

## THIRD SEMESTER

### Course Name: Basic Microbiology

**Mode: Offline**  
**BMMIT3201**

**Credits: 5(3+2)**

**Aim of the Course:** To acquaint students with basics of microbiology

**Course Objectives:** To impart basic knowledge about the classification, growth and maintenance of microorganisms as well as the basic concept of sterilization along with a historical perspective

Sl	Graduate attributes	Mapped modules
CO1	The student will get an Overview of history of Microbiology and Systems of classification	M1
CO2	The students will get a clear concept on Stains and staining techniques	M2
CO3	The student shall get a concept of Microbial growth and nutrition, Microbial Metabolism and Bacterial gene transfer	M3
CO4	To acquaint students with the details about Concept of Sterilization	M4
CO5	The student shall be master to know the procedure of Water Microbiology and Food Microbiology	M5

**Learning Outcome/Skills:** To impart basic knowledge about the following

- Overview of history of Microbiology
- Systems of classification
- Stains and staining techniques
- Microbial growth and nutrition
- Microbial Metabolism
- Bacterial gene transfer
- Concept of Sterilization
- Water Microbiology
- Food Microbiology

Module Number	Content	Total Hours	% of questions	Bloom Level ( applicable)	Remarks, if any
<b>THEORY</b>					
M1	Overview of history of Microbiology and Systems of classification	8	18	1,2,3	NA
M2	Stains and staining techniques	4	12	1,2,3,4	NA
M3	Microbial growth and nutrition, Microbial Metabolism and Bacterial gene transfer	15	34	1,2,3,4	NA

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M4	Concept of Sterilization	9	18	1,2,3,4	NA
M5	Water Microbiology and Food Microbiology	9	18	1,2,3,4	NA
<b>Total Theory</b>		<b>45</b>	<b>100</b>		
<b><u>Practical</u></b>		<b>30</b>			
<b>TOTAL</b>		<b>75</b>			

**Detailed Syllabus**

**Module 1:**

**Overview of history of Microbiology** - Biogenesis and abiogenesis, Contributions of Redi, Spallanzani, Needham, Pasteur, Tyndal, Joseph Lister, R. Koch [Germ Theory], Edward Jenner and A. Flemming [Penicillin], Scope of Microbiology.

**Systems of classification-** Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Classification of Microbes (Microbial Taxonomy) – Identifying characters for classification, General properties and principles of classification of microorganisms. Systematics of bacteria, Numerical taxonomy, General properties of Archae and Eubacteria..

**(Total Hours:8)**

**Module 2:**

**Stains and staining techniques** – Definition of auxochrome, chromophores, dyes, Classification of stains, Theories of staining, Mechanism of gram staining, acid fast staining, negative staining, capsule staining, flagella staining, endospore staining.

**(Total Hours:4)**

**Module 3:**

**Microbial growth and nutrition** - Common nutrient requirements, nutritional types [Definition and examples], Types of culture media, Methods of isolation of pure culture; Cultivation, Maintenance and Preservation of pure cultures.

Growth curve, Generation time, Batch culture, synchronous and continuous culture, measurement of growth and factors influencing microbial growth. Classification of microbes on the basis of oxygen requirement.

**Microbial Metabolism:** Metabolic pathways, amphi-catabolic and biosynthetic pathways.

**Bacterial gene transfer** – Transformation, Transduction and conjugation

**(Total Hours:15)**

**Module 4:**

**Concept of Sterilization,** Physical methods of sterilization - dry and moist heat, tyndallization, pasteurization, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation, ultrasonication. Chemical methods of sterilization - disinfectants, types and mode of action. Definition of MIC, sanitization, antisepsis and fumigation. Determination of Phenol coefficient of disinfectant

**(Total Hours:9)**

**Module 5:**

**Water Microbiology:** Bacterial pollutants of water, coliforms and non coliforms. Sewage composition and its disposal.

**Food Microbiology:** Important microorganism in food Microbiology: Molds, Yeasts, bacteria. Major food born infections and intoxications, general principles and methods of food preservation, Fermented Foods (Yoghurt, cheese, Idli, Kinema), Probiotics and Prebiotics.

**(Total Hours:9)**

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**PRACTICAL**

**BMMIT 3291**

**Paper Name- Lab on Basic Microbiology**

(Where ever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

**Credit:2**

**Total Hours:30**

1. Introduction, operation, precautions and use of common microbiology laboratory instruments: (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope) .
2. Preparation of different culture media and inoculation techniques - Nutrient agar, Nutrient broth, McConkey agar, EMB agar, Sabaraud's Chloramphenicol agar, YEPD agar, BG-11.
3. Sampling and enumeration of viable microorganisms in air, soil and water.
4. Isolation of pure cultures of bacteria by streaking, spreading, pour plate method .
5. Staining techniques- [simple staining, Gram's staining, acid fast staining, capsule staining, endospore staining , negative staining, fungal staining]
6. Observation of motility in bacteria using: Hanging drop method.
7. Microscopic measurements- micrometer (ocular and stage).

**Suggested Readings:**

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers.
6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.

## Course Name: Hematology and Clinical Pathology

**Mode: Offline**

**Credits: 5(3+2)**

**BMMIT 3202**

**Aim of the Course:** To acquaint students with basics of Hematology and clinical pathology

**Course Objectives:** To impart basic knowledge about the disorders of red and white blood cells, disorders of hemostasis, Basic principles of laboratory Medicine, different examinations related to clinical pathology and flow cytometry and immune-histochemistry in hematopathology

Sl	Graduate attributes	Mapped modules
CO1	To acquaint students about the Disorders of red blood cells	M1

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CO2	To acquaint students with the basic concept of Disorders of white blood cells	<b>M2</b>
CO3	To acquaint students with an overview of Disorders of hemostasis	<b>M3</b>
CO4	To acquaint students with Clinical pathology-Basic Principles of Laboratory Medicine	<b>M4</b>
CO5	To acquaint students with the basic knowledge of Clinical pathology	<b>M5</b>
CO 6	To acquaint students with the Process of Flow cytometry and immunohistochemistry in hematopathology	<b>M6</b>

**Learning Outcome/Skills:** To impart basic knowledge about the following

- Disorders of red blood cells
- Disorders of white blood cells
- Disorders of hemostasis
- Clinical pathology
- Basic Principles of Laboratory Medicine
- Flow cytometry
- Immunohistochemistry in hematopathology

Module Number	Content	Total Hours	% of questions	Bloom Level ( applicable)	Remarks, if any
<b>THEORY</b>					
M1	Disorders of red blood cells	7	16	1,2	NA
M2	Disorders of white blood cells	7	16	1,2,3	NA
M3	Disorders of hemostasis	8	17	1,2,3,4	NA
M4	Clinical pathology- Basic Principles of Laboratory Medicine	8	17	1,2,3,4	NA
M5	Clinical pathology	8	17	1,2,3,4	NA
M6	Flow cytometry and Immunohistochemistry in hematopathology	7	17	1,2,3,4	NA
<b>Total Theory</b>		<b>45</b>	<b>100</b>		
<b><u>Practical</u></b>		<b>30</b>			
<b>TOTAL</b>		<b>75</b>			

**Detailed Syllabus**

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<p><b><u>Module 1:</u></b> <b>Disorders of red blood cells</b>-Anemias-due to impaired red cell production, , due to excessive red cell destruction <b>(Total Hours: 7)</b></p>
<p><b><u>Module 2:</u></b> <b>Disorders of white blood cells</b>----Acute leukemias, Myeloproliferative Neoplasms, Chronic Lymphoid Leukemias,multiple myeloma,Malignant lymphomas <b>(Total Hours: 7)</b></p>
<p><b><u>Module 3:</u></b> <b>Disorders of hemostasis</b>- bleeding disorders caused by abnormalities of platelets, disorders of coagulations-inherited, acquired <b>(Total Hours: 8)</b></p>
<p><b><u>Module 4:</u></b> <b>Clinical pathology-Basic Principles of Laboratory Medicine</b>-Quality assurance, quality control, safety in clinical laboratories <b>(Total Hours: 8)</b></p>
<p><b><u>Module 5:</u></b> <b>Clinical pathology</b>-examination of Urine, stool, CSF, sputum, Body fluid and Semen analysis <b>(Total Hours: 8)</b></p>
<p><b><u>Module 6:</u></b> <b>Flow cytometry and immunohistochemistry in hematopathology</b>- Principle, procedure and applications <b>(Total Hours: 7)</b></p>
<p><b>PRACTICAL</b></p> <p><b>BMMIT 3292</b></p> <p><b>Paper Name- Lab on Hematology and clinical pathology</b></p> <p>(Where ever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)</p> <p><b>Credit:2</b></p> <p><b>TotalHours:30</b></p> <ol style="list-style-type: none"><li>1. Collection of blood and blood smear examinations</li><li>2. Estimation of hemoglobin</li><li>3. Packed cell volume, ESR, red cell indices</li><li>4. Total leucocyte count and platelet count</li><li>5. Demonstration of toxic granulation of neutrophil</li></ol>

**Suggested Readings:**

1. Essentials of clinical Pathology-SM Kawthalkar, JAYPEE Brothers
2. Essentials of Hematology - SM Kawthalkar, JAYPEE Brothers
3. Wintrobe's Clinical Haematology, (2014), 13th edition, Lippincott Williams & Wilkins
4. De Gruchy's Clinical Haematology in Medical Practice, (2012),Sixth edition, WileyPublications
5. Dacie & Lewis Practical Haematology, (2011), 11th edition, Elsevier Publications
6. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications