UNIVERSITY

B.Sc. in Medical Lab Technology (BMLT)

UNIVERSITY

Program Schema

1st Semester

SEMESTER-1							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM1001	Human Anatomy and Physiology-I (Theory)	3	0	0	3
2		YBM1002	Pathology-I (Theory)	3	0	0	3
3		YBM1003	Biochemistry-I (Theory)	3	0	0	3
4		YBM1004	Communication for Professionals (Theory)	3	0	0	3
PRACTICAL							
5		YBM1101	Human Anatomy and Physiology-I (Practical)	0	0	3	2
6		YBM1102	Pathology-I (Practical)	0	0	3	2
7		YBM1103	Biochemistry-I (Practical)	0	0	3	2
FIELD VISIT							
8		YBM1503	Diagnostic Lab Tour Visit	0	0	0	2
MANDATORY NON-CGPA COURSE							
9		YBM1501	Seminar and GD	0	0	0	1*
10		YBM1502	Skill-X	0	0	0	1*
		YBM1504	Universal Human Values	3	0	0	3*
TOTAL				**15**	**0**	**9**	**20(+5*)**

* Non-CGPA Credit Course

2nd Semester

SEMESTER-2							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM2001	Human Anatomy and Physiology-II (Theory)	3	0	0	3
2		YBM2002	Pathology-II (Theory)	3	0	0	3
3		YBM2003	General Microbiology-I (Theory)	3	0	0	3
4		YBM2004	Biochemistry-II (Theory)	3	0	0	3
5		YBM2005	Fundamentals of Computer Science (Theory)	3	0	0	3
PRACTICAL							
6		YBM2101	Human Anatomy and Physiology-II (Practical)	0	0	3	2
7		YBM2102	Pathology-II (Practical)	0	0	3	2
8		YBM2103	General Microbiology-I (Practical)	0	0	3	2
9		YBM2104	Biochemistry-II (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
10		YBM2501	Seminar and GD	0	0	0	1*
11		YBM2502	Skill-X	0	0	0	1*
INTERNSHIP							
12		YBM2503	Summar Internship	0	0	0	0/2#
TOTAL				**15**	**0**	**12**	**23(+2*)**

YBM2503- Internship (for 2 months)- only for exiting students (credit 2)

* Non-CGPA Credit Course

3rd Semester

SEMESTER-3							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM3001	Haematology and Blood Banking-I (Theory)	3	0	0	3
2		YBM3002	General Microbiology-II (Theory)	3	0	0	3
3		YBM3003	Clinical Biochemistry	3	0	0	3
4		YBM3004	Hospital Infection Management	3	0	0	3
5		YBM3005	Health education and health communication (Theory)	3	0	0	3
PRACTICAL							
6		YBM3101	Haematology and Blood Banking-I (Practical)	0	0	3	2
7		YBM3102	General Microbiology-II (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
9		YBM3501	Seminar and GD	0	0	0	1*
10		YBM3502	Skill-X	0	0	0	1*
TOTAL				**15**	**0**	**06**	**19 (+2*)**

* Non-CGPA Credit Course

4th Semester

SEMESTER-4							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM4001	Haematology and Blood Banking-II (Theory)	3	0	0	3
2		YBM4002	Cell and Tissue Culture Technique	3	0	0	3
3		YBM4003	AI & ML-based Diagnostic Assessments	3	0	0	3
4		YBM4004	Community Medicine (Theory)	3	0	0	3
5		YBM4005	Basic and Clinical Pharmacology (Theory)	3	0	0	3
PRACTICAL							
6		YBM4101	Haematology and Blood Banking-II (Practical)	0	0	3	2
FIELD VISIT							
8		YBM4503	Diagnostic Lab Tour Visit	0	0	0	2
MANDATORY NON-CGPA COURSE							
7		YBM4501	Seminar and GD	0	0	0	1*
8		YBM4502	Skill-X	0	0	0	1*
INTERNSHIP							
9		YBM4504	Summar Internship	0	0	0	0/2#
TOTAL				**15**	**0**	**03**	**19(+2*)**

YBM4504- Internship (for 2 months)- only for exiting students (credit 2)

* Non-CGPA Credit Course

5th Semester

SEMESTER-5							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM5001	Histopathology-I (Theory)	3	0	0	3
2		YBM5002	Basic Biomedical Instrumentations (Theory)	3	0	0	3
3		YBM5003	Essentials of Medical Pharmacology (Theory)	3	0	0	3
4		YBM5004	Metabolic and Technical Biochemistry (Theory)	3	0	0	3
5		YBM5005	Biomedical Waste Management (Theory)	3	0	0	3
PRACTICAL							
6		YBM5101	Histopathology-I (Practical)	0	0	3	2
7		YBM5102	Basic Biomedical Instrumentations (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
8		YBM5501	Seminar and GD	0	0	0	1*
9		YBM5502	Skill-X	0	0	0	1*
TOTAL				**15**	**0**	**03**	**19(+2*)**

* Non-CGPA Credit Course

6th Semester

SEMESTER-6							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM6001	Histopathology-II (Theory)	3	0	0	3
2		YBM6002	Virology, Mycology and Applied Microbiology (Theory)	3	0	0	3
3		YBM6003	Experimental Data Analysis and Biostatistics	3	0	0	3
4		YBM6004	Diagnostic Molecular Biology (Theory)	3	0	0	3
5		YBM6005	Modern Biomedical Instrumentations (Theory)	3	0	0	3
PRACTICAL							
5		YBM6101	Histopathology-II (Practical)	0	0	3	2
6		YBM6102	Virology, Mycology and Applied Microbiology (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
7		YBM6501	Seminar and GD	0	0	0	1*
8		YBM6502	Skill-X	0	0	0	1*
INTERNSHIP							
9		YBM6503	Summar Internship	0	0	0	0/4#
TOTAL				**12**	**0**	**03**	**19(+2*)**

YBM6503- Internship (for 6 months)- only for exiting students (credit 4)

* Non-CGPA Credit Course

7th Semester

SEMESTER-7							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM7001	Clinical Microbiology (Theory)	3	0	0	3
2		YBM7002	Bacteriology, Immunology and Parasitology (Theory)	3	0	0	3
3		YBM7003	Diagnostic Cytology (Theory)	3	0	0	3
PRACTICAL							
4		YBM7101	Clinical Microbiology (Practical)	0	0	3	2
5		YBM7102	Bacteriology, Immunology and Parasitology (Practical)	0	0	3	2
6		YBM7103	Diagnostic Cytology (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
7		YBM7501	Seminar and GD	0	0	0	1*
8		YBM7502	Skill-X	0	0	0	1*
PROJECT							
9		YBM7503	Research Project Proposal and Interim Analysis	0	0	0	4
TOTAL				**9**	**0**	**9**	**19(+2*)**

* Non-CGPA Credit Course

8th Semester

SEMESTER-8							
Sl. No.	**Type**	**Course No.**	**Course Name**	**L**	**T**	**P**	**Credits**
THEORY							
1		YBM8001	Clinical Endocrinology and Toxicology (Theory)	3	0	0	3
2		YBM8002	Clinical Enzymology and Automation (Theory)	3	0	0	3
PRACTICAL							
3		YBM8101	Clinical Endocrinology and Toxicology (Practical)	0	0	3	2
MANDATORY NON-CGPA COURSE							
4		YBM8501	Seminar and GD	0	0	0	1*
5		YBM8502	Skill-X	0	0	0	1*
INTERNSHIP							
6		YBM8503	Summer Internship	0	0	0	4
PROJECT							
7		YBM8504	Project Work	0	0	0	8
TOTAL				**9**	**0**	**6**	**20(+2*)**

* Non-CGPA Credit Course

Semester 1 Curriculum and Syllabus

UNIVERSITY

Course Code	YBM1001			
Course Title	HUMAN ANATOMY AND PHYSIOLOGY-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objective:

At the end of the course students will able to:

1. Explain the basic terminologies to describe anatomy of human system, different body parts along with their location in human system.
2. Explain the basic of cells, their structures, types and functions.
3. Explain the knowledge about the body fluids and their measurements in terms of diffusion, osmosis, tonicity and homeostasis.
4. Explain the blood composition, their function, blood grouping, coagulation and lymphatic system.
5. Explain the basic anatomy and function of cardiovascular, muco-skeletal and respiratory system.

Course Content:

UNIT I: **[5L]**

Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and their membranes, Dorsal cavity, Ventral cavity, Planes and Sections.

UNIT II: **[10L]**

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division. Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue. The Integumentary System: structure and function of The Skin, Subcutaneous Tissue.

UNIT III: **[6L]**

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis.

UNIT IV: **[5L]**

Blood-composition, function, cellular component & their function, haemoglobin and anaemia, blood groups and coagulation. Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus.

UNIT V: **[4L]**

Musculoskeletal System: Basic anatomy of important muscles and bones, Structure of skeletal muscle. Muscle contraction and relaxation.

UNIT VI: **[8L]**

Cardiovascular system: general arrangement, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock.

UNIT VII: **[7L]**

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases.

Recommended Books (Latest Edition):

1. Ross and Wilson, (2014), Anatomy and Physiology in health and illness,11th edition, Elsevier Publications.

2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers.

3. Gerard J. Tortora and Bryan H. Derrickson, (Principles of Anatomy and Physiology, 14th edition, Wiley Publications.

4. Sujit Chaudhury, (2011), Concise Medical Physiology,6th edition, NCBA.

5. Sembulingam K, (2012), Essentials of Medical Physiology,6th edition, Jaypee Publications.

6. Guyton and Hall, (2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1001.1	3	-	-	-	-	-	-	-	-	-	-
YBM1001.2	3	-	-	-	-	-	-	-	-	-	-
YBM1001.3	3	-	-	1	-	-	-	-	-	-	-
YBM1001.4	3	-	-	1	-	-	-	-	-	-	-
YBM1001.5	3	-	-	1	-	-	-	-	-	-	-

Course Code	YBM1002			
Course Title	PATHOLOGY-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objective:

At the end of the course students will able to:

1. Explain the history of pathology, basic terms used in pathology and types and mechanism of cellular injuries.
2. Explain the types of inflammation, various components related to inflammations, mediators of inflammation.
3. Write about the basics of tissue renewal, repair and healing. They will explain knowledge regarding the tissue related disorders.
4. Explain about protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances along with the etiology and pathophysiology of several disease like diabetes, COPD, parkinsonism, typhoid, dengue.
5. Write the definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

Course Content:

UNIT I: **[9L]**

Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis.

UNIT II: **[9L]**

General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, Phagocytosis and its mechanism.

UNIT III: **[9L]**

Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.

UNIT IV: **[9L]**

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease, Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue.

UNIT V: **[9L]**

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

Recommended Books (Latest Edition):

1. Harsh Mohan, Text book of Pathology, 6th edition, Jaypee publication.

2. Robbins (2012), Text book of Pathology, 3rd edition, Elsevier Publications.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1002.1	3	-	-	-	-	-	-	-	-	-	-
YBM1002.2	3	-	-	1	-	-	-	-	-	-	1
YBM1002.3	3	-	-	1	-	-	-	-	-	-	-
YBM1002.4	3	-	-	-	-	-	-	-	-	-	-
YBM1002.5	3	-	-	1	-	-	-	-	-	-	1

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Course Code	YBM1003			
Course Title	BIOCHEMISTRY-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objective:

At the end of the course students will able to:

1. Explain the definition, classification, function and metabolisms of carbohydrates, proteins, lipids.
2. Write the definition, classification and function of enzymes. They will able to explain different factors influencing the enzyme activity, will also explain the factor responsible for abnormal enzyme secretion. They will able to write the structure and function of different nucleic acids.
3. Explain the classification, function and disease associated with vitamins, minerals and ions.

Course Content:

UNIT I: **[9L]**

Carbohydrate – Definition, Source, Classification, Functions and Importance, Physiological

importance of major type of carbohydrates. Carbohydrate metabolism – Glycolysis, HMP shunt, TCA cycle, Glycogenesis, Glycogenolysis, Neoglucogenesis, Blood sugar level.

UNIT II: **[8L]**

Protein – Definition, Source, Classification, Function and Importance of major type of proteins. Protein metabolism – Transamination, Transmethylation, Deamylation, Urea synthesis, Inborn error of metabolism.

UNIT III: **[7L]**

Lipids - Definition, Source, Classification, Function of major type of lipids. Saturated and Unsaturated type of fatty acids, Essential fatty acids and their importance. Phospholipids and their importance. Lipid metabolism – Fatty acid oxidation, Ketone bodies, Metabolism of cholesterol, Arteriosclerosis and Obesity.

UNIT IV: **[7L]**

Enzymes: Definition, Classification of enzyme, Cofactor & Coenzymes, Concept of active sites and general mode of action of enzymes, units for measuring enzyme activity, factor affecting enzyme activity.

UNIT V: **[7L]**

Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases, purines and pyrimidines and role of Nucleic acid.

UNIT VI: **[7L]**

Vitamins: classification, function and disease associated with vitamins. Minerals and ions: Requirement, function and biological importance of Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Sodium and Potassium

Recommended Books (Latest Edition):

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers.
2. M N Chatterjea and Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe

Publications.

3. Singh and Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.
4. Lehninger,(2013),Principles of Biochemistry, 6th edition, W H Freeman.
5. U Satyanarayan,(2008), Essentials of Biochemistry, 2nd edition, Standard Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1003.1	3	-	-	-	-	-	-	-	-	-	-
YBM1003.2	3	-	-	-	-	-	-	-	-	-	-
YBM1003.3	3	-	-	2	-	-	-	-	-	-	-

Course Code	YBM1004			
Course Title	COMMUNICATION FOR PROFESSIONALS (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the meaning of communication, its role in business, elements, level, models and media of communication.
2. Write about the verbal and non-verbal communication-functions and its types; they could also explain the barriers to effective Communication.
3. Write appropriate vocabulary, grammar and comprehension.
4. Write essay, précis, report, proposal, C.V. and job application letter.
5. Communicate well by developing their skills through role playing and group discussion.

Course Content:

UNIT I: **[15L]**

Introduction: Meaning of Communication; Role of Communication in Business; Basic elements of the Communication process, level of Communication, forms, models and media of Communications, Verbal and non-verbal Communication-functions and types.

Barriers to effective Communication.

UNIT II: **[10L]**

Grammar: Subject verb agreement, tense, voice, improvement of sentences, rearrangement of sentences. Vocabulary: usage, synonyms, antonyms. Comprehension.

UNIT III: **[10L]**

Forms of Writing: The Essay, The Précis, The Report, The Proposal, The C.V. and Job. Application letter.
The Presentation

UNIT IV: **[10L]**

Role Playing

Group Discussion

Recommended Books (Latest Edition):

1. Professional communication, Editor Jana English (Fourth edition).
2. Professional communication skill by S. Chand (second edition).

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1004.1	3	-	-	-	-	-	-	-	-	-	-
YBM1004.2	3	-	3	-	-	-	3	1	-	-	2
YBM1004.3	3	-	-	-	-	-	3	-	-	-	-
YBM1004.4	3	-	3	-	-	-	-	-	-	-	1
YBM1004.5	3	-	3	-	-	-	3	1	-	-	2

Course Code	YBM1101			
Course Title	HUMAN ANATOMY AND PHYSIOLOGY-I (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Identify the major organs and tissues through models and permanent slides.
2. Recognize the bones and joints of the skeletal system.
3. Measure the pulse rate, blood pressure; able to grow their concept about ECG technique; and can determine blood haemoglobin by different techniques.

Course Content:

1. Demonstration of Major organs through models and permanent slides.
2. Demonstration of parts of circulatory system from models.
3. Demonstration of parts of respiratory system from models.
4. Demonstration of structural differences between skeletal, smooth and cardiac muscles.
5. Demonstration of various bones.
6. Demonstration of various joints.
7. To measure pulse rate.
8. To measure blood pressure.
9. Demonstration of ECG.

Recommended Books (Latest Edition):

1. Ross and Wilson, (2014), Anatomy and Physiology in health and illness,11th edition,

Elsevier Publications.

2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers.
3. Gerard J. Tortora and Bryan H. Derrickson, (Principles of Anatomy and Physiology, 14th edition, Wiley Publications.
4. Sujit Chaudhury, (2011), Concise Medical Physiology,6th edition, NCBA.
5. Sembulingam K, (2012), Essentials of Medical Physiology,6th edition, Jaypee Publications.
6. Guyton and Hall, (2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1101.1	3	-	-	2	1	-	-	-	-	-	-
YBM1101.2	3	-	-	-	-	-	-	-	-	-	-
YBM1101.3	3	-	3	3	3	-	-	-	-	-	1

Course Code	YBM1102			
Course Title	PATHOLOGY-I (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Determine different haemotogical parameters like, RBC count, leucocyte count, PCV, platelet count, red cell indices, bleeding and clotting time.
2. Examine CSF, urine and sputum, physically and microscopically.

Course Content:

1. Haemoglobin by CMG method.
2. To perform Total RBC count.
3. To perform total leucocyte count.
4. To perform differential leucocyte count.
5. To perform PCV.
6. To calculate red cell indices.
7. To perform total platelet count.
8. To perform bleeding time.
9. To perform clotting time.

Recommended Books (Latest Edition):

1. Harsh Mohan, Text book of Pathology, 6th edition, Jaypee publication.

2. Robbins (2012), Text book of Pathology, 3rd edition, Elsevier Publications.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1102.1	3	-	3	3	2	-	-	-	-	-	-
YBM1102.2	3	-	3	3	2	-	-	-	-	-	-

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Course Code	YBM1103			
Course Title	BIOCHEMISTRY-I (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Measure proteins by different methods, determine the bile salts, bile pigments, ketone bodies, carbohydrates.
2. At the end of the course the students can perform physical analysis of urine and determine various parameters of urine by uristik method.

Course Content:

1. Determination of protein by Biuret method.
2. Physical examination of urine.
3. Urine sugar determination by Benedict's method.
4. Protein by heat and acetic method.
5. Bile salt, Bile pigments and urobilinogen determination.
6. Determination of Ketone bodies.
7. Determination of various parameters of urine by uristik method.
8. Preparation of hemolysate.
9. Identification of carbohydrates in given solution by any chemical method.

Recommended Books (Latest Edition):

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers.

2. M N Chatterjea and Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications.

3. Singh and Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.

4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman.

5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM1103.1	3	-	3	3	-	-	-	-	-	-	1
YBM1103.2	3	-	3	3	-	-	-	-	-	-	-

Semester 2 Curriculum and Syllabus

UNIVERSITY

Course Code	YBM2001			
Course Title	HUMAN ANATOMY AND PHYSIOLOGY-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain basic anatomical structures of digestive system.
2. Explain the functions of GIT system and the structure of liver, spleen, pancreas, gall bladder and their associated diseases.
3. Explain the functions of different hormones and their regulations.
4. Explain the different anatomical structures of nervous system and special sense organs along with their physiology.
5. Explain the different structures and functions of excretory system and reproductive system.

Course Content:

UNIT I: **[9L]**

Digestive system: basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas.

UNIT II: **[8L]**

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis & Pancreatitis.

Renal physiology: Structure and function of renal system. Urine formation, micturi-tion, renal clearance test, renal buffer system.

UNIT III: **[7L]**

Endocrine system: Different hormones in endocrine system. Action of pituitary, thyroid parathyroid, adrenal and gonadal hormones. Body temperature regulatory process in human - role of endocrine and nervous system.

UNIT IV: **[7L]**

Neurophysiology: Reflex system, automatic nervous system, parts of brain and function of each part. Nerve tract and their role.

UNIT V: **[7L]**

Special senses: Structure of retina, rhodopsin and iodopsin cycle, visual tract, accommodation. Auditory tract, mechanism of audition. Structure of taste bud, taste pathway, Olfaction and its physiology.

UNIT VI: **[7L]**

Reproductive system: Male and female reproductive organs, Gametogenesis, Ovulation, Menstrual Cycle.

Recommended Books (Latest Edition):

1. Ross and Wilson,(2014),Anatomy and Physiology in health and illness,11th edition, Elsevier Publications.
2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers.
3. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley Publications.
4. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA.
5. Sembulingam K, (2012), Essentials of Medical Physiology,6th edition, Jaypee Publications.
6. Guyton and Hall, (2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2001.1	3	-	-	-	-	-	-	-	-	-	-
YBM2001.2	3	-	-	-	-	-	-	-	-	-	-
YBM2001.3	3	-	-	-	-	-	-	-	-	-	-
YBM2001.4	3	-	-	-	-	-	-	-	-	-	-
YBM2001.5	3	-	-	-	-	-	-	-	-	-	-

UNIVERSITY

Course Code	YBM2002			
Course Title	PATHOLOGY-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain and determine different hematological parameters like hemoglobin count, RBC count, WBC count, Platelet count, ESR, PCV, MCV, MCH, MCHC, etc using different methods and also identify the various pathological variations of these parameters.
2. Explain the collection of various biological samples like blood, CSF, urine, semen, sputum, stool, etc and write the significance of routine examination of these samples along with total blood count.
3. Explain the general mechanism of blood clotting and determine the various parameters involving blood coagulation like, bleeding time, clotting time, etc.
4. Explain immuno hematology, blood banking technology and determine blood group with its significance.
5. Explain about the use, care, maintenance and calibration of different instruments used in pathological laboratories along with the pre and post analytical variables.

Course Content:

UNIT I: **[9L]**

Haemoglobin, structure, function and types, Haemoglobinometry, Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters, Hemocytometry, visual and electronic method, Neubauer counting chamber, RBC count, WBC count, Platelet's count, absolute eosinophil count, principle, procedure, calculation, significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values,

Erythrocyte sedimentation rate, manual and automated method, factor affecting ESR, packed cell volume, red cell indices (MCV, MCH, MCHC), Physiological and pathological variations in value.

UNIT II: **[9L]**

Complete blood count, determination by automated method and significance of each parameter, Reticulocyte count, routine examination of CSF, semen, sputum and stool.

UNIT III: **[9L]**

Mechanism of coagulation, coagulation factors, bleeding time, clotting time, platelet count, protamine sulphate test, clot retraction test.

UNIT IV: **[9L]**

Introduction to immune-hematology and blood banking technology, antigen, antibody, complements, ABO and Rh blood group system, method of determination, other blood group system, Donor selection, blood collection, anticoagulants, additive systems, blood bags, its labelling, storage and transportation.

UNIT V: **[9L]**

Uses, care and maintenance and calibration of Coulter counter, coagulometer, automatic ESR analyser, urine analyser, point of care testing, Pre and Post analytical variables, automation in haematology.

Recommended Books (Latest Edition):

1. Harsh Mohan, Text book of Pathology, 6th edition, Jaypee publication.
2. Robbins (2012), Text book of Pathology, 3rd edition, Elsevier Publications.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2002.1	3	1	-	1	-	-	-	-	-	-	-
YBM2002.2	3	1	-	1	-	-	-	-	-	-	-
YBM2002.3	3	1	-	1	-	-	-	-	-	-	-
YBM2002.4	3	1	-	2	-	-	-	-	-	-	-
YBM2002.5	3	2	-	3	-	-	-	-	-	-	-

Course Code	YBM2003			
Course Title	GENERAL MICROBIOLOGY-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain about the history, basics of microbiology and equipment used in microbiology.
2. Explain different microscopic techniques like bright field, dark field, phase contrast, fluorescence, transmission electron and scanning electron microscope.
3. Write about bacteria, their classification, morphology, cellular components and staining.
4. Explain the definition, types and functions of antiseptics and disinfectants.

Course Content:

UNIT I: **[9L]**

Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner, Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, and ribosomes.

UNIT II: **[9L]**

Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope.

UNIT III: **[9L]**

Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram positive and Gram-negative cell walls, Cell Membrane: Structure, function and chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation.

UNIT IV: **[9L]**

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators. Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal.

UNIT V: **[9L]**

Antiseptics and Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. Precautions while using the disinfectants.

Recommended Books (Latest Edition):

2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
3. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013).
4. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
5. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
7. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2003.1	3	-	-	-	-	-	-	-	-	-	-
YBM2003.2	3	-	-	1	-	-	-	-	-	-	1
YBM2003.3	3	-	-	-	-	-	-	-	-	-	-
YBM2003.4	3	-	-	-	-	-	-	-	-	-	-

Course Code	YBM2004			
Course Title	BIOCHEMISTRY-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the safety measures employed in a clinical biochemistry laboratory; different glassware and plasticwares' apparatus used in the Clinical Biochemistry laboratory along with their maintenance and cleaning.
2. Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, pH meter.
3. Explain the preparation techniques of volumetric solutions, the concept of acid & base and their units and measurement.
4. Explain the specimen collection technique, preservation of blood, urine & CSF samples.
5. Explain the process of physical, chemical and microscopic examination of urine.

Course Content:

UNIT I: **[9L]**

Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents. Glassware's & plastic wares used in lab, calibration of volumetric apparatus, cleaning & care and maintenance.

UNIT II: **[9L]**

Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement.

UNIT III: **[9L]**

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins.

UNIT IV: **[9L]**

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample.

UNIT V: **[9L]**

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

Recommended Books (Latest Edition):

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers.
2. M N Chatterjea and Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications.
3. Singh and Sahni,(2008),Introductory Practical Biochemistry, 2nd edition, Alpha science.
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman.
5. U Satyanarayan,(2008), Essentials of Biochemistry, 2nd edition, Standard Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2004.1	3	-	-	-	1	-	-	-	-	-	-
YBM2004.2	3	-	-	1	-	-	-	-	-	-	-
YBM2004.3	3	-	-	-	3	-	-	-	-	-	-
YBM2004.4	3	-	3	-	-	-	-	-	-	-	-
YBM2004.5	3	-	3	-	2	-	-	-	-	-	-

Course Code	YBM2005			
Course Title	FUNDAMENTALS OF COMPUTER SCIENCE (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the basic fundamentals of computes science.
2. Explain basic features of MS Windows.
3. Demonstrate the creation of folders and shortcuts along with some features of windows explorer..
4. Demonstrate and perform some basic activities using MS Word, Excel, Power point.

Course Content:

UNIT I: **[15L]**

Introduction to Application of Computers

UNIT II: **[10L]**

MS Windows (Windows '98 Second Edition)

UNIT III: **[10L]**

Desktop, creation of folders and shortcuts, features of Windows explorer.

UNIT IV: **[10L]**

MS Office packages – Word, Excel, PowerPoint, basic skills in using these tools.

Recommended Books (Latest Edition):

1. Introduction to Computers with MS-Office, Leon, TMH.
2. Personal Computer Software, EXCEL BOOKS.

3. A First Course in Computers 2003, Saxena, VIKAS.

4. Computer Concepts and Windows,Stoline,SPD/LABYRINTH.

5. Windows'98 in easy steps,Harshad Kotecha, Wiley Dreamtech.

6. Office 2000 in easy steps, Stephen Copestake, Wiley Dreamtech.

7. Windows and MS-Office 2000, Krishnan, SCITECH.

8. Trouble Shooting Microsoft Windows,PHI/MSP.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2005.1	3	-	-	-	1	-	-	-	-	-	-
YBM2005.2	2	-	-	-	1	-	-	-	-	-	1
YBM2005.3	2	-	-	-	1	-	-	-	-	-	-
YBM2005.4	2	-	-	-	2	-	-	-	-	-	-

Course Code	YBM2101			
Course Title	HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Identify different anatomical structures of digestive and excretory system using models.
2. Identify different anatomical structures of nervous system and special sense organs using models.
3. Identify and differentiate different anatomical structures between the male and female reproductive system using models.

Course Content:

1. Demonstration of digestive system from models.
2. Demonstration of Gastrointestinal system from models.
3. Demonstration of excretory system from models.
4. Demonstration of nervous system from models.
5. Demonstration of endocrine system from models.
6. Structure of eye and ear.
7. Demonstration of various parts of male & female reproductive system from models.

Recommended Books (Latest Edition):

1. Ross and Wilson,(2014),Anatomy and Physiology in health and illness,11th edition, Elsevier Publications.

2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers.

3. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley Publications.

4. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA.

5. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications.

6. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2101.1	3	-	-	-	1	-	-	-	-	-	-
YBM2101.2	3	-	-	-	1	-	-	-	-	-	-
YBM2101.3	3	-	-	-	1	-	-	-	-	-	-

UNIVERSITY

Course Code	YBM2102			
Course Title	PATHOLOGY II (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Perform ELISA, TB and Dengue IgG, IgM test.
2. Demonstrate agglutination reaction.
3. Perform RA and WIDAL tests.
4. Explain different intrauterine contraceptive devices.

Course Content:

1. To perform ELISA test.
2. To perform TB IgG and IgM test.
3. To perform Dengue IgG and IgM test.
4. To demonstrate agglutination reaction.
5. To perform RA test.
6. To perform WIDAL test.
7. To study about intrauterine contraceptive devices.

Recommended Books (Latest Edition):

1. Harsh Mohan, Text book of Pathology, 6th edition, Jaypee publication.
2. Robbins (2012), Text book of Pathology, 3rd edition, Elsevier Publications.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2102.1	3	1	2	-	3	-	-	-	-	-	-
YBM2102.2	3	-	-	-	-	-	-	-	-	-	-
YBM2102.3	3	1	2	-	2	-	-	-	-	-	-
YBM2102.4	3	-	1	-	3	-	-	-	-	-	-

UNIVERSITY

Course Code	YBM2103			
Course Title	GENERAL MICROBIOLOGY-I (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Identify and explain the usages of autoclave, hot-air oven, laminar air flow and incubators.
2. Sterilize glass apparatus and they could prepare media and culture plates.

Course Content:

1. Demonstration of Autoclave and sterilization of media.
2. Demonstration of Laminar air flow.
3. Demonstration of Centrifuge.
4. Demonstration of hot air Oven and sterilization of glassware's.
5. Demonstration of Incubator and preservation of cultures.
6. Preparation of media.
7. Preparation of culture plates.
8. Antibiotic sensitivity test.

Recommended Books (Latest Edition):

2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

3. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013).

4. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

5. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.

6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

7. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2103.1	3	-	-	-	3	-	-	-	-	-	-
YBM2103.2	3	-	3	1	2	-	-	-	-	-	-

Course Code	YBM2104			
Course Title	BIOCHEMISTRY-II (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explains the laboratory safety rules and demonstrates glasswares, apparatus and plasticwares used in the laboratory.
2. Demonstrate methods of collecting blood sample, separation of serum and plasma and deproteinization of blood sample.
3. Prepare volumetric solutions.
4. Demonstrate different Instruments like colorimeter, spectrophotometer, pH meter.

Course Content:

1. To study general laboratory safety rules.
2. To demonstrate glass-wares, apparatus and plasticwares used in laboratory.
3. Collection of blood sample.
4. To separate serum and plasma.
5. Preparation of different percentage solutions.
6. Preparation of normal and molar solutions. (0.1 N NaOH, 0.2N HCl,0.1 M H_2SO_4).
7. Demonstration of colorimeter.
8. Demonstration of spectrophotometer.
9. Demonstration of pH meter.
10. Deproteinization of blood sample.

Recommended Books (Latest Edition):

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers.
2. M N Chatterjea and Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications.
3. Singh and Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman.
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM2104.1	3	-	-	1	2	-	-	-	-	2	1
YBM2104.2	3	3	3	1	2	-	-	-	-	-	-
YBM2104.3	3	-	1	-	1	-	-	-	-	-	-
YBM2104.4	3	-	2	1	3	-	-	-	-	-	-

Semester 3 Curriculum and Syllabus

UNIVERSITY

Course Code	YBM3001			
Course Title	HEMATOLOGY AND BLOOD BANKING-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain about haemoglobin and its laboratory investigations, leucocytes and their identification, haemostasis and coagulation.
2. Explain about anaemia, its types, thalassemia and their investigations.
3. Explain about general blood picture, estimation of iron, plasma haemoglobin, platelet count and thrombin time.

Course Content:

UNIT I: **[8L]**

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3- BPG and oxygen dissociation curve. Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management, Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test Megaloblastic anaemia, pernicious anaemia, pathogenesis, laboratory investigations.

UNIT II: **[7L]**

Haemoglobin, its synthesis and types, normal and abnormal haemoglobins, extravascular and intravascular haemolysis. Haemolytic anaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD.

UNIT III: **[6L]**

Leukopoiesis, Stages of Leukocyte Maturation, Features of Cell Identification, leucocy-

tosis and leucocytopenia, neutrophilia, eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cell parameter.

UNIT IV: **[6L]**

Overview of haemostasis and coagulation, Stages of platelets development, Primary and Secondary haemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis.

UNIT V: **[6L]**

General blood picture, estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin, Vit.B12, Folic acid, FIGLU test, Schilling test, Parietal cell antibodies, G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR APTT, Mixing experiments in PT and APTT, Thrombin time.

UNIT VI: **[6L]**

Aplastic anaemia, Anaemia of chronic disorders, Sideroblastic anaemia, Haemolytic Anaemia, etiology, pathogenesis, clinical features, laboratory investigations, Bone marrow examination, composition & functions, aspiration techniques, processing and staining.

UNIT VII: **[6L]**

Hemoglobinopathies, qualitative and quantitative, Sickle cell anaemia, sickle cell trait, etiology, pathogenesis, clinical features, and laboratory investigations, Disease management and prognosis, Sickling test, Thalassaemia, classification, etiology, pathogenesis, clinical features, laboratory investigations, haemoglobin electrophoresis.

Recommended Books (Latest Edition):

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.
2. Ochei J and Kolhatkar A(2000),Medical Laboratory Science: Theory and Practice, 3rd edition,Mcgraw Hill Education.

3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill.

4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications.

5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams and Wilkins.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3001.1	3	3	2	3	2	-	-	-	-	-	-
YBM3001.2	3	3	2	3	2	-	-	-	-	-	-
YBM3001.3	3	3	2	3	2	-	-	-	-	-	-

Course Code	YBM3002			
Course Title	GENERAL MICROBIOLOGY-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the management of microbiology laboratory along with the safety measures to be taken.
2. Explain the basic terminologies like infection, invasion, pathogen, pathogenicity, virulence, toxigenicity, etc along with their carriers and mode of transmission.
3. Explain the working principle, use, care, maintenance of different instruments used in microbiology laboratory.
4. Explain microbial infection, its cause, detection procedure and treatment.
5. Explain morphology, culture characteristics, pathogenicity, clinical features and laboratory diagnosis of different microorganisms.

Course Content:

UNIT I: **[9L]**

Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory, Occurrence of lab infections, route of infections in laboratory, safety measures precaution in use of pathogens in teaching.

UNIT II: **[8L]**

Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial

infections. Transmission of infection.

UNIT III: **[7L]**

Principle, working, use, care & maintenance of Laminar air flow, Centrifuge, Auto-clave, hot air Oven, Incubator, Colony Counter, Muffle Furnace, Macintos Field jar etc. Sterility testing of I/v fluids, Collection, transportation and processing of I/v fluids for bacterial contamination, Recording the result and interpretation.

UNIT IV: **[7L]**

Hospital acquired infection, Specimen collection from patients, clinics and hospitals, Specimen collection for epidemiological investigations, role of microbiology laboratory in control of nosocomial infection.

UNIT V: **[7L]**

Antimicrobial agents and Antibiotics: Introduction, mechanism of action, classification and uses, Antibiotic susceptibility testing in bacteriology, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums, Con-trol bacterial strains, Description, morphology, cultural characteristics, pathogenicity, cultural characteristics, clinical features and lab diagnosis of Staphylococcus, Strep-tococcus, Pneumococcus, Neisseria, Bordetella, Choice of antibiotics MIC and MBC: Concepts and methods for determination. Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method.

UNIT VI: **[7L]**

Description, morphology, cultural characteristics, pathogenicity, cultural characteristics, clinical features and lab diagnosis of Clostridia, Escherichia coli, Salmonella, Shigella, Proteus, Vibrio, Pseudomonas, Spirochaetes, Chlamydia, Actinomyces, Rick-ettsia, Yersinia, Brucella;

Introduction of Mycology: Definition, general properties and classification Cutaneous mycoses, Systemic mycoses, Opportunistic mycoses Culture and laboratory test for fungus.

Recommended Books (Latest Edition):

1. Text book of Microbiology by Ananthanarayan and Paniker.
2. Microbiology by Michael J. Pelczar, E.C.S. Chan and N.R. Krieg.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3002.1	3	-	-	1	1	-	-	-	-	-	-
YBM3002.2	3	-	-	-	-	-	-	-	-	-	-
YBM3002.3	3	-	-	-	2	-	-	-	-	-	-
YBM3002.4	3	-	-	-	2	-	-	-	-	-	-
YBM3002.5	3	-	-	-	-	-	-	-	-	-	-

Course Code	YBM3003			
Course Title	CLINICAL BIOCHEMISTRY			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Develop proficiency in interpreting liver function tests, including assays for bilirubin, bile salts, and liver enzymes, to diagnose liver diseases.
2. Understand renal function tests such as urea, creatinine, and clearance tests to evaluate kidney health and diagnose renal conditions.
3. Identify and interpret biochemical markers for heart diseases, understanding their application in diagnosing and monitoring cardiac conditions.
4. analyze gastric function tests and understand the use of tumor markers in diagnosing gastrointestinal diseases and cancers.
5. Gain the ability to comprehend arterial blood gas analysis and interpret results to assess and manage acid-base imbalances in clinical settings.

Course Content:

Unit I: **[9L]**

Liver function tests: Introduction, bile pigment metabolism, jaundice and its types, Estimation of Bilirubin, Bile salt, Bile pigments, urobilinogen, SGPT/ALT, SGOT/AST, ALP, GGT, Viral Hepatitis

Unit II: **[9L]**

Renal Function Test: Introduction, Glomerular filtration rate, renal threshold, Urea, Creatinine, Uric Acid, Sodium, Potassium, Creatinine Clearance test, Urea clearance test, examination of renal calculi

Unit III: **[9L]**

Cardiac Function test: Introduction, myocardial infarction, CHD, Biochemical markers of Heart diseases, Role of laboratory in monitoring heart diseases

Unit IV: **[9L]**

Gastric function Test: Introduction, gastric secretions, total and free acid, stimulation test, physical & chemical examination of gastric secretions. Tumour markers: Introduction, types, applications

Unit V: **[9L]**

Acid base balance, action of buffer system, Hb buffers, respiratory and metabolic acidosis, respiratory and metabolic alkalosis, arterial blood gas analysis, blood gas analyzer.

Recommended Books (Latest Edition):

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3003.1	3	1	3	3	2	1	3	1	-	3	3
YBM3003.2	3	1	3	3	2	1	3	1	-	3	3
YBM3003.3	3	1	3	3	2	1	3	1	-	3	3
YBM3003.4	3	1	3	3	2	1	3	1	-	3	3
YBM3003.5	3	1	3	3	2	1	3	1	-	3	3

Course Code	YBM3004			
Course Title	HOSPITAL INFECTION MANAGEMENT			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Understand the definition, significance, and epidemiology of hospital-acquired infections (HAIs), and identify the common types and sources of HAIs in healthcare settings.
2. Gain proficiency in implementing standard and transmission-based precautions, and understand the methods of sterilization, disinfection, and environmental cleaning to prevent HAIs.
3. Develop skills in establishing surveillance systems for HAIs, conducting outbreak investigations, and ensuring proper reporting and documentation of infection data.
4. Comprehend the principles of antimicrobial stewardship, the mechanisms of antimicrobial resistance, and the strategies to optimize the use of antimicrobials in clinical practice.
5. Learn to develop and manage comprehensive infection control programs, implement quality improvement initiatives, and navigate the legal and ethical considerations in infection control.

Course Content:

Unit I: **[9L]**

Introduction to Hospital Infections: Overview of Hospital-Acquired Infections (HAIs)- Definition and significance of HAIs, Epidemiology of HAIs, Common types of HAIs (e.g., surgical site infections, urinary tract infections, respiratory infections); Sources and Transmission of Infections- Sources of pathogens in the hospital environment, Modes of transmission (contact, droplet, airborne, vector-borne); Microbial Flora of Hospital Environment- Normal flora vs. pathogenic flora, Common pathogens causing HAIs; Risk Factors and Vulnerable Populations- Patient-related risk factors, Procedure-related risk factors, Environmental risk factors.

Unit II: **[9L]**

Infection Control Practices: Standard Precautions- Hand hygiene techniques and importance, Use of personal protective equipment (PPE), Respiratory hygiene and cough etiquette; Transmission-Based Precautions- Contact precautions, Droplet precautions, Airborne precautions; Sterilization and Disinfection- Methods of sterilization (physical and chemical), Levels of disinfection (high, intermediate, low), Best practices for sterilization and disinfection in healthcare settings; Environmental Cleaning and Waste Management- Cleaning protocols for patient care areas, Handling and disposal of medical waste, Role of housekeeping in infection control.

Unit III: **[9L]**

Surveillance and Reporting: Surveillance Systems for HAIs, Outbreak Investigation and Management Reporting and Documentation

Unit IV: **[9L]**

Antimicrobial Stewardship: Principles of Antimicrobial Stewardship, Antimicrobial Resistance, Strategies to Optimize Antimicrobial Use.

Unit V: **[9L]**

Infection Control Program Management: Developing an Infection Control Program, Quality Improvement and Patient Safety, Legal and Ethical Considerations.

Recommended Reading

1. "Infection Control and Management of Hazardous Materials for the Dental Team" by Chris H. Miller
2. "Hospital Epidemiology and Infection Prevention" by C. Glen Mayhall
3. "Practical Healthcare Epidemiology" by Ebbing Lautenbach, Keith F. Woeltje, and Preeti N. Malani

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3004.1	3	1	2	2	1	1	2	1	-	2	2
YBM3004.2	3	1	2	2	1	1	2	1	-	2	2
YBM3004.3	3	3	2	3	2	2	3	2	-	2	3
YBM3004.4	3	2	2	3	2	2	3	1	-	2	3
YBM3004.5	3	3	3	3	2	2	3	3	2	3	3

Course Code	YBM3005			
Course Title	HEALTH EDUCATION AND HEALTH COMMUNICATION (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain principle, objective, evaluation methods and practice of health education and health counselling.
2. Explain the basic concept and principles of health communication, process of health communication and different models of health communication.
3. Explain mass communication and the role of media, IT in health education along with the future trends in information and communication system.

Course Content:

UNIT I: **[15L]**

Health Education: Principles & Objectives, Levels of Health Education, Educational Methods, Evaluation & Practice of Health Education in India.

Health Counselling: Introduction, Theories, Process & Techniques. Health Care Reporting, Role of NIC & Other Bodies, Research in Health Education.

UNIT II: **[15L]**

Heath Communication: Basic Concept & Principles of Communication, Definition, Purpose,

Types of Communication, Communication Process, Directions of Communication: Upward, Downward, Lateral, Factors influencing Communication, Barriers of Effective Communication.

How to overcome the Barriers Models of communication: Aristotle Model, Shannon

and Weaver model, Schramm Model, Laegan's Model, Fano Model, Literer's Model, Westly Maclean's Model.

UNIT III: **[15L]**

Mass communication & Role of Media in health education, Information Communication Technologies (ICT) in health care and awareness. (Telemedicine & e-health, community radio) Future trends in information and communications systems.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3005.1	3	-	-	-	-	-	3	-	-	-	1
YBM3005.2	3	-	-	-	-	-	3	-	-	-	1
YBM3005.3	3	-	-	-	-	-	3	-	-	-	1

Course Code	YBM3101			
Course Title	HEMATOLOGY AND BLOOD BANKING-I (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Perform different blood samples in the laboratory required during different pathological conditions.
2. Perform different tests such as Differential Leukocyte Count, Absolute Leukocyte Count, sickling test and reticulocyte count.
3. Determine red cell indices, G-6-PD, Plasma Haemoglobin and APTT.

Course Content:

1. General blood picture.
2. Determination of red cell indices.
3. Demonstration of hypochromic microcytic slide.
4. Determination of G-6-PD.
5. Differential Leukocyte Count.
6. Absolute leucocyte count.
7. Demonstration of toxic granulation of neutrophil.
8. To perform PT and Calculate INR.
9. To perform APTT.
10. To perform sickling test.
11. Determination of Plasma Haemoglobin.

12. To perform reticulocyte count.

Recommended Books (Latest Edition):

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.

2. Ochei J and Kolhatkar A(2000),Medical Laboratory Science: Theory and Practice, 3rd edition,Mcgraw Hill Education.

3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill.

4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications.

5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams and Wilkins.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3101.1	3	3	2	3	2	-	-	-	-	-	-
YBM3101.2	3	3	2	3	2	-	-	-	-	-	-
YBM3101.3	3	3	2	3	2	-	-	-	-	-	-

Course Code	YBM3102				
Course Title	GENERAL MICROBIOLOGY-II (PRACTICAL)				
Category					
LTP & Credits	L	T	P	Credits	
	0	0	3	2	
Total Contact Hours	3 Hours/ Week				
Pre-requisites	None				

Objectives:

At the end of the course students will able to:

1. Perform immune-diffusion and immune-precipitation, tridot test.
2. Perform rapid blood test to detect the presence of HBsAg, streptococcus bacteria by ASO test, also could able to screen tuberculosis by Mantoux test.
3. Analyse allergic conditions.
4. Process tissues by manual method.

Course Content:

1. To perform HIV Tridot test.
2. To perform radial immune-diffusion test.
3. To perform immune-precipitation method.
4. To perform HBsAg rapid test.
5. To perform ASO test.
6. Introduction of Allergy panel.
7. Mantoux test.
8. Grossing of tissue.
9. To perform tissue processing by manual method.

Recommended Books (Latest Edition):

2. Text book of Microbiology by Ananthanarayan and Paniker.

3. Microbiology by Michael J. Pelczar, E.C.S. Chan and N.R. Krieg.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM3102.1	3	1	2	-	2	-	-	-	-	-	-
YBM3102.2	3	1	2	-	2	-	-	-	-	-	-
YBM3102.3	3	-	2	-	2	-	-	-	-	-	-
YBM3102.4	3	-	2	-	2	-	-	-	-	-	-

Semester 4 Curriculum and Syllabus

Course Code	YBM4001			
Course Title	HAEMATOLOGY AND BLOOD BANKING-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain about the leukaemia, its classification and laboratory investigation, disorders of platelets, bleeding, coagulation, thrombosis and blood parasites.
2. Explain the principles of blood banking, blood grouping, blood group determination, blood collection, separation and storage of blood components.
3. Explain about the transmitted diseases through transfusion, laboratory testing, quality control and apheresis techniques.

Course Content:

UNIT I: **[9L]**

Leukaemia and its classification, WHO and FAB classification, AML, ALL, CML, CLL, its etiology, clinical features, laboratory investigations Cytochemistry involved in diagnosis of various types of leukaemia.

UNIT II: **[8L]**

Qualitative and quantitative disorders of platelets, hypercoagulable test, Disorders of secondary haemostasis, haemophilia and its lab diagnosis, Von- Willebrand disease, Disseminated intravascular coagulation, thrombosis, Disorder of fibrinogen, test for bleeding and coagulation disorders, correction, studies for factor deficiency, quantitative factor assay. LE cells, its demonstration and significance, lupus anticoagulants, Blood parasites, Malaria, Trypanosomes, Filariasis, Leishmania.

UNIT III: **[7L]**

Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method. Other blood group system such as Lewis, MNS, Kell Duffy etc. Anticoagulants and preservative used in blood bank, Donor selection criteria, Blood collection and processing.

UNIT IV: **[7L]**

Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reactionn/Agglutination.

UNIT V: **[7L]**

Blood components and its preparation, preservation, storage and transportation. Indications for different blood component transfusion, Blood transfusion reaction and its type, Introduction of stem cell banking and bone marrow transplantation.

UNIT VI: **[7L]**

Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis Quality control of reagents, equipment, blood components used in transfusion medicine. Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.

Recommended Books (Latest Edition):

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.
2. Ochei J and Kolhatkar A(2000),Medical Laboratory Science: Theory and Practice, 3rd edition,Mcgraw Hill Education.
3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill.
4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications.
5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams and Wilkins.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4001.1	3	-	2	-	-	-	-	-	-	-	-
YBM4001.2	3	-	2	-	-	-	-	-	-	-	-
YBM4001.3	3	-	2	-	-	-	-	-	-	-	-

UNIVERSITY

Course Code	YBM4002			
Course Title	CELL AND TISSUE CULTURE TECHNIQUES			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Understand cell culture origins, characterization, differentiation, and material selection; master subculture techniques, medium selection, and culture systems.
2. Learn methods and parameters for scaling-up animal cell cultures, including monolayer, suspension, and immobilized cultures.
3. Master cell line banking, freezing, recovery quantitation, authentication, and serum-free media development.
4. Gain expertise in cytotoxicity and viability assays, FISH techniques, and understanding senescence, apoptosis, and necrosis.
5. Explore three-dimensional culture technology, organ, histolytic, organotypic cultures, and tissue engineering applications.

Course Content:

Unit I: **[9L]**

Biology of cells in culture- origin and characterization, differentiation; Choice of materials- cell type, source of tissue, subculture, selection of medium, culture system; Procedures- substrate, medium, cell culture.

Unit II: **[9L]**

Scallng-up of animal cell cultures- General methods and culture parameters; Monolayer culture; Suspension culture; Immobilized cultures.

Unit III: **[9L]**

Cell line preservation and authentication- Cell line banking, Cell freezing and quantitation of recovery, Cell line authentication. Development of serum-free media

Unit IV: **[9L]**

Cytotoxicity and viability assays- Specific techniques, End-points, Assay comparisons, Interpretation of results, Pitfalls and troubleshooting; Fluorescence In situ hybridization- Probes, Probe detection; Senescence, apoptosis, and necrosis

Unit V: **[9L]**

Application of animal cell culture and animal biotechnology- Three dimensional culture technology: organ culture, histolytic culture, organotypic culture, tissue engineering and its application

Recommended Books (Latest Edition):

1. Animal Cell Culture: A Practical Approach. Third Edition. Edited by John R. W. Masters (2000)
2. Culture of Animal Cells: A Manual of Basic Technique and Specialized application, 7th Edn, (2016) by R. Ian Freshney, pub- Wiley-Blackwell.
3. Basic Cell Culture, 2nd Edn. (2005) by J.M, Davis. pub- Oxford University Press.
4. Animal Cell Culture: A Practical Approach (2000) by John Masters, pub- Oxford University Press.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4002.1	3	2	2	3	3	2	1	1	1	1	2
YBM4002.2	3	3	2	3	3	2	1	2	1	1	2
YBM4002.3	3	2	3	3	3	1	1	2	1	2	2
YBM4002.4	3	2	3	3	3	2	1	2	1	2	2
YBM4002.5	3	3	3	3	3	3	2	3	2	2	3

Course Code	YBM4003			
Course Title	AI & ML-BASED DIAGNOSTIC ASSESSMENTS			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Understanding AI and ML basic concepts and historical evolution in healthcare.
2. Learning supervised and unsupervised learning algorithms in medical imaging and signals.
3. Reviewing real-world case studies and technical challenges in diagnostics.
4. Exploring ethical issues, regulations, and compliance in AI and ML healthcare applications.

Course Content:

UNIT I: **[12L]**

Definition and basic concepts of AI and ML, Overview of AI and ML technologies, Importance of AI and ML in modern healthcare, Brief history of AI and ML, Evolution of AI and ML in healthcare, Examples of AI and ML applications in healthcare, Benefits and limitations.

UNIT I I : **[12L]**

Introduction to supervised and unsupervised learning, Overview of common algorithms (e.g., decision trees, neural networks), Use of AI and ML in medical imaging (e.g., X-rays, MRI), AI and ML for analyzing medical signals (e.g., ECG, EEG).

UNIT I I I : **[12L]**

Review of real-world case studies of AI and ML in diagnostics, Latest advancements in AI and ML for diagnostics, Future trends and potential developments, Technical challenges in implementing AI and ML, Limitations and potential risks in diagnostics,

Unit IV: **[9L]**

Ethical issues related to the use of AI and ML in healthcare, Patient privacy and data security, Overview of regulations governing AI and ML in healthcare, Importance of compliance and standards

Recommended Books (Latest Edition):

1. Artificial Intelligence in Healthcare: A Practical Guide. Edited by Adam Bohr, Kaveh Memarzadeh. Academic Press (Elsevier) (2020)

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4003.1	3	1	2	3	1	2	2	1	2	2	3
YBM4003.2	3	2	3	3	2	2	2	2	2	2	3
YBM4003.3	2	2	3	3	2	2	2	2	2	2	3
YBM4003.4	2	1	2	2	1	3	3	1	3	2	2

Course Code	YBM4004			
Course Title	COMMUNITY MEDICINE (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Describe the concept on history, environment relationship, levels of prevention with examples related to few diseases of national importance.
2. Identify the mode of transmission and method of control of diseases, using of appropriate disinfection methods in the laboratory.
3. Explain the health services, health care and the role of laboratory technicians in primary health care.
4. Describe the National Programmes of Health and Disease Eradication /Control, Demography & Population Control and Biostatistics, Environmental Sanitation and Health Education.

Course Content:

UNIT I: **[9L]**

Natural History of Disease: Determinants of health, multi – factorial causation of disease host, agent, and environment relationship primary, secondary and tertiary levels of prevention with examples related to few diseases of national importance. Mode of Transmission of Disease: Air – borne, vector and vehicle transmission; Methods of control with examples for control of each mode.

Disinfection: Disinfection of the infective materials received in the Laboratory by using the appropriate disinfection methods, at the health centre level.

UNIT II: **[6L]**

Health Services: Brief description of organization of health services at the centre and

state levels; Primary Health Care - Definition, components and principles of primary health care; Health for all indicators; Primary Health Centre - The functions, staffing pattern and the role of laboratory technicians in primary Health Centre.

UNIT III: **[8L]**

National Programmes of Health and Disease Eradication /Control: Health Programmes Family Welfare Programme, National Programme for water supply and sanitation, Nutritional Programmes, Immunization and universal immunization programme; Disease Eradication programme - Leprosy & Guniea worm; Disease control programmes - Tuberculosis, Malaria, Filaria, S.T.D, Goitre, Cholera and other di-arrhoeal diseases and National Programme for prevention of blindness including tra-choma.

UNIT IV: **[4L]**

Demography & Population Control: The factors influencing population growth, death rate, birth rate and methods of contraception.

UNIT V: **[4L]**

Environmental Sanitation: Methods of water purification and disinfection, collection of water samples, their transport and bacteriological analysis; Methods of excreta disposal.

UNIT VI: **[8L]**

Health Education: Definition, principles, objectives, purpose, types and AV aids; Communication - definition, process and types, Behavioural change communication;

IEC (Information education and communication) - aims, scope, concept and approaches; Inter personal relationship - Co-ordination and co-operation in health education with other members of the health team; Teaching and learning process, concept, characteristics of leaner and educator;

Role and skill of health professional in Health Education.

UNIT VII: **[6L]**

Biostatistics: Application of statistical principles in history; Presentation of data, calculation

of mean, median and mode, range and standard deviation and their significance; Significance of 'T' test, Chi square values.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4004.1	3	-	-	-	-	2	-	-	-	-	1
YBM4004.2	3	-	-	2	3	3	-	-	-	-	-
YBM4004.3	3	-	1	2	-	-	-	-	-	1	-
YBM4004.4	3	-	1	3	-	-	-	-	1	-	-

Course Code	YBM4005			
Course Title	BASIC AND CLINICAL PHARMACOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the general pharmacology, route of administrations and clinical trial.
2. Explain about the drugs acting on central and autonomic nervous system.
3. Explain about the drugs acting on respiratory, cardiovascular, blood and hormonal system.
4. Explain about the opioid analgesics and concept of drug abuse, drug addiction and drug dependence.

Course Content:

UNIT I: **[9L]**

General Pharmacology: Pharmacology; Different branches of Pharmacology; Routes of drug administration; Absorption, Distribution, Metabolism and excretion of drugs; General mechanism of drug action; Animal used in experiments; Animal handling and ethics; Bioassay procedures; Instruments used in Pharmacology; Basics of Clinical trials.

UNIT II: **[9L]**

Drugs Acting on CNS: General anaesthetics; Anxiolytic and hypnotic drugs; Psychotropic agents;

Epilepsy and Anticonvulsant drugs; Narcotic analgesics and antagonists; Centrally acting muscle relaxation and anti-parkinsonism agents; Analgesics; antipyretics; antiin-

flammatory agents and Central nervous system stimulant; Local anaesthetics.

UNIT III: **[9L]**

Drugs Acting on ANS: Autonomic nervous system and neurohumoral transmission; Cholinergic or parasympathetic drugs; Anticholinergic or parasympathomimetic drugs Adrenergic or sympathomimetic drugs; sympatholytic drugs; Drugs acting on autonomic ganglion; Neuromuscular blockers.

UNIT IV: **[9L]**

Drugs Acting on Respiratory System: Bronchodilators; analeptics; Nasal decongestants, expectorants; antitussive agents.

Drugs acting on Cardiovascular System: Antiarrhythmic drugs; Cardiotonic; Antiang-ina drugs; Antihypertensive drugs; Drugs used in atherosclerosis.

Drugs Acting on Blood and Blood Forming Organs: Haematinics – Iron (Fe); Coagu-lants; Anticoagulants; Blood and plasma expanders.

Hormones and Hormone Antagonists: Antithyroid drugs; Hypoglycaemic agents; Sex hormones and oral contraceptives; Corticosteroids.

UNIT V: **[9L]**

Opioid Analgesics: Endogenous opioid peptides; Opioid receptors; Effects of clinically used opioids; Morphine and related opioid agonists; Acute opioid toxicity; Opioid agonist & antagonist; Therapeutic uses of opioid analgesics.

Drug Addiction and Drug Abuse: Drug dependence; Physical dependence on Drugs.

Recommended Books (Latest Edition):

1. Rang and Dale's Pharmacology, Nineth edition, Elsevier.
2. K.D. Tripathi, Essentials of Pharmacology, 7th edition, Jaypee publication.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4005.1	3	-	-	-	-	-	-	-	-	-	-
YBM4005.2	3	-	-	-	-	-	-	-	-	-	1
YBM4005.3	3	-	-	-	-	-	-	-	-	-	1
YBM4005.4	3	-	-	1	-	-	-	-	-	-	1

UNIVERSITY

Course Code	YBM4101			
Course Title	HEMATOLOGY AND BLOOD BANKING-II (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Analyse the different blood samples in the laboratory required for the diagnosis of different pathological conditions.
2. Perform different tests such as sickling test, fetal haemoglobin, LAP scoring, total platelet count, PT and APTT.
3. Perform thrombin time, haemoglogin electrophoresis, D-dimer test and determination of fibrinogen concentration.

Course Content:

1. Staining of bone marrow.
2. To perform sickling test.
3. To determine fetal haemoglobin.
4. To perform Heinz bodies.
5. Demonstration of leukemic slides.
6. To perform LAP scoring.
7. To perform thrombin time.
8. To perform D-dimer test.
9. To determine fibrinogen concentration.

10. General blood Picture.

11. To demonstrate malarial slide.

12. Demonstration of hemo-parasites like trypanosomes, Filaria, Malaria.

Recommended Books (Latest Edition):

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.

2. Ochei J and Kolhatkar A(2000),Medical Laboratory Science: Theory and Practice, 3rd edition,Mcgraw Hill Education.

3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill.

4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications.

5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams and Wilkins.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM4101.1	3	2	2	1	1	-	-	-	-	-	-
YBM4101.2	3	3	2	2	1	-	-	-	-	-	-
YBM4101.3	3	2	1	2	1	-	-	-	-	-	-

Semester 5 Curriculum and Syllabus

UNIVERSITY

Course Code	YBM5001			
Course Title	HISTOPATHOLOGY-I (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Describe the equipment's used in histology laboratory, safety measurement in the lab, Recording, Labelling and transportation techniques of tissue specimen.
2. Explain about anaemia, its types, thalassemia and their investigations.
3. As a result of completing the course, Student will be able to describe the histopathology, types of tissues, instruments and equipment's used in cytology, aspiration and exfoliative cytology, sex chromatin determination and automated screening devices.

Course Content:

UNIT I: **[9L]**

Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence.

UNIT II: **[8L]**

Introduction of histopathology, cytology & histo-techniques, laboratory organization, care & maintenance of equipments used in histotechnology lab, Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology.

UNIT III: **[7L]**

Tissue and its types, Location and function, grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and auto mated method, components and principle of automatic tissue processor. Decalcification, decalcification methods,

types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties.

UNIT IV: **[7L]**

Instruments and equipment's used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP,Diff-quick, MGG, H & E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping.

UNIT V: **[7L]**

Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure. Pap staining, Progressive & Regressive, Hormonal cytology in different age groups, Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample.

UNIT VI: **[7L]**

Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device.

Recommended Books (Latest Edition):

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications.
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications.
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition, Bhalani Publications.
4. C F A Culling,(1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition, Butterworths Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5001.1	3	-	-	2	-	-	-	-	-	1	1
YBM5001.2	3	-	-	2	-	-	-	-	-	-	1
YBM5001.3	3	-	-	2	-	-	-	-	-	-	-

UNIVERSITY

Course Code	YBM5002			
Course Title	BASIC BIOMEDICAL INSTRUMENTATIONS (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the centrifugation process, types of centrifugations.
2. Explain the basic principle, types and biomedical application of chromatography.
3. Explain the basic principle, types and biomedical application of electrophoresis.
4. Explain the basic principle, biomedical application of different immunoassays.

Course Content:

UNIT I: **[9L]**

Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifuga-tion.

UNIT II: **[9L]**

Chromatography, its principle, types and applications. Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

UNIT III: **[9L]**

Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDSPAGE, Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophore-

sis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

UNIT IV: **[9L]**

Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry.

UNIT V: **[9L]**

Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

Recommended Books (Latest Edition):

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications.
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier.
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman.
5. Wilson & Walker, Practical Biochemistry,2nd edition.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5002.1	3	-	-	-	2	-	-	-	-	-	1
YBM5002.2	3	-	-	-	2	-	-	-	-	-	1
YBM5002.3	3	-	-	-	2	-	-	-	-	-	1
YBM5002.4	3	-	-	-	2	-	-	-	-	-	1

Course Code	YBM5003			
Course Title	ESSENTIALS OF MEDICAL PHARMACOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the classification and mechanism of action separation of antimicrobial drugs.
2. Explain the classification and mechanism of action of antitubercular drug, antileprotic drugs, antifungal drugs, antiviral drugs, antimalarial drugs, antiprotozoal drugs, anthelmintics.
3. Explain the classification and mechanism of action of Immunosuppressants, drugs acting on skin and mucous membrane, chelating agents, vitamins. They could also explain the gene therapy.
4. Explain the classification and mechanism of action of vaccines and sera.

Course Content:

UNIT I: **[9L]**

Antimicrobial drugs: Classification and mechanism of action of antimicrobial drugs, sulphonamides, beta-lactum antibiotics, Tetracyclines, chloramphenicol, aminoglycosides, macrolides.

UNIT II: **[9L]**

Classification and mechanism of action of antitubercular drug, antileprotic drugs, antifungal drugs, antiviral drugs, antimalarial drugs, antiprotozoal drugs, anthelmintics.

UNIT III: **[9L]**

Classification and mechanism of action anticancer drugs.

UNIT IV: **[9L]**

Miscellaneous drugs: Immunosuppressants, gene therapy, drugs acting on skin and mucous membrane, chelating agents, vitamins: Classification and mechanism of action.

UNIT V: **[9L]**

Vaccines and sera: Classification and mechanism of action.

Recommended Books (Latest Edition):

1. Rang and Dale's Pharmacology, Nineth edition, Elsevier.
2. K.D. Tripathi, Essentials of Pharmacology, 7th edition, Jaypee publication.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5003.1	3	-	-	-	-	-	-	-	-	-	-
YBM5003.2	3	-	-	-	-	-	-	-	-	-	-
YBM5003.3	3	-	-	-	-	-	-	-	-	-	-
YBM5003.4	3	-	-	-	-	-	-	-	-	-	1

Course Code	YBM5004			
Course Title	METABOLIC AND TECHNICAL BIOCHEMISTRY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Comprehending key regulatory mechanisms in glycolysis, gluconeogenesis, citric acid cycle, and fatty acid metabolism.
2. Recognizing disorders in carbohydrate, lipid, amino acid metabolism, and mitochondrial function.
3. Utilizing chromatography, mass spectrometry, enzyme assays, and molecular diagnostics in clinical settings.
4. Examining signal transduction, metabolism-immune system interplay, and metabolomics techniques in disease biomarker discovery.

Course Content:

UNIT I: **[10L]**

Introduction to Metabolic Regulation: Overview of metabolic pathways, Key regulatory mechanisms, Regulation of Major Pathways- Glycolysis and gluconeogenesis, Citric acid cycle, Fatty acid synthesis and oxidation, Amino acid metabolism.

UNIT II: **[12L]**

Metabolic Disorders: Carbohydrate Metabolism Disorders- Diabetes mellitus, Glycogen storage diseases; Lipid Metabolism Disorders: Hyperlipidemias, Fatty acid oxidation disorders; Amino Acid Metabolism Disorders: Phenylketonuria, Maple syrup urine disease; Mitochondrial Disorders: Mitochondrial myopathies, Inborn errors of metabolism.

UNIT III: **[13L]**

Technical Aspects of Biochemistry in Diagnostics: Biochemical Techniques in Metabolism Studies: Chromatography, Mass spectrometry, Enzyme assays; Clinical

Biochemistry Applications: Blood glucose monitoring, Lipid profile analysis, Amino acid and organic acid analysis; Molecular Diagnostics: PCR and its applications in metabolic disorders, Next-generation sequencing (NGS).

UNIT IV: **[10L]**

Advanced Topics in Metabolic Biochemistry: Signal Transduction and Metabolic Regulation: Receptor-mediated signaling, Second messengers (cAMP, Ca2+); Interplay between Metabolism and the Immune System: Metabolic control of immune responses, Metabolic reprogramming in cancer; Metabolomics and Systems Biology: Techniques in metabolomics, Applications in disease biomarker discovery.

Recommended Books (Latest Edition):

1. "Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox.
2. "Harper's Illustrated Biochemistry" by Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5004.1	3	1	3	2	1	1	1	1	1	1	3
YBM5004.2	3	1	3	2	1	1	1	1	1	1	3
YBM5004.3	3	3	2	3	2	2	2	1	2	2	3
YBM5004.4	3	2	2	3	2	2	3	1	3	2	3

Course Code	YBM5005			
Course Title	BIOMEDICAL WASTE MANAGEMENT (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the concepts of waste generation and disposal, planning and perspectives of biomedical waste management.
2. Explain about the record keeping, biomedical waste management and biomedical waste treatment technologies.
3. Explain the occupational safety and health issues, legal aspects and environmental concern and approaches to common regional facilities.

Course Content:

UNIT I: **[9L]**

Present Scenario of Bio-medical waste – Concepts and Perceptions, Waste Generation, Segregation, Disposal.

UNIT II: **[9L]**

Planning and Objectives of BMW Management, Survey, Policies and Perspectives of BMW Management.

UNIT III: **[9L]**

Record Keeping, Management of Bio-medical Waste, Technologies for Treatment for BMW, Criteria for selecting appropriate Medical Waste Technologies.

UNIT IV: **[9L]**

Training, Occupational Safety and Health Issues.

UNIT V: **[9L]**

Legal Aspects and Environment Concern, Implementation of Action Plan, Approaches

to Common Regional facility.

Recommended Books (Latest Edition):

2. The Book of Hospital Waste Management: Dr. D.B. Acharya & Dr. Meeta Singh (Minerva Press, New Delhi).

3. Hospital Waste Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi).

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5005.1	3	-	3	1	-	3	-	-	-	3	1
YBM5005.2	3	-	3	1	-	-	-	-	-	3	1
YBM5005.3	3	-	3	1	-	3	-	-	-	3	1

Course Code	YBM5101			
Course Title	HISTOPATHOLOGY-I (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Demonstrate glassware and equipment's used in histopathology lab.
2. Prepare alcohol of different concentrations, formalin from stock solution and grossing of tissue.
3. Process tissue specimen, prepare paraffin embedded tissue, fix the smear on glass slide and prepare fixatives.

Course Content:

1. Demonstration of glass wares and equipment used in histopathology lab.
2. To prepare alcohol of different concentration.
3. To prepare formalin from stock solution.
4. To sharp knife by honing and stropping.
5. Grossing of tissue.
6. To perform tissue processing by manual method.
7. To perform section cutting of paraffin embedded tissue.
8. To fix the smear on glass slide.
9. Preparation of various cytological fixative.

Recommended Books (Latest Edition):

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications.
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications.
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.
4. C F A Culling,(1974),Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition, Butterworths Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5101.1	3	-	-	-	-	-	-	-	-	-	-
YBM5101.2	3	2	-	-	-	-	-	-	-	-	-
YBM5101.3	3	2	1	2	-	-	-	-	-	-	-

Course Code	YBM5102			
Course Title	BASIC BIOMEDICAL INSTRUMENTATIONS (Practical)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Perform the separation of amino acids by paper and thin layer chromatography.
2. Perform paper, agarose and SDS-PAGE gel electrophoresis.
3. Demonstrate ELISA and RIA.

Course Content:

1. To perform separation of amino acids by paper chromatography.
2. To perform separation of amino acids by thin layer chromatography.
3. To perform separation of DNA by Agarose gel electrophoresis.
4. Separation of protein by SDS-PAGE.
5. Separation of protein by paper electrophoresis.
6. Demonstration of ELISA.
7. Demonstration of RIA.

Recommended Books (Latest Edition):

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications.
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, El¬sevier.
3. Singh and Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.

4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman.
5. Wilson and Walker, Practical Biochemistry,2nd edition.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM5102.1	3	-	2	-	3	-	-	-	-	-	-
YBM5102.2	3	-	2	-	3	-	-	-	-	-	-
YBM5102.3	3	-	2	-	3	-	-	-	-	-	-

Semester 6 Curriculum and Syllabus

UNIVERSITY

Course Code	YBM6001			
Course Title	HISTOPATHOLOGY-II (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Describe the principle, procedure of detection of carbohydrate, minerals and pigments using advanced staining techniques.
2. Explain the preparation of tissue sample and their staining techniques for nuclic acid, bone marrow, neuropathological samples.
3. Explain the process to prepare issue samples to examine under sophisticated microscope and their working principle.
4. Explain the principle, types and applications of immunohistochemistry.
5. Explain the working principle, type, instrumentation and application of microtome. They should able to describe the different technologies employed for tissue sectioning, different dye or stains and their chemistry.

Course Content:

UNIT I: **[9L]**

Staining of carbohydrates: preparation of Schiff reagent, PAS staining, Alcian blue, staining of glycogen, Amyloid, other staining method. Connective tissue & its staining: Trichrome staining, verhoeff stain, Weigert Resorcin stain, Gordon's and Sweet stain, Gomori's method, von Geison stain, PTAH stain.

UNIT II: **[8L]**

Demonstration of minerals and pigments in tissue sample, Demonstration and iden-

tification of lipids, Demonstration of enzymes, diagnostic application and the demonstration of phosphatases, dehydrogenases, oxidases and peroxidases, Demonstration of microorganism on tissue specimens, Bacteria, AFB, Actinomyces, spirochetes, fungi.

UNIT III: **[7L]**

Demonstration of nucleic acids, Processing and staining of bone marrow sample. Fixation, Processing and section cutting of bones, eye ball, Techniques in neuropathology: Neurons staining, Myelin, Neuropathology lab specimen handling.

UNIT IV: **[7L]**

Demonstration of sex chromatin, Museum techniques, Electron microscopy: Principle and working, fixation, processing and staining of tissue Fluorescence Microscope: Principle and working.

UNIT V: **[5L]**

Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP, PAP Staining, Quality control in histopathology.

UNIT VI: **[9L]**

Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive. Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis, Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes. Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index.

Recommended Books (Latest Edition):

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications.
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications.

3. Godkar.B. Praful,(2016) Textbook of MLT, 3rd edition, Bhalani Publications.

4. C F A Culling,(1974),Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition, Butterworths Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6001.1	3	-	2	1	-	-	-	-	-	-	-
YBM6001.2	3	-	2	1	-	-	-	-	-	-	-
YBM6001.3	3	-	2	1	-	-	-	-	-	-	1
YBM6001.4	3	-	2	-	2	-	-	-	-	-	-
YBM6001.5	3	-	2	1	2	-	-	-	-	-	1

Course Code	YBM6002			
Course Title	VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the western blotting and other laboratory techniques, transplant immunology, autoimmune and immunological disorders and vaccination.
2. Describe about the definition, structure taxonomy of viruses; modes of viral replication, transmission and concept of various types of viruses.

Course Content:

UNIT I: **[9L]**

Western blotting, Immuno diffusion, Immuno electrophoresis, Hypersensitivity and its types Introduction to Allergy and its laboratory test. Introduction of transplant immunology, graft rejection, tissue typing for kidney and bone marrow transplant, Laboratory test for transplant.

UNIT II: **[8L]**

Autoimmune disorders, pathogenesis, organ specific and systemic autoimmune

disorders and its markers such parietal cell antibody, anti-sperm antibody, lupus anticoagulants, antimitochondrial antibody, ANA, ds DNA, HLA-B27, ASMA, anti CCP.

Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS, Tumour, types of tumours, Various Tumour Markers, their significance and method of estimation.

UNIT III: **[7L]**

Vaccines, classification and applications, Active and passive immunization, Immuno-prophylaxis schedule in neonates, children and in pregnancy.

UNIT IV: **[7L]**

Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses Isolation, purification and cultivation of viruses, Viral taxonomy: Classification and nomenclature of different groups of viruses, Modes of viral transmission: Persistent, non-persistent, vertical and horizontal. Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions.

UNIT V: **[7L]**

Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhab-doviruses, orthomyxoviruses and paramyxo viruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese En-cephalitis.

UNIT VI: **[7L]**

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses,

concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination.

Recommended Books (Latest Edition):

2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
3. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013).
4. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
5. SGoering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
7. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
8. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6002.1	3	-	2	-	-	-	-	-	-	-	-
YBM6002.2	3	-	2	-	-	-	-	-	-	-	1

Course Code	YBM6003			
Course Title	EXPERIMENTAL DATA ANALYSIS AND BIOSTATISTICS			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

1. Gain an understanding of biostatistics, data types, collection methods, and descriptive statistics, and learn how to present data using various graphical methods.
2. Understand basic probability concepts and become familiar with key probability distributions such as normal, binomial, and Poisson distributions.
3. Learn hypothesis testing, significance tests, confidence intervals, and correlation and regression analysis to interpret and analyze statistical data.
4. Understand different epidemiological study designs and measures of disease frequency, including incidence, prevalence, and mortality rates.
5. Get introduced to statistical software for data management and analysis, and learn to perform and present both descriptive and inferential statistical analyses.

Course Content

Unit I: **[12L]**

Introduction to Biostatistics

Overview of Biostatistics: Definition, importance, and applications in medical and health sciences.

Types of Data: Qualitative and quantitative data; scales of measurement (nominal, ordinal, interval, ratio).

Data Collection: Methods of data collection, sampling techniques, and sample size determination.

Descriptive Statistics: Measures of central tendency (mean, median, mode) and measures of dispersion (range, variance, standard deviation).

Presentation of data (Bar diagram, Pie diagram, Histogram, Frequency, Polygon, Frequency curve, Cumulative frequency curve, Line diagram)

Unit II: **[6L]**

Probability and Distributions

Basic Probability Concepts: Definitions, rules of probability.

Probability Distributions: Introduction to probability distributions (normal, binomial, Poisson).

Unit III: **[12L]**

Hypothesis Testing and Inferential Statistics

Hypothesis Testing: Null and alternative hypotheses, type I and type II errors, significance levels (p-values).

Tests of Significance: Parametric (t-test, ANOVA) and non-parametric tests (chi-square, Mann-Whitney U test).

Confidence Intervals: Interpretation and calculation of confidence intervals for means and proportions.

Correlation and Regression: Pearson and Spearman correlation, linear regression analysis.

Unit IV: **[7L]**

Biostatistical Methods in Epidemiology

Study Designs: Types of epidemiological studies (cross-sectional, cohort, case-control).

Measures of Disease Frequency: Incidence, prevalence, and mortality rates.

Unit V: **[8L]**

Statistical Software and Data Analysis

Introduction to Statistical Software: Overview of software used in biostatistics (e.g., SPSS, R, SAS).

Data Management: Data entry, cleaning, and preparation for analysis.

Basic Data Analysis: Performing descriptive and inferential statistical analysis using software.

Interpretation and Presentation of Results: Reporting statistical findings in a clear and concise manner.

Recommended Books (Latest Edition):

1. Introduction to Biostatistics and Research Methods (5th Edition)– P.S.S. SundarRao & J. Richard.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6003.1	3	2	1	2	2	1	2	1	1	1	2
YBM6003.2	3	1	1	2	2	1	1	-	-	1	2
YBM6003.3	3	2	1	3	2	1	2	1	1	2	3
YBM6003.4	3	2	1	3	1	2	2	1	-	2	2
YBM6003.5	3	3	1	3	3	1	3	2	2	2	3

Course Code	YBM6004			
Course Title	DIAGNOSTIC MOLECULAR BIOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the basics of transcription apparatus and different transcription factor used.
2. Explain the principle, types and application of different PCR techniques.
3. Explain about the blotting techniques, chromosomes, their structures and related disorders, nucleic acids & their synthesis, effect of different enzymes in DNA replications.
4. Explain the concept of radioisotopes and their applications in the field of diagnosis.

Course Content:

UNIT I: **[9L]**

Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation.

UNIT II: **[9L]**

Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RTPCR, reverse transcriptase PCR, Nested PCR.

UNIT III: **[9L]**

Blotting techniques, southern blotting and Western blotting Introduction to chromo-somes, its structure and disorder, Karyotyping, Chromosomal studies in

hematological disorders (PBLC and Bone marrow), FISH.

UNIT IV: **[9L]**

Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radio-active material Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis.

UNIT V: **[9L]**

Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renatu-ration of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6004.1	3	-	1	1	-	-	-	-	-	-	-
YBM6004.2	3	1	1	1	-	-	-	-	-	-	-
YBM6004.3	3	1	1	1	-	-	-	-	-	-	-
YBM6004.4	3	1	1	1	-	-	-	-	-	-	1

Course Code	YBM6005			
Course Title	MODERN BIOMEDICAL INSTRUMENTATIONS (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the working principle, instrumentation and application of ECG, EEG and EMG.
2. Explain the working principle and application of blood pressure monitor, electrocardio scope, pulse oximeter, pH meter, pacemaker, Nerve and muscle stimulators, Dialysis machines, Surgical diathermy equipment, Nebulizer, inhalator, Aspirator, Humidifier, Ventilator and spirometry.
3. Explain the production, nature and properties of X rays, X-ray machine, block diagram, its application.
4. Explain the working principle and application of CT, PET-CT, NMR imaging system.

Course Content:

UNIT I: **[9L]**

Principle, instrumentation of ECG, EEG, EMG and their application.

UNIT II: **[9L]**

Diagnostic and Therapeutic Equipments: Blood pressure monitors – Electrocardioscope - Pulse Oximeter - pH meter - Auto analyzer – Pacemakers – Defibrillator - Heart lung machine - Nerve and muscle stimulators - Dialysis machines - Surgical diathermy equipments – Nebulizer; inhalator - Aspirator – Humidifier - Ventilator and spirometry.

UNIT III: **[9L]**

Basics of diagnostic radiology – Production, Nature and properties of X rays, X-ray machine - Block diagram, Application.

UNIT IV: **[9L]**

Radioisotopes in medical diagnostic, Basic working principle and application of CT scan, PET CT scan.

UNIT V: **[9L]**

Principles of NMR Imaging systems - Block diagram of NMR Imaging System – Ultrasonic Imaging Systems, Doppler effect, Physiological effects of electricity. Micro & macro shock hazards, Protection of patients.

Recommended Books (Latest Edition):

1. R.S. Khandpur, Handbook of Biomedical Instrumentation, second edition, Tata McGraw-Hill Publishing Company Limited.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6005.1	3	-	1	1	2	-	-	-	-	-	-
YBM6005.2	3	-	1	1	2	-	-	-	-	-	-
YBM6005.3	3	-	1	1	2	-	-	-	-	-	-
YBM6005.4	3	-	1	1	2	-	-	-	-	-	-

Course Code	YBM6101			
Course Title	HISTOPATHOLOGY-II (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Prepare the tissue samples by microtoming.
2. Prepare tissue smear.
3. Perform various staining protocols like hematoxylin & eosin, Giemsa, Trichrome, PAS, alcian, PAP staining.

Course Content:

1. Prepare the tissue section by microtome.
2. To perform hematoxylin and eosin staining.
3. Preparation of various stains used in cytology.
4. Preparation of tissue smear.
5. To perform PAP staining.
6. To perform Giemsa staining on fluid sample.
7. To perform alcian staining.
8. To perform Trichrome staining.
9. To perform PAS staining.

Recommended Books (Latest Edition):

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications.
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications.
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications.
4. C F A Culling,(1974),Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition, Butterworths Publishers.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM6101.1	3	1	3	1	3	-	-	-	-	-	-
YBM6101.2	3	-	3	1	-	-	-	-	-	-	-
YBM6101.3	3	3	3	1	1	-	-	-	-	-	-

Course Code	YBM6102			
Course Title	VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Analyse the slide of Trichuris, Ascaris and Hookworm, perform saline and iodine wet mount to for observe ova and eggs of parasites.
2. Perform Leishman staining for malarial parasites, HBsAg by ELISA, HIV Tridot method, HIV by ELISA.
3. Perform PCR for HBV, PCR for HIV, determine the Viral load, Perform aldehyde Chopra test for Kala Azar, Zinc sulphate conc. for stool sample, and Serological diagnosis of Leishmania.

Course Content:

1. Leishman staining for malarial parasites.
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm.
3. Saline wet mount for observing ova and eggs of parasites.
4. Iodine wet mount for observing ova and eggs of parasites.
5. Concentration of stool samples by floatation method.
6. Zinc sulphate concentration Method for stool sample.
7. Demonstration of various parasites by permanent slides.

8. Concentration of stool sample by sedimentation method.
9. Serological diagnosis of Leishmania.
10. Aldehyde Chopra test for Kala-Azar.
11. To perform HBsAg/ Australia Ag by rapid method.
12. To perform HBs Ag by ELISA.
13. To perform HIV Tridot method.
14. To perform HIV by ELISA.
15. To perform TORCH profile.
16. Demonstration of PCR HBV.
17. Demonstration of PCR HIV Viral load

Recommended Books (Latest Edition):

1. Ross and Wilson,(2014),Anatomy and Physiology in health and illness,11th edition, Elsevier Publications.
2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers.
3. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edi-tion,Wiley Publications.
4. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA.
5. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications.
6. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

YBM6102.1	3	2	2	3	1	-	-	-	-	-	-
YBM6102.2	3	2	2	3	2	-	-	-	-	-	-
YBM6102.3	3	2	2	3	2	-	-	-	-	-	-

Semester 7 Curriculum and Syllabus

Course Code	YBM7001			
Course Title	CLINICAL MICROBIOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Learn the history, classification, and general methods for isolating and identifying pathogenic bacteria.
2. Understand infections by Gram-positive bacteria, including their pathogenesis, clinical features, and laboratory identification techniques.
3. Study infections caused by Gram-negative bacteria, focusing on their epidemiology, pathogenic mechanisms, and diagnostic methods.
4. Explore diseases from Mycoplasma, Mycobacterium, Spirochetes, Actinomycetes, Rickettsiae, and Chlamydiae, emphasizing pathogenesis and diagnosis.
5. Understand nosocomial infections, zoonotic diseases, sterilization, disinfection, antimicrobial agents, culturing techniques, and water quality testing methods.

Course Content:

Unit I **[9L]**

Historical development in Bacteriology, Classification of Pathogenic bacteria, General methods of isolation and identification of pathogenic bacteria.

Unit II **[9L]**

Infections associated with following Gram-positive bacteria – Bacillus anthracis. Clostridium, Pneumococcus, Corynebacterium, Streptococcal infections, Staphylococcal infections.

Unit III **[9L]**

Infections associated with following Gram-negative bacteria – Enterobacteriaceae – Salmonella, Shigella, Klebsiella, Proteus, Yersinia and Escheichia. Vibrio, Pseudomonas, Neisseria, Haemophilus, Campylobacter, Bordetella, Brucella.

Unit IV **[9L]**

Infections associated with Mycoplasma, Mycobacterium tuberculosis and Mycobacterium leprae. Spirochetes – Treponema, Borrelia and Leptospira. Actinomycetes. Rickettsiae and Chlamydiae.

Unit V **[9L]**

Nosocomial infections and Zoonotic diseases, Sterilization, disinfection and antimicrobial agents, culturing Techniques and sensitivity Testing; MPN count for water Quality.

Recommended Books (Latest Edition):

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Microbiology - 5th Edition - 2023-24/Ed. by Michale J. Pelczar J

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7001.1	3	1	1	2	2	2	1	-	-	-	3
YBM7001.2	3	2	2	3	3	2	1	1	-	1	2
YBM7001.3	3	2	2	3	3	3	1	1	-	1	2
YBM7001.4	3	1	1	2	2	2	1	1	-	1	3
YBM7001.5	3	3	3	3	3	3	2	1	2	1	3

Course Code	YBM7002			
Course Title	BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Describe the concept of immunity, antigens and antibodies.
2. Explain about the laboratory testing of antigen and antibodies using different techniques, rheumatological diseases and their laboratory investigations.
3. Explain about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites.

Course Content:

UNIT I: **[7L]**

Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response. Cell and organs of immune system, Phagocytosis.

UNIT II: **[9L]**

Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, Band Tcell epitopes; T-dependent and T independent antigens. Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody.

UNIT III: **[7L]**

Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation, complement system and complement fixation test.

UNIT IV: **[6L]**

Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence, Rheumatological diseases, etiology and pathogenesis and lab investigations.

UNIT V: **[10L]**

Introduction of parasites, host, zoonosis, host parasites relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection Lab diagnosis-ntamoeba histolytica, Malarial Parasites, Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Helminthology: Introduction and classification, Taeniasolium, Taenia Saginata, Fasciola, Ascaris, Wuchereriabancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis. Hookworm, Trichuris. Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

UNIT VI: **[6L]**

Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology.

Recommended Books (Latest Edition):

2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

3. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013).

4. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

5. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.

6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

7. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7002.1	3	-	-	-	2	-	-	-	-	-	-
YBM7002.2	3	-	-	-	2	-	-	-	-	-	1
YBM7002.3	3	-	-	-	2	-	-	-	-	-	-

Course Code	YBM7003			
Course Title	DIAGNOSTIC CYTOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Understand cell structure, function, organelles, cell cycle, tumors, cytology instruments, buffer preparation, stains, and various microscopy techniques.
2. Learn about cytology instruments, fixatives, adhesive media, cell block techniques, staining methods, significance of PAPHPV, and slide preparation.
3. Master techniques in aspiration and exfoliative cytology, patient preparation, sample collection, fixation, processing, staining, and on-site quick staining.
4. Gain expertise in Pap staining methods, hormonal cytology, and collection and processing of various bodily fluids and gynecologic samples.
5. Explore sex chromatin demonstration, immunocytochemistry, application of markers, automation in cytology, liquid-based preparation, and automated screening devices.

Course Content:

UNIT I: **[9L]**

Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence

UNIT II: **[9L]**

Instruments and equipment used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAPHPV, Destaining and restaining of slides, Cover slipping

UNIT III: **[9L]**

Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure

UNIT IV: **[9L]**

Pap staining, Progressive & Regressive, Hormonal cytology in different age groups, Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample

UNIT V: **[9L]**

Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device

Recommended Books (Latest Edition):

1. Bibbo, (1997),Comprehensive Cytopathology,2nd edition, Saunders Publishers
2. Koss's Diagnostic Cytology,Vol.1 & 2,(2006),5th edition, Lippincott

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7003.1	3	2	1	2	3	1	1	-	-	-	3
YBM7003.2	3	3	2	3	3	1	2	1	1	1	2
YBM7003.3	3	3	2	3	3	2	2	2	1	1	2
YBM7003.4	3	2	2	3	3	2	2	2	1	1	3
YBM7003.5	3	3	2	3	3	3	2	2	2	1	3

Course Code	YBM7101			
Course Title	CLINICAL MICROBIOLOGY (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Master essential microbiological techniques, including Gram staining, acid-fast staining, and microbial growth characterization for identifying and studying microorganisms in clinical samples.

2. Evaluate antibiotic efficacy and resistance through disc diffusion, MIC, and MBC methods, interpreting results to guide effective infection treatment strategies.

Course Content:

1. Physical, Chemical and Microscopic examination of Clinical samples – urine
2. Gram staining
3. Acid fast staining
4. Antibiotic sensitivity by Disc diffusion method
5. MIC and MBC
6. Growth Characteristic study of microorganisms
7. Blood culture testing

Recommended Books (Latest Edition):

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Microbiology - 5th Edition - 2023-24/Ed. by Michale J. Pelczar J
3. Practical Microbiology by D.K.Maheshwari, S. Chand Publishing, 2002.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7101.1	3	2	3	2	1	1	2	2	3	2	1
YBM7101.2	3	3	2	2	2	2	3	2	3	3	2

Course Code	YBM7102			
Course Title	BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. At the end of the course the student shall be able to demonstrates microscope and its parts, autoclave, hot air oven and sterilization of glasswares.
2. Perform different staining techniques like Gram staining, Acid fast staining, Indian ink staining, and staining of bacterial spores.
3. Perform RA test, WIDAL test, RPR test and CRP test.

Course Content:

1. Demonstration of Microscope and its parts.
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glass-wares.
4. Demonstration of Hot air oven and sterilization of glass-wares
5. To perform Gram staining.
6. To perform Acid fast staining (Zeihl Neelsen staining).
7. To perform Indian ink staining.

8. To perform Hanging drop method.
9. Staining of bacterial spores.
10. To demonstrate agglutination reaction.
11. To perform RA test.
12. To perform WIDAL test.
13. To perform RPR test.
14. To perform CRP test.

Recommended Books (Latest Edition):

2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
3. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013).
4. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
5. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
7. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7102.1	3	-	-	-	2	-	-	-	-	-	-
YBM7102.2	3	-	-	-	2	-	-	-	-	-	-
YBM7102.3	3	-	-	-	2	-	-	-	-	-	-

Course Code	YBM7103			
Course Title	DIAGNOSTIC CYTOLOGY (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Master preparation of cytological fixatives and stains for cytology.
2. Learn to prepare smears and perform PAP and Giemsa staining.
3. Gain skills in cell suspension and processing various fluid samples.

Course Content:

1. Preparation of various cytological fixatives
2. Preparation of various stains used in cytology
3. Preparation of smear
4. To perform PAP staining
5. To perform Giemsa staining on fluid sample
6. To prepare cell suspension
7. Processing of various fluid samples

Recommended Books (Latest Edition):

1. Koss's Diagnostic Cytology,Vol.1 & 2,(2006),5th edition, Lippincott

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM7103.1	3	2	2	2	3	1	1	-	-	1	3
YBM7103.2	3	2	2	3	3	1	2	1	-	1	3
YBM7103.3	3	2	2	3	3	2	2	1	1	1	3

Semester 8 Curriculum and Syllabus

Course Code	YBM8001			
Course Title	CLINICAL ENDOCRINOLOGY AND TOXICOLOGY (THEORY)			
Category				
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	45			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Explain the classification of hormones, its regulation and mechanism of action.
2. Explain and determine the parameters of thyroid function test along with disorders associated with it. Along with, the estimation and clinical significance of growth hormones.
3. Explain the influence of LH, FSH, TSH, oestrogen, progesterone, testosterone in infertility and their measurement.
4. Explain about different poisoning like alcohol, lead, zinc, mercury, screening and their estimation.

Course Content:

UNIT I: **[9L]**

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action.

UNIT II: **[9L]**

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T3, T4, TSH, FT3, FT4, TBG, Disorder associated with thyroid dysfunction.

UNIT III: **[9L]**

Infertility profile: LH, FSH, TSH, oestrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test.

UNIT IV: **[9L]**

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion.

UNIT V: **[9L]**

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

UNIVERSITY

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM8001.1	3	-	-	-	-	-	-	-	-	-	-
YBM8001.2	3	-	-	2	-	-	-	-	-	-	-
YBM8001.3	3	-	-	2	-	-	-	-	-	-	-
YBM8001.4	3	-	-	2	-	-	-	-	-	-	1

UNIVERSITY

Course Code	YBM8002				
Course Title	CLINICAL ENZYMOLOGY AND AUTOMATION (THEORY)				
Category					
LTP & Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	45				
Pre-requisites	None				

Objectives:

At the end of the course students will able to:

1. Describe the enzymes, classification of enzymes and enzyme action.
2. Define the coenzymes and their functions and outline the clinical assay.
3. Evaluate enzyme kinetics, its physiological significances and Enzyme Inhibition and the clinical significance of isoenzymes.
4. Explain the isoenzyme, their tissue distribution and clinical significance.

Course Content:

UNIT I: **[9L]**

Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity.

UNIT II: **[9L]**

Coenzyme: Classification, various types and function, structure of NAD+, NADP+, FAD and FMN, PPP. Units for measuring enzyme activity, factors affecting enzyme level in serum/plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes.

UNIT III: **[9L]**

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme.

UNIT IV: **[9L]**

Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK, MB, LDH, Troponin, Myoglobin, Amylase, Lipase, ACP.

UNIT V: **[9L]**

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analysers, point of care testing, Hospital Laboratory Management.

Recommended Books (Latest Edition):

2. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers.
3. M N Chatterjea & Rana Shinde,(2012),Text book of MedicalBiochemistry,8th edition,Jayppe Publications.
4. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science.
5. Lehninger,(2013), Principles of Biochemistry,6th edition, W H Freeman.
6. U Satyanarayan,(2008), Essentials of Biochemistry, 2nd edition, Standard Publishers.
7. Teitz,(2007),Fundamentals of Clinical Chemistry, 6th edition, Elsevier Publications.
8. Bishop(2013), Clinical Chemistry, 7th edition, Wiley Publications.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM8002.1	3	-	1	-	-	-	-	-	-	-	-
YBM8002.2	3	-	1	-	-	-	-	-	-	-	-
YBM8002.3	3	-	1	-	-	-	-	-	-	-	-
YBM8002.4	3	-	1	-	-	-	-	-	-	-	-
YBM8002.5	3	-	1	-	-	-	-	-	-	-	-

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Course Code	YBM8101			
Course Title	CLINICAL ENDOCRINOLOGY AND TOXICOLOGY (PRACTICAL)			
Category				
LTP & Credits	L	T	P	Credits
	0	0	3	2
Total Contact Hours	3 Hours/ Week			
Pre-requisites	None			

Objectives:

At the end of the course students will able to:

1. Prepare the hemolysate.
2. Estimate T3, T4, TSH, LH, FSH, Beta HCG and Prolactin conc. in serum sample.
3. Demonstrate the TRIPLE test, male and female fertility test.

Course Content:

2. To determine T3 conc. in serum sample.
3. To determine T4 conc. in serum sample.
4. To determine TSH conc. in serum sample.
5. To determine LH conc. in serum sample.
6. To determine FSH conc. in serum sample.
7. To determine Prolactin conc. in serum sample.
8. To determine TSH conc. in serum sample.
9. To perform TRIPLE test.
10. Demonstration of male and female infertility test.

CO-PO Mapping:

	Program Outcome										
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YBM8101.1	3	1	3	1	1	-	-	-	-	-	1
YBM8101.2	3	2	3	2	3	-	-	-	-	1	1
YBM8101.3	3	2	3	2	3	-	-	-	-	2	1

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