNIT II		
1)Collection, Transport and Examination of Specimens–	**-5**	**-20**
• Urine		
• Urogenital Specimens		
• Throat and mouth specimens		
• Sputum		
• Blood		
2)Viruses (Part –I)	**-3**	**-8**
Introduction, Useful definitions, Classification, Structure and properties ,Infection of host cells, General transmittance routes, Host response		
Overview of DNA and RNA containing viruses, Important viruses and related diseases. Viruses of medical Importance	**-3**	**-8**
UNIT III Viruses (Part –II)		
Lentiviruses and AIDS: Introduction, Important properties of Lentiviruses, Major gene products of HIV Pathogenesis and pathology, Prevention of HIV, Transmission of HIV, Clinical findings in HIV, Laboratory diagnosis	**-6**	**-20**
Poxviruses: Introduction,Structureandcomposition,Classificationreplication, Related diseases, pathogenesis and pathology, Laboratory diagnosis	**-2**	**-10**
Picornaviruses: Introduction, Structure and composition, Classification, replication, Related diseases, pathogenesis and pathology, Laboratory diagnosis.	**-2**	**-8**
	30	**100**

Referencebook:

1) Medical microbiology by Dr. Ananthnarayana
2) Textbook of medical laboratory technology byDr.P. B.Godkar.
3) Jawetz, Melnick and Adelberg's medical microbiology.
4) Shaums outline Microbiology

Note:

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1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems 4) Library reference work 5) Attendance requirement

SEMESTER–IV

BIOCHEMISTRY– (PRACTICALS)

No. ofhrs. / week: 4
Credits: 2

Topics

1)	Lipid profile tests: S.total cholesterol, HDL. Cholesterol, LDL-Cholesterol VLDL-cholesterol, T. cholesterol /HDL Cholesterol ratio.
2)	Special Diabetic profile tests: Determination of Glycosylated hemoglobin, Micro albumin urea.
3)	Determination of ApolipoproteinA1, Lp (a) and Determination of Apoliprotein B
4)	Determination of serum calcium, inorganic phosphoru sand S.alkaline phosphatase as a part of bone profile tests
5)	Determination of cardiac injury panel tests: CK-T, CK-MB, SGOT,LDH and SHBD
6)	Determination of Troponin T and Troponin-I
7)	Determination of blood pH, PO_2,PCO_2, and plasma bicarbonate.
8)	Determination of Thyroid profile tests: T_3,T_4,TSH, free T_3,free T_4,Thymoglobulin,TBG and TRH

Laboratory Visits:

Observation and participation in the operation of random access analyzers for the determination of Experiments 1 to 8

Reference /text book:

Textbook of Medical Laboratory Technology by Dr. P. B. Godkar.

SEMESTER-IV

MICROBIOLOGY–(PRACTICALS)

No. ofhrs. / week : 4
Credits: 2

Topics

1.Microbiological Examination of

i. Urine
ii. Urogenital specimens.
iii. Throat and mouth specimens.
iv. Sputum.
v. Blood
vi. Use of Versa-trek system or Bacteck system
vii. Use of Fully automated API system.
viii. Mycobacterium culture (LJ method).

2. Determination of hepatitis markers

3. Detection of HIV-1and HIV-II by screening methods.

4. Detection of Human Anti HIV-1by Immunoblotting technique.

Reference /Text Book:

Text book of Medical Laboratory Technology by Dr. P. B. Godkar.

- **Instruction for teacher: <u>Note:</u>**

  It is necessary for the teacher to give orientation regarding the following on the first day-

  1) <u>Requirements for practical's</u>: Journal, rough notebook, lab coat, fractional weight box, other requirements and safety requirements.
  2) Writing rough note book, SOP.
  3) Writing Journals.

SEMESTER–IV
HAEMATOLOGY–*(THEORY)*

hr / WK 1
Credits: 1

Topics	**Hr / WK**	**%Wtg**
UNIT I		
1) Revision of Anemia and Classification of anemia. Bone marrow examination, structure of bone marrow, sites of bone marrow aspirate, evaluation of bone marrow aspirate, various cells. Assessment of iron-stores.	**3**	**22**
2) Iron deficiency anemia (IDA),Introduction, Prevalence of IDA in India, Iron metabolism, Iron balance, causes of iron-deficiency, Bone marrow features, Differential diagnosis using histograms.	**2**	**12**
UNIT II		
1) Hemolytic anemia: Red cell destruction: Intravascular and extra vascular, laboratory findings Clinical manifestations, compensatory mechanism.	**3**	**22**
2) Megaloblastic anemia: Folate deficiency, VitaminB12 deficiency, Pathogenesis, Clinical features, Peripheral blood findings, Bone marrow picture, Pernicious anemia.	**2**	**12**
UNIT III		
1) Aplastic anemia, Pathogenesis, Hematological findings, Clinical features, Course of the disease, Associated Laboratory findings.	**2**	**12**
2) Revision of Automation in hematology, Cell counting by impedance technique, General measurement parameters , Determination of RBC, WBC and platelet histograms. Fixed and automatic discriminators, Differential Methods ,Laser technology, Importance of RWD-CV, study of histograms	**3**	**20**
	15	**100**
Reference book:		
1) Text book of hematology by Dr. Tejinder Singh.		
2) Textbook of Medical Laboratory Technology by Dr. P. B. Godkar		
Note:		
On the first day of the new semester the teacher should provide following information to the students		
1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems 4) Library reference work 5) Attendance requirement		

SEMESTER–IV

MOLECULARBIOLOGY–(THEORY)

Hrs. / week 2
Credits: 2

Topics	Hr / Wk	%Wtg
UNIT I		
Introduction to molecular biology & molecular pathology.	**1**	**3**
Nucleic acid Biochemistry and biology: Molecular composition and structure.	**4**	12
Replication of DNA, nucleic acid associated.	**2**	**7**
Transcription of DNA to RNA, post-transcriptional modifications.	**2**	**7**
Translation of RNA to protein (protein synthesis).	**2**	**6**
UNIT II		
Transcriptional control, mechanism of DNA repair, DNA mutations.	**2**	**7**
Nucleic acid analysis, electrophoretic separation, nucleic acid hybridization.	**3**	11
Hybridization assays-Southern and Northern hybridizations.	**2**	**7**
In-situ Hybridization.	**1**	**3**
Restriction fragment length polymorphism-based assays.	**2**	**6**
UNIT III		
Target amplification methods, polymerase chain reaction.	**2**	**7**
Reverse-transcriptase PCR ,branched DNA.	**1**	**3**
Hybridization array technologies, microarrays, oligonucleotide microarrays.	**2**	**7**
DNA microarrays, clinical applications of microarrays technology.	**2**	**7**
Molecular diagnosis of genetic diseases.	**2**	**7**
	30	**100**

Reference / Text Book: Henry's Clinical Diagnosis & Management by LaboratoryMethods.

Note:

On the first day of the new semester the teacher should provide following information to the students

1) Orientation to the subject 2) Syllabus topics 3) Internal and semester examination systems
4) Library reference work 5) Attendance requirement

HAEMATOLOGY–(PRACTICAL)

Hr / WK 4
Credits: 2

Topics

1) Study of blood smears related to iron deficiency anemia.
2) Study of histograms related to iron deficiency anemia.
3) Determination of blood cell indices and RDW for the differentiation of IDA and Thalassemia minor.
4) Preparation of bone marrow smears and microscopic examination of stained smears.
5) Determination of plasma hemoglobin.
6) Sucrose lysis test.
7) Determination of hemoglobin, MCV ,MCH, MCHC and RDW by auto analyzer.
8) Determination of RBC count and related histogram by auto analyzer.
9) Study of blood smears related to Megaloblastic anemia.
10) Study of histograms related to Megaloblastic anemia.
11) Study of histograms related to aplastic anemia.

Reference / Text Book: Text book of Medical Laboratory Technology by Dr. P. B. Godkar.

- **Instruction for teacher: Note:**
  It is necessary for the teacher to give orientation regarding the following on the first day-
  - Requirements for practical's: Journal, rough notebook, lab coat, fractional weight box, other requirements and safety requirements.
  - Writing rough note book, SOP.
  - Writing Journals.

SEMESTER–IV
MOLECULAR BIOLOGY – (PRACTICALS)

No. ofhrs. / week 2
Credits: 1

Topics

1) Extraction of DNA from peripheral blood mononuclear cells.
2) Extraction of RNA from peripheral blood mononuclear cells
3) Performing polymerase chain reaction (PCR) of DNA
4) Isolation of DNA (after PCR)
5) Electrophoretic fractionation of DNA (southern blot technique)
6) Performing Northern blot technique
7) Performing western blot technique
8) Demonstration of PCR and RT–PCR for the determination of viral local and working of FAC scan for CD_4 and CD_8 determination.
9) Power Point presentations related toMolecular Biology & PCR

ReferenceText Book: Textbook ofMedical Laboratory Technology by Dr.P. B. Godkar

- **Instructionforteacher: <u>Note:</u>**
  It is necessary for the teacher to give orientation regarding the following on the first day-
  - <u>Requirements for practical's</u>: Journal, rough notebook, lab coat, fractional weight box, other requirements and safety requirements.
  - Writing rough note book, SOP.
  - Writing Journals.