B.M.S. COLLEGE FOR WOMEN
AUTONOMOUS
Basavanagudi, Bengaluru-04
NAAC Accreditation 'A'Grade
Affiliated to Bengaluru City University, Bengaluru
Choice Based Credit System NEP 2020

Annexure-II

Syllabus for I & II Semesters

B.Sc., MICROBIOLOGY (BASIC/HONS.) FIRST SEMESTER

Course Title: MB DSC T-01, General Microbiology	
Course Code: **MB DSC T-01**	**L-T**-Period per week: 4-0-0
Total Contact Hours: **56**	Course Credits: **04**
FormativeAssessmentMarks: **40**	Duration of ESA/Exam: **3h**
Model Syllabus Authors: **Curriculum Committee**	Summative Assessment Marks: **60**

B.SC. MICROBIOLOGY (BASIC/HONS.), FIRST SEMESTER

Content of Course 01:Theory: MB DSC T-01:General Microbiologv	**56h**
Unit-1:Historical development and origin of microorganisms	**14h**
Historical development of Microbiology - Origin of life, Fossil evidences of microorganisms. Primitive cells and evolution of microorganisms. Theory of spontaneous generation, .Contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming, Martinus Beijerinck, Sergei Winogradsky and Elie Metchnikoff. Contribution of Indian scientists in the field of Microbiology. **Microscopy** working principle, construction and operation of Bright field microscope Dark field, Phase Contrast, Confocal and Flourescent Microscope.SEM ,TEM and scanning probe microscopy.	
Unit-2:Staining,sterilizationandpreservationtechniques	**14h**
Staining: Nature of stains, principles, mechanism, methods and types of staining- simple, Differential-Gram staining, acid fast staining, capsule staining, endospore, inclusion bodies. **Sterilization**: Principles, types– dry heat, moist heat, radiation, filtration, pulsed field technology, ozone, Chemical- Alcohols, Phenols, Heavy metals, Halogens, Gaseous agents, Peracetic acid. **Preservation of microorganisms**: Methods of preservation, slant culture, stab culture, soil culture, mineral oil overlaying, glycerol preservation, Lvophilization.	

Unit-3: Prokaryoticmicroorganisms	**14h**
Overview of prokaryotic cell structure: Size, shape, arrangement. Ultra structure of prokaryotic cell: bacterial and archaeal - cell wall and cell membrane. Components external to cell wall - capsule, slime, s-layer, pili, fimbriae, flagella; structure, motility, chemotaxis Cytoplasmic matrix-Cytoskeleton, ribosome, inclusion granules: Composition and function. Nuclear Material -bacterial structure (its differences with the Eukaryotic chromosome); Extra Chromosomal material. Bacterial Endospore-Examples of spore forming organisms, habitats, function, Formation and germination. Reproduction in bacteria.	
4: **Eukaryotic microorganisms:**	**14h**
Overview of eukaryotic cell: Types of cells; Structure and function of organelles- cell wall, cell membrane, cytoplasmic matrix, cytoskeleton, endoplasmic reticulum, Golgi complex, peroxisomes, lysosomes, vesicles, ribosomes, mitochondria, chloroplast and nucleus. Structure and functions of flagella. Salient features of fungi and their reproduction -Vegetative, asexual and sexual methods	

PEDAGOGY: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage** in **marks**
Assignment/Field Report/Project	10 Marks
Tests	20 Marks
Seminar/Activity/ Case study/Field visits	10 marks
Total	**40 Marks**

GENERAL MICROBIOLOGY LABORATORY CONTENT
COURSE 01: PRACTICALS: MB DSC P-01: GENERAL MICROBIOLOGY

Course Title: **General Microbiology**	Course Credits: **02**
Course Code: **MB DSC P-01**	L-T-P per week:0-0-4
Total Contact Hours:**28**	Duration of ESA/Exam:4h
Formative AssessmentMarks:**25**	Summative Assessment Marks:**25**

1. Microbiological laboratory standards and safety protocols.
2. Operation and working principles of light and compound microscope.
3. Working principle and operations of basic equipments of microbiological laboratory (Autoclave, Hot Air oven, incubator, LAF, pH meter, spectrophotometer, colorimeter, vortex, magnetic stirrer, inoculation loop and needle)
4. Isolation and Identification of Microorganisms from natural sources (Algae, Yeast, Filamentous fungi and protozoa).
5. Bacterial motility by hanging drop method.
6. Simple staining-Negative staining.
7. Differential staining- Gram staining.
8. Acid-Fast staining. (demonstration)
9. Structural staining-Flagella (Demo).
10. Bacterial endospore and capsule staining.
11. Staining of reserved food materials (polyphosphate granule).
12. Staining of fungi by lactophenol cotton blue –*Aspergillus* sp., *Rhizopus* sp., *Penicillium* sp. and *Fusarium* sp.

Textbooks/References

1. Atlas, R.M. 1984. Basic and practical microbiology. MacMillan Publishers, USA. 987pp.
2. Black, J.G. 2008. Microbiology principles and explorations. 7th edition. John Wiley and Sons Inc., New Jersey. 846pp.
3. Dubey, R.C. and Maheshwari, D.K. 1999. A Textbook of Microbiology, 1st edition, S.Chand & Company Ltd.
4. Madigan, M.T., Martinko, J.M., Dunlap, P.V. and Clark, D.P. 2009. Brock Biology of Microorganisms,-12th edition, Pearson International edition, Pearson Benjamin Cummings.
5. Michael Pelczar, Jr., Chan E.C.S., Noel Krieg 1993. Microbiology – Concepts and Applications, International edn, McGraw Hill.

6. Pommerville, J.C. 2013. Alcamo's Fundamentals of Microbiology. Jones and Bartlett.
7. Schlegel, H.G.1995 General Microbiology. Cambridge University Press, Cambridge. 655pp
8. Stanier, Ingraham et al. 1987. General Microbiology, 4th and 5th edition Macmillan education limited. International, edition 2008, McGraw Hill.
9. Talaro, KP. 2009. Foundations in Microbiology, 7th International edition, McGraw Hill.
10. Toratora, G.J., Funke, B.R. and Case,C.L.2007.Microbiology 9thedn. Pearson Education Pvt .Ltd., San Francisco. 958pp.
11. Tortora, G.J., Funke, B.R., Case C.L. 2008. Microbiology an Introduction, 10th edn. Pearson Education.
12. Willey, J. M., Sherwood, L., Woolverton, C. J., & Prescott, L. M. (2008).Prescott, Harley, and Klein's microbiology. New York: McGraw-Hill Higher Education.

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in marks**
Performance	10
Project/assignments/activity/Presentations	05
Test	05
Practical class records	05
Total	**25**

Course 02: Theory: MBOE 1-A: Microorganisms for Human Welfare

Course Title: **Microorganisms for Human Welfare**	**Course Credits**: **03**	
Course Code: **MB OE 1-A**	L-T-P per week: 0-0-3	
Total Contact Hours: **42h**	Duration of ESA/Exam: 4h	
Formative Assessment Marks: **30**	Summative Assessment Marks: **45**	
Unit-I: **Food and Fermentation**		**14h**
Fermented Foods- Types, nutritional values and health benefits Probiotics, probiotics, symbiotics, functional foods and nutraceuticals Fermented Products - Alcoholic and non-alcoholic beverages, dairy Products.		
Unit-2:Agriculture		**14h**
Bio-fertilizers and bio-pesticides - types and applications, beneficial microorganisms in agriculture, AM fungi, Mushroom cultivation, Biogas production.		
Unit- 3: Pharmaceutical industry		**14h**
Drugs - types, development and applications. **Antibiotics** - types, functions and antibiotic therapy. **Vaccines** - types, properties, functions and schedules.		

Texbooks/References

1. Ananth narayanan, R and Jeyaram Panicker, C.K. 2010. Text books of Microbiology, Orient Longman.
2. Dubey, R.C. and Maheshwari, D.K. 2013. A Textbook of Microbiology - 2nd edition (S. chand & Co.N.Delhi).
3. Michael, J. Pelczar, Jr. E.C.S., Chan, Noel R. 1998. Krieg Microbiology Tata McGraw – Hill Publisher.
4. Pelczar, M J., Chan, E.C.S.andKreig,N.R.1993.Microbiology5thedition(Tata McGraw-Hill,NewDelhi)
5. Prescott, L.M., Harley, J.P. and Klein, D.A., 2007. Microbiology-7thedition (Wm. C. Brown Publishers, USA) Elementary Microbiology -Modi, HA (vol. I), l6th edition (Ekta Prakashan, Nadiad).
6. Prescott, M.J., Harley, J.P. and Klein 2002. Microbiology 5th Edition, WCB McGraw Hill, NewYork.
7. Sateesh, M.K. 2010. Bioethics and Biosafety. IK International Pvt Ltd. 2. Dubey, RCA .Text book of Biotechnology. S. Chand Publications.
8. Singh, B.D. 2013. Expanding Horizons in Biotechnology. Kalyani Publication.
9. SreeKrishna,V. 2007. Bioethics and Biosafety in Biotechnology, New age International Publishers.
10. Willey, J.M., Sherwood L.M and Woolverton C.J., Prescott, Harley and Klein's. 2013. Microbiology. 9th Edition., McGraw Hill Higher education.

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminars, Field Visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	15
Written Assignment/ Presentation/Project/Term Papers/ Seminar	10
Class performance/Participation	05
Total	**30**

SKILL ENHANCEMENT COURSE IN MICROBIOLOGY

Course 03: Theory: MB SE – 1A Microbiological Techniques

Learning Out comes:

- Demonstrate skills as per National Occupational Standards (NOS) of "Lab Technician / Assistant "Qualification Pack issued by Life Sciences Sector Skill Development Council – LFS / Q0509, Level-3.

- Perform microbiology and analytical techniques. Knowledge about environment, health, and safety (EHS), good laboratory practices (GLP), good manufacturing practices (GMP) and standard operating procedures (SOP).

- Demonstrate professional skills at work, such as decision making, planning and organizing. Problem solving, analytical thinking, critical thinking and documentation.

- Principles of sterilization of culture media, glassware and plastic ware to be used for microbiological work.

- Principles of a number of analytical instruments which the students have to use during the study and also later as microbiologists for performing various laboratory manipulations.

- Handling and use of microscopes for the study of microorganisms which are among the basic skills expected from a practicing microbiologist. They also introduced to a variety of modifications in the microscopes for specialized viewing.

Course content: 03 **Course Title: Theory: MB SE T-01 : Microbiological Techniques**		**14h**
Total Contact Hours:14 Hours	Duration of ESA : 0l Hrs.	
Formative Assessment Marks:10	Summative Assessment Marks: 15	

Unit-1:

- **Microbiological culture media:** Types, Composition, Preparation, Application and storage; Ingredients of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media.

- **Isolation and cultivation of microorganisms:** Collection of samples, processing of samples, serial dilution, inoculation of samples, incubation and observations of microbial colonies. Morphological characterization of microorganisms-Colonycharacteristics, Microscopic characters, biochemical / physiological tests or properties and identification. Sub culturing of microorganisms and pure culture techniques. Preservation of microorganisms.

- **Advanced Microscopic Skills :** Different types of microscopes-Phase contrast, Bright Field, Dark Field, Fluorescent, Confocal, Scanning and Transmission Electron Microscopes, Scanning Probe Microscopy

- **Centrifugation, Chromatography and Spectroscopy:** principles, types, instrumentation, operation and applications.

LAB CONTENT OF SKILL ENHANCEMENT COURSE IN MICROBIOLOGY

Course-03: Theory: MB SE P- 01, Microbiological Techniques

Course content: 03 **Course Title**: **Practical : MB SE P-01 : Microbiological Techniques**	
Total Contact Hours: 28 Hours	Duration of ESA: 02 Hrs.
Formative Assessment Marks: 25	Summative Assessment Marks:25

l. Methods and practices in Microbiology lab: MSDS (Material Safety and Data Sheet), Good Clinical Practices (GCP), Standard Operating Procedure (SOP), Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP).
2. Usage and maintenance of basic equipments of microbiology lab: Principles, calibrations, and SOPs of balances, pH meter, autoclave, incubators, Laminar Air Flow (LAF) and biosafety cabinets, microscopes, homogenizers, stirrers.
3. Preparation of different types of bacterial culture media.
4. Preparation of different types of fungal culture media.
5. Preparation of different types of algal culture media.
6. Isolation and cultivation of bacteria, actinobacteria, fungi and algae.
7. Identification and characterization of bacteria, actinobacteria, fungi and algae.
8. Biochemical and physiological tests for identification of bacteria.
9. Separation of biomolecules by paper/thin layer chromatography.
10. Demonstration of column chromatography
11. Preparation of permanent slides (bacteria, fungi and algae).
12. Procedures for documentation, lab maintenance, repair reporting.

Pedagogy: Lectures, Presentation, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in marks**
Assignment/Monograph	10
Test	10
Participation in class	05
Total	25

B.M.S. COLLEGE FOR WOMEN
Autonomous
Affiliated to Bengaluru City University
DEPARTMENT OF MICROBIOLOGY
MODEL QUESTION PAPER (THEORY)
MB DSC T-01: General Microbiology

Sl. No.	**Name of the Unit**	**2 marks questions**	**5 marks**	**10 marks**	**1 mark**
1	Historical Development and Origin of Microorganims	2	1	1	3
2	Staining , Sterilization and Preservation Techniques	1	2	1	3
3	Prokaryotic Microorganisms	2	1	1	3
4.	Eukaryotic Microorganisms	1	2	1	3
		Any 5 (2x5=10)	**Any 4 (5x4=20)**	**Any 2 (2x10=20)**	**Any 10 (1x10=10)**
		Total = 60 marks			

B.M.S. COLLEGE FOR WOMEN
Autonomous
Affiliated to Bengaluru City University
I Semester B.Sc., (Theory) Degree Examination
MICROBIOLOGY
General Microbiology MB DSC T-01
Semester Scheme- Freshers

Time:3 hours **Max. Marks: 60**

Instructions to Candidates:

1) Answer all the Sections
2) Draw diagrams wherever necessary

SECTION - A

I. Answer the following **(5x2=10)**

1. Define Resolution Power
2. Write the principle Negative Staining
3. What is Nucleoid
4. Write any 2 Contributions of Winogradsky
5. Write the significance of Fimbriae
6. Expand LTH and HTST

SECTION - B

II. Answer any 4 of the following **(4x5=20)**

7. Describe Radiation as a method of Sterilization
8. Describe Acid-Fast staining
9. Write in brief about the contributions of Alexander Fleming
10. Explain the structure and functions of Prokaryotic Cell wall
11. Write in brief about Ribosomes of Eukaryotic Microorganisms
12. Write the working principle of Flourescence Microscope.

SECTION - C

III. Answer any 2 of the following (2x10=20)

11. Explain Heat as a method of Sterilization
12. Write in detail about the contributions of Louis Pasteur
13. Describe the Cytoplasmic matrix in detail
14. Explain Asexual methods of Reproduction in fungi

SECTION - D

IV. Answer <u>any 10</u> -multiple choice questions (10x1=10)

1. How long does it take Autoclave to complete the sterilization?
   A. 30 to 35 minutes
   B. 50 minutes to one hour
   C. 15 to 20 minutes.
   D. 4. 5 to 10 minutes.

2. Ultra high temperature pasteurization involves exposure of objects for
   A. 1 to 3 seconds
   B. 1 to 3 minutes
   C. 1 to 3 hours
   D. 10 to 30 hours.

3. Which of the following microbial control methods does not actually kill microbes or inhibit their growth but instead removes them physically from samples?

   A. Filtration
   B. Desiccation
   C. Lyophilization
   D. Nonionizing radiation

4. Exchange of lipid molecules (amphipathic) between the leaflets is called…..

A. Reverse movement
B. Flexing
C. Rotation
D. Flip-flop

5. Rough endoplasmic reticulum mainly involved in the……

A. Carbohydrate synthesis
B. Lipid synthesis
C. Steroid synthesis
D. Protein synthesis

6. Which one of the components are increases the Fluidity of the cell membrane

A. Saturated fatty acids
B. Unsaturated fatty acids
C. Proteins
D. Carbohydrates

7. What is the name of the region where double stranded, single circular DNA is found in prokaryotic cell?

A. Protonucleus
B. Nucleus
C. Nucleoid
D. Nucleoplasm

8. In prokaryotic cells, ribosomes are

A. 70 S
B. 80 S
C. 60 S
D. 50 S

9. From which structure is a mesosome derived from?

A. Plasmid
B. Cell wall
C. Ribosome
D. Cell membrane

10. Name an Organelle which serves as a primary packaging area for molecules that will be distributed throughout the cell?

A. Mitochondria
B. Plastids
C. Golgi apparatus
D. Vacuole

11. In acid fast staining the primary stain is

A. Crystal violet
B. Carbol fuchsin
C. Methylene blue
D. Nigrosine

12. In Gram staining, iodine is used as

A. Fixative
B. Mordant
C. Solubilizer
D. Stain

B.M.S. College for Women
Autonomous
Affiliated to Bengaluru City University

B.Sc, MICROBIOLOGY PRACTICAL EXAMINATION
I SEMESTER

MB DSC P-01 General Microbiology

Duration -3 hrs **Max Marks: 25**

1. Write the Principle, Procedure and Observation for the given Specimen '**A**' by Gram Staining **05**
2. Write the Principle, Procedure and Observation for the given Specimen '**B**' by Endospore/ capsules Staining **05**
3. Demonstrate Bacterial Motility by Hanging drop Technique for the given specimen '**C'**

OR

Identify the Given fungal specimen **'D**' by Lactophenol Cotton Blue method **05**

4. Write the Principle, Construction and Applications of the given Instruments **'E' and 'F '** **04**
5. Spotters (media, staining slides, protozoa, algae, acid fast staining) **(Any -2)** **02**
6. Viva Voce **04**

B.M.S. College for Women
Autonomous
Affiliated to Bengaluru City University
Practical Examination Scheme
I Semester
MB DSC-P-01
General Microbiology

1.	**a) Preparation**	**-**	**2 m**
	b) Principle & Procedure	**-**	**2 m**
	c) Comment	**-**	**1 m**
	Total	**-**	**5 m**
2.	**a) Preparation**	**-**	**2 m**
	b) Principle & Procedure	**-**	**2 m**
	c) Comment	**-**	**1 m**
	Total	**-**	**5 m**
3	**a) Preparation**	**-**	**2 m**
	b) Principle & Procedure	**-**	**2 m**
	c) Comment	**-**	**1 m**
	Total	**-**	**5 m**
4.	**a) Principle**	**-**	**1 m**
	b) Construction & Applications	**-**	**1 m**
	Total	**-**	**4 m (2x2)**
5.	**Identification**	**-**	**2m (1x2)**
5.	**Viva Voce**	**-**	**04m**
	TOTAL	**-**	**25 Marks**