

# Rajarshi Shahu Mahavidyalaya, Latur

## ( Autonomous )

### Structured Work Plan for Teaching

(June – 2021 to March. 2022)

#### Details of Classes to be taught

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II	Manisha A. Dhotre	Biotechnology	Course Title: Metabolism Course Code : U-MET-401 Course Title: Lab Course XII Course Code: U-LAC-405
2	M.Sc. II			Course Title: Microbial Biotechnology Course Code:P-MIB-335 Course Title: Lab Course X Course Code: P-LAC-339
3.	M.Sc.I			Course Title: Biochemistry Course Code: P-BIO- 135

#### 1. Summary of Lesson Plan

Name of Teacher: Manisha A. Dhotre

Class : B.Sc. BT. II (Third Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Metabolism	<b>Unit 1</b> 1. Metabolism: Introduction to Metabolism – catabolism, anabolism, catabolic, anabolic and amphibolic pathway. Respiration 2.aerobic respiration – glycolysis and its regulation 3.Krebs cycles and its regulation 4.Substrate Level Phosphorylation 5.oxidative phosphorylation: ETC and its inhibitors	05-07-21 To 31-07-21	01 02 02 01 03 03 02 02	Quiz Assignments Online Discussions	Quiz 1 : 19/07/21 Assignment 1 : 24/07/2021 Assignment 2 : 29/072021

		6.Electrochemical proton gradient chemiosmotic theory, ATP synthase, 7.P/O ratio,pasteur effect, warburg effect, respiratory quotient 8. Alcohol and Lactic acid Fermentation, cori cycle.				Quiz 2 : 27/07/2021  Quiz 3 : 5/08/2021  Assignment 3 : 08/08/2021
		<b>Unit II</b> 1.Photosynthesis 2. photosynthetic pigments, concept of photosynthetic unit, Hill reaction, oxygenic & anoxygenic photosynthesis 3. Light reaction: Cyclic and Non Cyclic 4.Photophosphorylation 5. Dark reaction: C <sub>3</sub>	04-08-20 To 28-08-20	01 04 03 02 04		Quiz 4: 18/08/2021  Quiz 5 :7/09/2021  Unit – I 10/09/2020
		<b>Unit III</b> 1. Glyoxylate PW. 2. Pentose Phosphate Pathway 3. Entner-Doudoroff PW 4. Carbohydrate metabolism – Gluconeogenesis, Glycogenesis, Glycogenolysis. 5. <b>Lipid Metabolism</b> – Biosynthesis of FA 6. Fatty acid oxidation, alternative PW of fatty acid oxidation 7. Ketone bodies	29-08-21 To 20-09-21	01 02 01 04  04 03  01		Quiz 6 :14/10/2021  Unit – II 27/12/20
		<b>Unit IV</b> 1. <b>Amino acid Metabolism:</b> Amino acid synthesis 2. Amino acid catabolism	21-09-21 To	03 02	12	

		3. urea cycle. 4. <b>Nucleotide Metabolism</b>  Nucleotide synthesis: De-Novo 5. Salvage PW 6. Nucleotide degradation.	02-11-21	01  02 02 02		
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Sr. No.	Subject	Practicals	Date	No. of Practical
1	Metabolism	Hydrolysis of Sucrose and Starch	12/07/21 To 02/11/21  Batch A, B,C,D	04
2	Lab Course XII	Qualitative Test for Amino Acids		04
3		Qualitative Test for Proteins		04
4		To Perform Fatty acid Titration		04
5		Estimation of Ketone Bodies		04
6		Determination of Urinary Titrable acidity		04
7		Estimation of Urinary Creatinine		04
8		Estimation of Enzyme activity of Acid Phosphatase		04
9		Estimation of Enzyme activity of $\beta$ -amylase		04
10		Estimation of Total Serum Cholesterol by Zak and Henley's method		04
11		Determination of Serum Bilirubin by Van de Bergh reaction		04
12		Solution of Problems in Biochemistry and Metabolism		04

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II			Course Title: Metabolism

		Manisha A. Dhotre	Biotechnology	<b>Course Code : U-MET-401</b> <b>Course Title: Lab Course XII</b> <b>Course Code: U-LAC-405</b>
2	M.Sc. II			<b>Course Title: Microbial Biotechnology</b> <b>Course Code:P-MIB-335</b> <b>Course Title: Lab Course X</b> <b>Course Code: P-LAC-339</b>
3.	M.Sc.I			<b>Course Title: Biochemistry</b> <b>Course Code: P-BIO-135</b>

Name of Teacher: Manisha A. Dhotre

Class : M.Sc. BT. II (Third Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Microbial Biotechnology	<b>Unit 1</b> <b>Organic acids:</b> Production of 1.Citric acid 2.Lactic acid 3.Acetic acid  <b>Organic feedstock:</b> 1.Butanol 2.Ethanol 3.Brewing Industry  <b>Amino acids:</b> Use of amino acids in industry; methods of production; Production of individual amino acids 1.L-Glutamic acid 2.L Lysine 3.L-Tryptophan	01-07-21 To 06-08-21	06  07	Classroom  Group Discussion	Quiz 1 : 20/07/21  Assignment 1 : 21/07/2021  Assignment 2 : 08/08/2021
		<b>Unit II</b> <b>Vitamins-</b> 1.Vitamin B12 2. Riboflavin <b>Antibiotics:</b> 1.beta-Lactam antibiotics 2. amino acid and peptide antibiotics (Streptomycin); 3.Carbohydrate antibiotics; Tetracycline; 4.Nucleoside antibiotics; 5.Aromatic antibiotics	09-08-21 To 01-09-21	03  06		Quiz 2 : 12/008/2021  Quiz 3 : 14/09/21

		<p><b>Production of</b>  <b>1.Hepatitis B Vaccine</b>  <b>2.Insulin</b>  <b>3.Erythropoietin</b></p>		04		
		<p><b>Unit III</b>  <b>Introduction to the use of microbes in environmental Applications</b>  1.Biomethanation,  2.Bioleaching: Mechanism of Bioleaching with example.  3.Biosorption and  4 Microbial recovery of petroleum (MEOR)</p> <p><b>Production of microbial polysaccharides:</b>  1. Xanthan and  2.Dextran</p> <p><b>Production of</b>  <b>1.Biopolymers and</b>  <b>2.Biopesticides</b></p>	02-09-21 To 06-10-21	07   05  05		Unit – I 16/09/2020  Unit – II 27/12-20
		<p><b>Unit IV</b>  <b>Microbial production of Enzymes:</b>  Immobilization of enzymes, Commercial applications and production of  1. Amylases;  2. Glucose Isomerase;  3. L Asparaginase  4. ,Proteases ;  5. Pectinases;  6. Lipases.</p> <p><b>Biotransformation:</b>  1.Types of bioconversion reactions: Oxidation, Reduction, Hydrolytic reactions, Condensations,  2.Transformation of steroids and sterols,  3.Transformation of nonsteroid compounds: L-Ascorbic acid, Prostaglandins, Antibiotics.</p>	07-10-21 To 02-11-21	06  06		

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Microbial Biotechnology Lab Course X	Fermentative production of amylase by <i>Bacillus subtilis</i> .	12/07/21 to 02/11/21  Batch A and B	02
2		Fermentative production of alpha amylase from fungi <i>Aspergillus niger</i>		02
3		Production of Sauerkraut by microorganism		02
4		Ethanol fuel production from Tissue Paper Waste or Molasses.		02
5		Estimation of Alcohol by specific gravity method		02
6		Estimation of Alcohol by Idometry test		02
7		I] Isolation and identification of lipase producer. II] Production and estimation of lipase producing organism.		02
8		Production of alkaline protease from <i>Bacillus</i> species.		02
9		I] Isolation and screening of Lactic acid producing bacteria II] Production and estimation of Lactic acid.		02
10		Isolation and Characterization of microorganisms used as Biofertilizer		04
11		Production of Extracellular Polysaccharide from <i>Rhizobium</i> Species isolated from leguminous Plant ( <i>Glycine max</i> )		04
12		Production of fermented milk by Lactobacillus.		04

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II	Manisha A. Dhotre	Biotechnology	<b>Course Title: Metabolism</b> <b>Course Code : U-MET-401</b> <b>Course Title: Lab Course XII</b> <b>Course Code: U-LAC-405</b>
2	M.Sc. II			<b>Course Title: Microbial Biotechnology</b> <b>Course Code:P-MIB-335</b> <b>Course Title: Lab Course X</b> <b>Course Code: P-LAC-339</b>
3.	M.Sc.I			<b>Course Title: Biochemistry</b> <b>Course Code: P-BIO-135</b>

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Name of Teacher: Manisha A. Dhotre

Class : M.Sc. BT. I (First Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Biochemistry	<p><b>Unit 1</b></p> <p>Structure of atom, Henderson- Hasselbalch equation pH, buffers, Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).</p> <p><b>Principles of Bioenergetics:</b> Introduction, Thermodynamic principles, Gibbs free energy, Relationship of Standard free energy to enthalpy, entropy and equilibrium constant, High energy compounds, ATP as universal currency of free energy, Redox Reactions and free energy change in redox reactions.</p>	27-09-21 To 02-08-21	04   02   06	Quiz  Assignments	<p>Quiz 1: 10-10-21</p> <p>Quiz 2: 31-10-21</p> <p>Quiz 3 : 14-11-21</p> <p>Assignment I: 18-10-21</p> <p>Assignment: 03-10-21</p> <p>Unit – I 17/11/21</p> <p>Unit – II 05/12/21</p>
		<p><b>Unit II</b></p> <p><b>Carbohydrates:</b> Introduction, Monosaccharides: Properties and</p>		03		

	<p>functions with example, Derived sugars- Sugar acids, Sugar alcohols, Glycosides, Amino sugars. Disaccharides-structures of Maltose, Lactose, Sucrose, Polysaccharides structure and properties of homo and hetero polysaccharides with examples (Starch, Glycogen, Cellulose, Chitin, Glycosaminoglycans).</p> <p><b>Carbohydrate metabolism (Energetics and regulation):</b> Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis.</p>	03-10-21 To 02-11-21	04  07		
	<p><b>Unit III</b></p> <p><b>Lipids:</b> Classification- Structure, properties, reactions and biological functions of lipids. Phospholipids, Sphingo and glycolipids, Steroids-cholesterol-bile salts, steroid hormones.</p> <p><b>Metabolism of Lipids:</b> Beta oxidation of Fatty acids-activation, transport to mitochondria, Biosynthesis of saturated and unsaturated fatty acids and cholesterol.</p> <p><b>Nucleic acids:</b> Structure and properties- Bases, Nucleosides, Nucleotides, Polynucleotides.</p> <p><b>Nucleic acid metabolism:</b> Biosynthesis of purines and pyrimidines, Denovo and Salvage pathways, biodegradation of purines and pyrimidines</p>	03-11-21 To 09-12-21	04  05  04  04		
	<b>Unit IV</b>				



	<p><b>Amino acids:</b> Classification, structure and properties of amino acids, reactions of amino acids, peptide bond. General aspects of amino acid metabolism: Transamination, Deamination, urea cycle and its regulation</p> <p><b>Proteins structure:</b> Classification of proteins- Structural organizations of proteins (primary, secondary, tertiary and quaternary), conformational analysis, Ramachandran's plot. Thermodynamic aspects of protein folding.</p>	<p>10-12-21 To 31-12-21</p>	<p>06</p> <p>06</p>		
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Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Biochemistry	Preparation of Standard Solutions	27/09/21 to 31/12/21  Batch A and B	02
2	Lab Course II	Preparation of Buffer		02
3		Estimation of Amino acid by Ninhydrin method		02
4		Estimation of Protein by Biuret method/Lowry Method		02
5		Estimation of Carbohydrate by Anthrone method/DNSA		02
6		Saponification Value of Fat		02
7		Acid Value of Fat		02
8		Iodine Value of Fat		02
9		Estimation of DNA /RNA by Spectrophotometric Method		02
10		Purification of Compound by Column Chromatography		02
11		Estimation of Urinary Creatinine		02
12		Estimation of Cholesterol		02



# Rajarshi Shahu Mahavidyalaya, Latur

## ( Autonomous )

### Structured Work Plan for Teaching

(Dec – 2021. to May 2022)

#### Details of Classes to be taught

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II	Manisha A. Dhotre	Biotechnology	Course Title: Enzymology Course Code : U-ENZ-498 Course Title: Lab Course XV Course Code: U-LAC-502
2	M.Sc. II			Course Title: Food and Nano Biotechnology Course Code:P-FNB-434 Course Title: Lab Course XIV Course Code: P-LAC-437

#### 1. Summary of Lesson Plan

Name of Teacher: Manisha A. Dhotre

Class

: B.Sc. BT. II (Fourth Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Metabolism	<b>Unit I ENZYMES &amp; ENZYME CATALYSIS:</b> 1.General Features of enzymes 2.Characteristics of enzymes 3.Classification - IUB system, rationale, overview and specific examples, 4.Enzyme substrate complex, Concept of active centre, binding sites 5.Types of Specificity 6. Effect of different factors on reaction rate 7.Factors affecting catalytic efficiency - proximity and orientation	17-12-21 To 18-01-22	01 01 02 01 01 01 02	Classroom  Group Discussion	Assignment 01 : 01/02/2022 Quiz 1 : 11/01/2021 Assignment 2 : 03/03/2022 Quiz 2: 13/02/2022

		<p>effects, distortion or strain, acid - base and nucleophilic catalysis</p> <p>8.Methods for studying fast reactions</p> <p>9. Chemical modification of enzymes</p> <p>10.Isoenzymes and multiple forms of enzymes.</p> <p>11.Examples of Enzymatic Reactions: Lysozyme and Chymotrypsin, Zymogen, Ribozyme.</p>		02 01 01 03		<p>Assignment 3 : 02/04/2022</p> <p>Quiz 3: 02/03/2022</p> <p>Quiz 4 29/03/2022</p>
		<p><b>Unit II.</b> <b>APPLICATION AND CHARACTERISATION OF ENZYMES</b></p> <p>1.Commercial application of enzymes in food pharmaceutical and other industries</p> <p>2. Commercial application of Enzymes for analytical and diagnostic applications</p> <p>3.Production and Purification of Crude Enzyme extracts from plant, animal and microbial sources-some case studies</p> <p>4.Methods of characterization of enzyme</p> <p>5..development of enzymatic assays.</p>	<p>19-01-22 To 12-02-22</p>	02 02 03 01 02		
		<p><b>Unit III ENZYME KINETICS:</b></p> <p>1.Michaelis - Menten Equation - form and derivation, steady state enzyme kinetics</p> <p>2.Significance of Vmax and Km,</p> <p>3.Bisubstrate reactions</p> <p>4.Graphical procedures in enzymology - advantages and disadvantages of alternate plotting</p> <p>5. Enzyme inhibition - types of inhibitors - competitive, non-competitive and uncompetitive, their</p>	<p>14/02/22 To 05-03-22</p>	02 01 01 02 03		

		mode of action and experimental determination. 6.Enzyme activity, international units, specific activity, turnover number 7. end point kinetic assay		01  01		
		Unit IV ENZYME REGULATION & IMMOBILIZED ENZYMES  1.Product inhibition, feedback control 2.enzyme induction and repression and covalent modification, Allosteric regulation 3. Relative practical and economic advantage for industrial use, effect of partition on kinetics and performance with particular emphasis on charge and hydrophobicity (pH, temperature and Km) 4.Various methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids), microencapsulation and gel entrapment. Immobilized multienzyme systems 5.Biosensors - glucose oxidase, cholesterol oxidase, urease and antibodies as biosensors.	07-03-22 To 15-04-22	01  03  02  03  04		

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Enzymology	To study effect of $\alpha$ amylase activity on starch		03

2		Determination of $\alpha$ amylase activity	20/12/21 To 15/04/22  Batch A,B,C	03
3		To study effect of pH on $\alpha$ amylase activity		03
4		To study effect of Substrate on $\alpha$ amylase activity		03
5		To study effect of Salt on $\alpha$ amylase activity		03
6		To study effect of Temperature $\alpha$ amylase activity		03
7		To study effect of Time on $\alpha$ amylase activity		03
8		A) Immobilization of Yeast cells by Calcium-Alginate Entrapment method B) Determination of viability of immobilized Cells by invertase activity		03
9		Hydrolysis of sucrose by yeast $\beta$ -Fructofuranosidase		03
10		Determination of Hydrolyzed Sucrose solution by Benedict Method		03
11		Indirect Estimation of Lactate Dehydrogenase		03
12		A) Purification of HRP by Affinity Chromatography B) Estimation of HRP activity		03
13		Problems Based on MM equation and Lineweaver-Burk plot		03

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II	Manisha A. Dhotre	Biotechnology	<b>Course Title: Enzymology</b> <b>Course Code : U-ENZ-498</b> <b>Course Title: Lab Course XV</b> <b>Course Code: U-LAC-502</b>
2	M.Sc. II			<b>Course Title: Food and Nano Biotechnology</b>

				Course Code:P-FNB-434 Course Title: Lab Course XIV Course Code: P-LAC-437
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Name of Teacher: Manisha A. Dhotre

Class : M.Sc. BT. II (Fourth Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Food and Nano Biotechnology	<b>Unit-I:</b> <b>Biotechnology for Food Ingredients</b> <ul style="list-style-type: none"> <li>● Metabolic engineering of bacteria for food ingredients</li> <li>● Biotechnology of microbial polysaccharides in food</li> <li>● Microbial biotechnology for food flavor production</li> </ul> <b>Aspects of Food Production.</b> <ul style="list-style-type: none"> <li>● Food safety: HACCP System to food protection, Responsibility for food safety.</li> <li>● Food Additives: Definition, Types and Functional characteristics.</li> <li>● Natural Colors: Types, Applications</li> <li>● Sweeteners: Types and Applications.</li> <li>● Causes of food spoilage</li> <li>● Food Preservation Methods</li> </ul>	20-12-21 To 12-01-22	02  02  02  01  01  02  02	Classroom  Group Discussion	Assignment 1 : 01/02/2022 Quiz 1 : 02/01/2022  Assignment 2 : 03/03/2022 2 Quiz 2: 10/02/2022 2  Quiz 3: 04/03/2022 2
		<b>Unit-II:</b> <b>Fermented Food Products</b>				

		<ul style="list-style-type: none"> <li>● Fermentation technology for traditional food of the Indian subcontinent</li> <li>● Solid state fermentations for food applications</li> <li>● Genetic engineering of bakers yeast Biotechnology of wine yeast</li> <li>● Biotechnology of beta carotene from Dunaliella</li> <li>● SCP: Spirulina and Chlorella</li> </ul>	13-01-22 To 04-02-22	02 01 02 02 02		
		<p><b>Unit-III :</b></p> <ul style="list-style-type: none"> <li>● Molecular evolution and diversity of food borne pathogens</li> <li>● Application of microbial molecular techniques for food systems</li> <li>● Application of ELISA assays for detection and quantitation of toxins in foods and <i>E.coli</i> in food</li> <li>● Biosensors for food quality assessment</li> <li>● Biotechnological approaches to improve nutritional quality and shelf life of fruits and vegetables</li> <li>● Biotransformation applicable to food industries</li> <li>● Functional foods: Concept of Prebiotics, Probiotics and Nutraceuticals</li> </ul>	05-02-22 To 17-03-22	02 02 02 02 02 02		



		<p><b>Unit IV</b></p> <p><b>Nano Biotechnology</b></p> <ul style="list-style-type: none"> <li>• The nanoscale dimension and paradigm.</li> <li>• Types of nanomaterials and their classifications. D, 2D and 3D etc.</li> <li>• Nanocrystal, Nanoparticle, Quantum dot, Quantum Wire and Quantum Well etc. Polymer, Carbon, Inorganic, Organic and Biomaterials – Structures and characteristics.</li> <li>• Physical and Chemical Fundamentals of Nanomaterial. Green Synthesis of Nanoparticles using bacteria and plants.</li> <li>• Characterization of nanoparticles..</li> </ul>	<p>18-03-22</p> <p>To</p> <p>15-04-22</p>	<p>01</p> <p>02</p> <p>03</p> <p>02</p> <p>02</p>		
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Sr. No.	Subject	Practicals	Date	No. of Practicals
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1	Food and Nano Biotechnology	Determination of quality of milk sample by methylene blue reduction test	20/12/22 to 15/04/22  Batch A and B	02
2		Determination of physiological properties of milk		02
3		Determination of calcium and phosphorous in milk		02
4		Efficiency of pasteurization of milk by phosphates test		02
5		Quantitative analysis of milk by standard plate count ( SPC) method		02
6		Estimation of Ascorbic Acid		02
7		Isolation and characterization of food fermenting micro-organisms from idli batter		02
8		Isolation of probiotics micro-organisms from various sources		02
9		Effect of temperature on growth of probiotics micro-organisms		02
10		Effect of pH on growth of probiotics micro-organisms		02
11		Effect of salt concentration on growth of probiotics micro-organisms		02
12		Estimation of lactic acid		02
13		Production of nanoparticles		02