Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Biosciences		
Lesson Plan - B. Sc. Year I Microbiology (July 2018 - June 2019)		
Micro+Chem+LS, Micro+Chem+Pharma		
Paper I - General Microbiology and Cell Biology		
Teacher - Fatema Matkawala, Zahabiya Saifee		
Day/Lecture	**Unit**	**Topic**
1	Unit 1	Introduction to microbiology
2		Contributions made by eminent scientists
3		Contributions made by eminent scientists
4		Contributions made by eminent scientists
5		Contributions made by eminent scientists
6		Scope and development of microbiology
7		Banches of microbiology
8		Concept of diseases
9		Applications of microbiology in human welfare
10	Unit 2	Classification of microorganisms
11		Classification of microorganisms
12		Morphology and types of bacteria
13		Ultra structure of Eubacteria and Archaebacteria
14		Cell wall of bacteria
15		Cell Membrane- structure and function
16		Capsule- Composition and function
17		Structure and Function of Flagella
18		Structure and Function of Pilli
19		Spheroplast, Protoplast, Prostheceae, Stalk, Gas vacuoles
20		Sheath, Glycocalyx, Internal membrane system, Mesosomes
21		Chromosomes, Nucleoid, Ribosomes, Cytoplasmic inclusions
22		Spores- endospores, exospores, Cysts,
23		Cyanobacteria, Actinomycetes, Mycoplasma
24		Rickettsia, Chlamydia
25	Unit 3	Introduction to fungi and classification
26		General characterstics, thallus, mycelia
27		Nutrition, Heterokaryosis
28		Structure and function of parts of fungi
29		Reproduction- sexual and asexual
30		Economic importance of fungi
31		Introduction and classification of phage
32		Morphology and structure of phages
33		Phage- nucleic acid, host,
34		Reproduction- lytic and lysogenic cycles
35		Reproduction- lytic and lysogenic cycles
36		DNA and RNA virus
37		T4, TMV, Pox virus, Prions, Virions, Virusoid, Viriod
38		Structure and organisation and function of cell organelles

39	Unit 4	Structure and organisation and function of cell organelles
40		Structure and organisation and function of cell organelles
41		Structure and organisation and function of cell organelles
42		Cell cycle
43		Cell division
44		Membrane structure and intercellular transport
45		Cellular interaction and locomotion
46		Cell differentiation
47		Cell senescence
48	Unit 5	Isolation of microorganisms
49		Pure, axenic, mixed culture, strain, isolate, clone
50		Pure culture techniques- spread plate, pour plate, streak plate methods
51		Serial dilution, Enrichment culture technique
52		Micromanipulator
53		Maintainance and preservation of pure cultures
54		Maintainance and preservation of pure cultures
55		Maintainance and preservation of pure cultures
56		Maintainance and preservation of pure cultures
57		Major culture collection centres of India

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. Year I Microbiology (July 2018 -June 2019)

Micro+Chem+LS, Micro+Chem+Pharma

Paper II- Tools and Techniques in Microbiology

Teacher -Dr. Mukesh K Patidar

Day/Lecture	Unit	Topic
1	Unit 1	Microscopy- Introduction
2		Light Microscopy
3		Phase Contrast Microscopy
4		Flourescence Microscopy
5		Electron Microscopy -SEM
6		Electron Microscopy -TEM
7		Preparation of specimen
8		Limitation and application of Microscopy
9		Use of Software in Microscopy
10	Unit 2	Basic principleand function of Autoclave
11		Oven - Principle and application
12		BOD Incubator -Principle and applications
13		LAF- Principle
14		Colorimeter
15		Spectrophotometer
16		Centrifugation
17		Principle of Sedimentation
18		Chromatography -Introduction
19		Types of chromatography
20		Applications of chromatography
21	Unit 4	Occular and stage micrometry
22		Cell count and haemocytometry
23		Useof camera lucida
24		Stain and staining techniques
25		Chemistry of dye and stains
26		Monochrome and Negative staining
27		Differentialstaining -Gram's Staining
28		Acid fast staining
29		Cell wall staining, metachromatic granules staining
30		Capsule staining
31		Typesof media and preparation of medium
32		Characteristics of growth medium

33	Unit 5	Control of microorganisms -Physical methods
34		Control of microorganisms -Physical methods
35		Control of microorganisms -Physical methods
36		Control of microorganisms -Chemical methods
37		Control of microorganisms -Chemical methods
38		Control of microorganisms -Chemical methods

Maharaja Ranjit Singh College of Professional Sciences, Indore	
Department of Biosciences	
Lesson Plan - B. Sc. Year I Microbiology (July 2018 -June 2019)	
Micro+Chem+LS, Micro+Chem+Pharma	
Practicals	
Teacher - Fatema Matkawala	
Day/Lecture	**Topic**
1	Demonstration and briefing about principles and working of basic instruments, autoclave, incubator,
	hot-air oven, Laminar air flow
2	Demonstration and briefing about principles and working of pH meter, Spectrophotometer and Centrifuge
3	Basic media preparation, autoclaving, cleaning and sterilization of glass wares
4	Basic media preparation, autoclaving, cleaning and sterilization of glass wares
5	Media preparation: Liquid media-Peptone water, Nutrient Broth, Solid media-Nutrient agar (Agar slant, Agar plate)
6	Media preparation: Enriched medium- Blood agar, Differential medium-Mac Conkey agar
7	Media preparation: Enrichment medium-Selenite F broth, Selective medium-EMB
8	Culture characteristics of Microorganisms on different media
9	Culture characteristics of Microorganisms on different media
10	Culture characteristics of Microorganisms on different media
11	Demonstration of Selective and Differential media
12	Demonstration of Selective and Differential media
13	Isolation of bacteria from water by serial dilution agar plating method
14	Isolation of bacteria from water by serial dilution agar plating method
15	Isolation of bacteria from soil by serial dilution agar plating method
16	Isolation of bacteria from soil by serial dilution agar plating method
17	Isolation of fungi from water by serial dilution agar plating method
18	Isolation of fungi from water by serial dilution agar plating method
19	Isolation of fungi from soil by serial dilution agar plating method
20	Isolation of fungi from soil by serial dilution agar plating method
21	Estimation of air microflora
22	Estimation of air microflora
23	Isolation of bacteria by Pour-plate method
24	Isolation of bacteria by Pour-plate method
25	Isolation of bacteria by Streak-plate method

26	Isolation of bacteria by Streak-plate method
27	Isolation of bacteria by Spread-plate method
28	Isolation of bacteria by Spread-plate method
29	Preparation of smear and microscopic examination of Fungi- *Mucor* sp, *Aspergillus* sp.
30	Preparation of smear and microscopic examination of Fungi- *Penicillium* sp. and *Alternaria* sp.
31	Preparation of smear and microscopic examination of Bacteria- *Staphylococcus* sp, *Lactobacillus* sp.
32	Preparation of smear and microscopic examination of Bacteria- *Escherichia* sp., *Vibrio* sp. and *Leptospira* sp.
33	Staining techniques- Simple staining, Differential staining (Gram's, Ziehl-Neelson)
34	Staining techniques-Spore and Capsular staining methods

Maharaja Ranjit Singh College of Professional Sciences

Department of Biosciences

Lesson Plan - B. Sc. Year II Microbiology (July 2018 -June 2019)

Micro+Chem+LS, Micro+Chem+Pharma

Paper I- Biochemistry and Microbial Physiology

Teacher - Shashwat Nigam

Day/Lecture	Unit	Topic
1	1	Carbohydrate Introduction and Properties
2		Classification of Carbohydrates
3		Classification of Carbohydrates and Functions
4		Important properties of proteins and amino acids
5		Classification of proteins and amino acids
6		Enzymes - Introduction and classification
7		Nomenclature and Factors affecting enzymaic activity
8		Factors affecting enzymaic activity
9		Mechanism of enzyme action
10		Regulation of enzyme activity
11		Applications of enzymes
12	2	Growth- Introduction and measurement
13		Growth - Mathematical expression
14		Growth curve and growth yield
15		Effect of nutrient, temperature and oxygen on growth
16		Effect of pH and osmotic pressure on growth
17		Cell count by direct method and indirect method
18		Cell count by dry weight and wet weight method
19		Synchronous and Continous culture
20		Continous culture
21		Batch Culture
22	3	Intro- Energy Production in aerobic & anaerobic process
23		Glycolysis
24		Pentose phosphate pathway
25		Entner Duodroff Pathway
26		Fermentation & glucose fermentation by E.coli
27		TCA cycle, Hetrotrophic carbon dioxide fixation
28		Glyoxylate cycle, Catabolism of lipids- Alpha & Beta Oxd.
29		Catabolism of proteins, Aerobic respiration
30		Principle of bioenergetics, Oxd and red reaction
31		Redox potential, Oxidative phosphorylation hyposthesis
32		Introduction - Utilization of energy
33		Methods of studying microbial biosynthesis

34	4	Assimilation of ammonia and sulfate
35		Assimilation of nitrogen
36		Utilization of energy in non biosynthetic process
37		Utilization of energy in biosynthetic process
38		Diffusion, gaseous exchange and osmosis
39		Plasmolysis and Active transport of nutrients in bacteria
40		Passive diffusion and facilitated diffusion
41		Group translocation
42	5	Intro- Energy Production by photosynthesis
43		Photochemical reaction
44		Cyclic photophosphorylation
45		Non-cyclic photophosphorylation
46		Role of ATP in metabolism
47		Role of reducing power in metabolism
48		Role of precursors of metabolism
49		Component of electron transport chain
50		Component of electron transport chain
51		Arrangement of ETC in cell membrane

Maharaja Ranjit Singh College of Professional Sciences

Department of Biosciences

Lesson Plan - B. Sc. Year II Microbiology (July 2018 - June 2019)

Micro+Chem+LS, Micro+Chem+Pharma

Paper II - Microbial Genetics & Molecular Biology

Teacher - Zahabiya Saifee

Day/Lecture	Unit	Topic
1	I	Structure & genetic material of microbes
2		DNA structure & types
3		Role of nuclear matrix in chromosome organization
4		DNA melting curve & Tm value
5		Buoyant density of DNA & its relation with G/C content
6		Types of rRNA, tRNA, mRNA
7		Gene structure & function
8	II	Types of DNA replication
9		Prokaryotic replication
10		Eukaryotic replication
11		Modes of replication
12		Messelson & Stahl Exp
13		DNA topology, supercoiling &linking number
14		DNA replication- enzymes & mechanism
15		Transcription in prokaryotes & eukaryotes
16	III	Features of genetic code
17		Polycistronic RNA
18		Deciphering of genetic code
19		Gene translocation
20		Translation in prokaryotes- initiation, elongation & termination
21		Translation in eukaryotes
22		Post translational modifications
23		Regulation of protein synthesis- Lac operon
24		Repressible operon
25	IV	Genetic recombination in bacteria
26		Transformation
27		Conjugation
28		Transduction
29		Plasmids & binary vectors
30		Transposons
31		Use of bacteria & viruses in genetic engineering
32		DNA mutations

33	V	Spontaneous mutation
34		Fluctuation test, new comb's test & replica test
35		Mutagens- chemical & physical
36		Reversion & supression
37		DNA repair pathways- photoreactivation, excision repair
38		Mis match repair, SOS repair

Maharaja Ranjit Singh College of Professional Sciences, Indore	
Department of Biosciences	
Lesson Plan - B. Sc. Year II Microbiology (July 2018 -June 2019)	
Micro+Chem+LS, Micro+Chem+Pharma	
Practicals	
Teacher - Dr. Mukesh K Patidar	
Day/Lectur	**Topic**
1	To determine the pH of the given solution
2	Prepare buffer solution
3	Identification of biomolecules- carbohydrates, protein, lipids
4	Identification of biomolecules- carbohydrates, protein, lipids
5	Identification of biomolecules- carbohydrates, protein, lipids
6	Estimation of glucose by Cole's method
7	Estimation of glucose by Cole's method
8	Estimation of protein by Folin Lowry method
9	Estimation of lipid by dichromate method
10	Study of enzyme activity
11	Effect of factors on enzyme activity
12	Effect of factors on enzyme activity
13	Demonstration of isolation of DNA
14	Quantitative estimation of DNA by DPA method
15	Quantitative estimation of RNA by Orcinol method
16	Effect of UV light on bacterial growth
17	Effect of UV light on bacterial growth
18	Replica plating method
19	Replica plating method
20	Screening of amylase producers
21	Screening of amylase producers
22	Screening of protease producers
23	Screening of protease producers

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. Year III Sem V Microbiology (July 2018 - Dec 2018)

Micro+Chem+LS, Micro+Chem+Pharma

Subject - Industrial Microbiology

Teacher - Fatema Matkawala

Day/Lecture	Unit	Topic
1	Unit 1	Isolation and screening microorganisms
2		Primary screening methods
3		Secondary screening methods
4		Secondary screening methods
5		Strain improvement
6		Media formulation
7		Media formulation
8		Scale-up
9		Inoculum development
10		Harvesting and product recovery
11		Harvesting and product recovery
12		Harvesting and product recovery
13		Harvesting and product recovery
14	Unit 2	Industrial sterilization
15		Basic fermentor design
16		Factors affecting fermenter design
17		Batch, Fed-batch, Continuous process
18		Types of fermenters
19		Types of fermenters
20		Solid state fermentation
21		Surface fermentation
22		Submerged fermentation
23		Measurements and control of bioprocess parameters
24		Measurements and control of bioprocess parameters
25	Unit 3	Bioassay of Vitamins
26		Bioassay of Vitamins
27		Bioassay of Antibiotics
28		Bioassay of Antibiotics
29		Phenol Coefficient Method
30		Sterility test
31		Sterility test
32		Microbial Limit Test
33		Microbial Limit Test
34		LAL test for pyrogen testing
35		Minimum Inhibitory Concentration
36		Industrial production of Ethanol
37		Industrial production of Lysine
38		Industrial production of Penicillin

39	Unit 4	Industrial production of Penicillin
40		Industrial production of Citric acid
41		Industrial production of Vitamin B12
42		Protease- production and purification
43		Bioinsecticides -bacterial, fungal, viral
44	Unit 5	Bioinsecticides -bacterial, fungal, viral
45		Biofertilisers- symbiotic
46		Biofertilisers - nonsymbiotic
47		Biofertilisers -phosphate solubilizer, mycorrhiza
48		Biofuel
49		Biogas production
50		Enzyme immobilisation
51		Enzyme immobilisation
52		Whole cell immobilisation
53		Applications of immobilization

Maharaja Ranjit Singh College of Professional Sciences, Indore Department of Biosciences Lesson Plan - B. Sc. Year III Sem V Microbiology (July 2018 - Dec 2018)	
Micro+Chem+LS, Micro+Chem+Pharma	
Subject - Industrial Microbiology (Practicals) **Teacher - Fatema Matkawala**	
Day/Lectur	**Topic**
1	Screening of antibiotic producing microorganisms
2	Screening of antibiotic producing microorganisms
3	Primary screening of Amylase producing microorganisms
4	Primary screening of Amylase producing microorganisms
5	Primary screening of Protease producing microorganisms
6	Primary screening of Protease producing microorganisms
7	Primary screening of Cellulase producing microorganisms
8	Primary screening of Cellulase producing microorganisms
9	Primary screening of Lipase producing microorganisms
10	Primary screening of Lipase producing microorganisms
11	Microbial assay of antibiotics
12	Microbial assay of antibiotics
13	Estimation of MIC for antibiotics
14	Estimation of MIC for antibiotics
15	Sterility testing of pharmaceutical products- injectables, eye drops and ear drops
16	Sterility testing of pharmaceutical products- injectables, eye drops and ear drops
17	Microbial Limit test- Tablets and Syrups
18	Microbial Limit test- Tablets and Syrups
19	Area monitoring
20	Area monitoring

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. Year III Sem VI Microbiology (Jan 2019 - June 2019)

Micro+Chem+LS, Micro+Chem+Pharma

Subject - Applied and Enviornmental Microbiology

Teacher - Shashwat Nigam

Day/Lecture	Unit	Topic
1	1	Soil Microbiology - Introduction
2		Physical characteristics of soil
3		Chemical characteristic of soil
4		Estimation of soil microflora
5		Estimation of soil microflora
6		Estimation of soil microflora
7		Interaction among soil microflora
8		Interaction among soil microflora
9		Nitrogen cycle
10		Carbon cycle
11		Sulfur cycle
12	2	Introduction to food microbiology
13		Microbiological examination of food and milk
14		Food and milk borne disease
15		Food and milk borne disease
16		Food intoxication
17		Spoilage of food - fresh food, canned food
18		Spoilage of food - vegetable and milk products
19		Grading of milk - MBRT
20		Resazurin and phosphatase test
21		Preservation of food
22		Dairy products - Cheese, Butter and Yogurt
23		Microorganism as a food - SCP
24	3	Waste water microbiology introduction
25		Microbiological examination of water
26		Microbiological examination of waste water
27		Microbiological examination of waste water
28		Water borne diseases
29		Water borne diseases
30		Water purification
31		Primary Treatment of waste water
32		Secondary Treatment of waste water
33		Tertiary Treatment of waste water

34		Solid processing
35		Eutrophication
36	4	Air microbiology introduction
37		Air borne disease
38		Air borne disease
39		Microbiological analysis of water
40		Microbiological analysis of water
41		Aeromicroflora of different habitats
42		Aeromicroflora of different habitats
43		Aeroallergens
44		Control of microorganism in air
45	5	Applications of microorganism
46		Microbial leaching of copper and uranium
47		Microbial leaching of copper and uranium
48		MEOR - biorecovery of petroleum
49		Bioremidiation
50		Biodeterioration - petroleum products, leather
51		Biodeterioration - textile and paper
52		Application of biosensors
53		Application of biosensors
54		Application of biopolymers
55		Application of biopolymers

Maharaja Ranjit Singh College of Professional Sciences, Indore Department of Biosciences Lesson Plan - B. Sc. Year III Sem VI Microbiology (Jan 2019 - June 2019) Micro+Chem+LS, Micro+Chem+Pharma Subject - Applied and Enviornmental Microbiology (Practicals) **Teacher -**	
ay/Lectu	**Topic**
1	Qualitative and quantitative examination of food/milk
2	Qualitative and quantitative examination of food/milk
3	Qualitative and quantitative examination of food/milk
4	Qualitative and quantitative examination of sewage/water
5	Qualitative and quantitative examination of sewage/water
6	Qualitative and quantitative examination of sewage/water
7	Estimation of soil microflora (bacteria, yeast and mould)
8	Estimation of soil microflora (bacteria, yeast and mould)
9	Isolation of Azotobacter
10	Isolation of Azotobacter
11	Isolation of Rhizobium from root nodules
12	Isolation of phosphate solubilizing microorganisms
13	Isolation of phosphate solubilizing microorganisms
14	Estimation of air microflora
15	Estimation of air microflora
16	Isolation of Lactobacillus
17	Isolation of Lactobacillus
18	Isolation of Yeast
19	Isolation of Yeast