



Sonopant Dandekar Shikshan Mandali's

**Sonopant Dandekar Arts, V.S. Apte Commerce
and M.H. Mehta Science College, Palghar**

Kharekuran Road, Palghar (W), Tal. & Dist – Palghar, Maharashtra

FACULTY OF SCIENCE

Bachelor of Science

Course Outcome

MDeshmukh

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IQAC Convener

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Vice Principal & IQAC Convenor

**Sonopant Dandekar Arts VS Apte Commerce and
M H Mehta Science College Palghar**

SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science (Chemistry)
Department	Chemistry
Total Number of Courses Offered	First Year – 03 per Semester Second Year – 04 per Semester Third Year – 10 per Semester Total Courses = 38

Subjects Offered by the Institute			
First Year – Bachelor of Science (Chemistry)			
Sr. No.	Semester – I	Sr. No.	Semester – II
1	Chemistry Paper-I	1	Chemistry Paper-I
2	Chemistry Paper-II	2	Chemistry Paper-II
3	Chemistry Practical	3	Chemistry Practical

Subjects Offered by the Institute			
Second Year – Bachelor of Science (Chemistry)			
Sr. No.	Semester – III	Sr. No.	Semester – IV
1	Chemistry Paper-I	1	Chemistry Paper-I
2	Chemistry Paper-II	2	Chemistry Paper-II
3	Basics of Analytical Chemistry	3	Basics of Analytical Chemistry
4	Chemistry Practical	4	Chemistry Practical

Subjects Offered by the Institute			
Third Year – Bachelor of Science (Chemistry)			
Sr. No.	Semester – V	Sr. No.	Semester – VI
1	Physical Chemistry	1	Physical Chemistry
2	Inorganic Chemistry	2	Inorganic Chemistry
3	Organic Chemistry	3	Organic Chemistry
4	Analytical Chemistry	4	Analytical Chemistry
5	Applied Component (Drugs & Dyes)	5	Applied Component (Drugs & Dyes)
6	Physical Chemistry Practical	6	Physical Chemistry Practical
7	Inorganic Chemistry Practical	7	Inorganic Chemistry Practical
8	Organic Chemistry Practical	8	Organic Chemistry Practical
9	Analytical Chemistry Practical	9	Analytical Chemistry Practical
10	Applied Component (Drugs & Dyes) Practical	10	Applied Component (Drugs & Dyes) Practical

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science(Chemistry)		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	https://archive.mu.ac.in/syllabus/4.6%20CHEMISTRY%20.pdf		
Department	Chemistry		

Course Code:	USCH101	Class:	FYBSC (CHEMISTRY)	Semester:	I
Course Name:	CHEMISTRY PAPER-I				

Course Objectives:

1.	To apply the fundamental principles of chemical thermodynamics to analyze and solve problems related to energy transfer, work, and chemical reactions.
2.	To gain a comprehensive understanding of the structure and behavior of atoms, allowing them to predict and explain periodic trends.
3.	To develop a solid foundation in the fundamentals of organic chemistry, enabling them to understand the structure, properties, and reactivity of organic molecules
4.	To develop critical thinking and analytical skills, enabling them to evaluate scientific information and solve complex problems & allowing them to effectively present their findings and collaborate with others.

Course Outcome:		Level of Blooms Taxonomy
CO1:	Learner will be able to apply the fundamental principles of chemical thermodynamics to analyze and solve problems related to energy transfer, work, and chemical reactions.	APPLY
CO2:	Learner will gain a comprehensive understanding of the structure and behavior of atoms, allowing them to predict and explain periodic trends.	UNDERSTAND
CO3:	Learner will develop a solid foundation in the fundamentals of organic chemistry, enabling them to understand the structure, properties, and reactivity of organic molecules	UNDERSTAND
CO4:	Learner will develop critical thinking and analytical skills, enabling them to evaluate scientific information and solve complex problems & allowing them to effectively present their findings and collaborate with others.	EVALUATE

Course Code:	USCH201	Class:	FYBSC (CHEMISTRY)	Semester:	II
Course Name:	CHEMISTRY PAPER-I				
Course Objectives:					
1.	To understand and apply the principles of gas behavior, chemical equilibria, and thermodynamics to solve problems related to pressure, volume, temperature, and spontaneity of reactions.				
2.	To gain a comprehensive understanding of qualitative analysis and acid-base theories, enabling them to identify unknown compounds, predict reaction behavior, and solve titration problems				
3.	To develop a strong foundation in the chemistry of aliphatic hydrocarbons, allowing them to predict reaction outcomes, design synthetic pathways, and interpret complex reaction mechanisms.				
4.	To apply chemical principles to analyze and solve problems related to various chemical phenomena.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to understand and apply the principles of gas behavior, chemical equilibria, and thermodynamics to solve problems related to pressure, volume, temperature, and spontaneity of reactions.			UNDERSTAND, APPLY	
CO2:	Learner will gain a comprehensive understanding of qualitative analysis and acid-base theories, enabling them to identify unknown compounds, predict reaction behavior, and solve titration problems			UNDERSTAND, APPLY	
CO3:	Learner will develop a strong foundation in the chemistry of aliphatic hydrocarbons, allowing them to predict reaction outcomes, design synthetic pathways, and interpret complex reaction mechanisms.			ANALYZE, APPLY	
CO4:	Learner will be able to apply chemical principles to analyze and solve problems related to various chemical phenomena.			UNDERSTAND, APPLY	

Course Code:	USCH102	Class:	FYBSC (CHEMISTRY)	Semester:	I
Course Name:	CHEMISTRY PAPER-II				
Course Objectives:					
1.	To gain a fundamental understanding of reaction kinetics and liquid properties, enabling them to analyze reaction rates, interpret experimental data, and design experiments.				
2.	To develop a comprehensive understanding of the comparative chemistry of main group elements, enabling them to predict properties, analyze reactions, and assess environmental impact.				
3.	To acquire a strong foundation in stereochemistry, enabling them to identify and distinguish isomeric forms, analyze conformational stability, and predict optical activity				
4.	To develop critical thinking and problem-solving skills through analysis, evaluation, and creative application of chemical knowledge.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will gain a fundamental understanding of reaction kinetics and liquid properties, enabling them to analyze reaction rates, interpret experimental data, and design experiments.			APPLY & UNDERSTAND	
CO2:	Learner will develop a comprehensive understanding of the comparative chemistry of main group elements, enabling them to predict properties, analyze reactions, and assess environmental impact.			UNDERSTAND & ANALYZE	
CO3:	Learner will acquire a strong foundation in stereochemistry, enabling them to identify and distinguish isomeric forms, analyze conformational stability, and predict optical activity.			ANALYZE	
CO4:	Learner will develop critical thinking and problem-solving skills through analysis, evaluation, and creative application of chemical knowledge.			EVALUATE & APPLY	

Course Code:	USCH202	Class:	FYBSC (CHEMISTRY)	Semester:	II
Course Name:	CHEMISTRY PAPER-II				
Course Objectives:					
1.	To gain a fundamental understanding of chemical bonding and its influence on reactivity, enabling them to predict molecular shapes, analyze redox processes, and design practical applications				
2.	To develop a comprehensive understanding of stereochemistry in cycloalkanes and the unique properties of aromatic compounds, enabling them to analyze conformational stability, predict reactivity patterns, and design aromatic synthesis strategies				
3.	To gain valuable conceptual understanding, preparing them for further study and research in chemistry and related fields				
4.	To develop a solid foundation in the principles of photochemistry, allowing them to understand light-driven processes, predict reaction outcomes, and design experimental studies & acquire proficiency in understanding and utilizing molecular spectroscopy for qualitative and quantitative analysis of molecules, providing a valuable tool for further research and applications.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will gain a fundamental understanding of chemical bonding and its influence on reactivity, enabling them to predict molecular shapes, analyze redox processes, and design practical applications.			UNDERSTAND	
CO2:	Learner will develop a comprehensive understanding of stereochemistry in cycloalkanes and the unique properties of aromatic compounds, enabling them to analyze conformational stability, predict reactivity patterns, and design aromatic synthesis strategies.			UNDERSTAND	
CO3:	Learner will gain valuable conceptual understanding, preparing them for further study and research in chemistry and related fields.			UNDERSTAND	
CO4:	Learner will develop a solid foundation in the principles of photochemistry, allowing them to understand light-driven processes, predict reaction outcomes, and design experimental studies & acquire proficiency in understanding and utilizing molecular spectroscopy for qualitative and quantitative analysis of molecules, providing a valuable tool for further research and applications.			UNDERSTAND & ANALYZE	

Course Code:	USCHP1	Class:	FYBSC (CHEMISTRY)	Semester:	I
Course Name:	CHEMISTRY PRACTICAL				
Course Objectives:					
1.	To gain practical skills in performing physical chemistry experiments, understanding theoretical concepts, and interpreting experimental data, preparing them for further laboratory work and research.				
2.	To develop a strong understanding of inorganic chemistry principles and analytical techniques, enabling them to analyze the composition of various inorganic materials and solve real-world problems.				
3.	To become proficient in organic laboratory techniques, learn to identify and purify organic compounds, and develop critical thinking skills for analyzing experimental data.				
4.	To enhance their critical thinking, problem-solving, and analytical skills, preparing them for further study and research in chemistry and related fields.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will gain practical skills in performing physical chemistry experiments, understanding theoretical concepts, and interpreting experimental data, preparing them for further laboratory work and research.			UNDERSTAND, APPLY	
CO2:	Learner will develop a strong understanding of inorganic chemistry principles and analytical techniques, enabling them to analyze the composition of various inorganic materials and solve real-world problems.			UNDERSTAND, ANALYZE	
CO3:	Learner will become proficient in organic laboratory techniques, learn to identify and purify organic compounds, and develop critical thinking skills for analyzing experimental data.			ANALYZE	
CO4:	Learner will enhance their critical thinking, problem-solving, and analytical skills, preparing them for further study and research in chemistry and related fields.			ANALYZE, UNDERSTAND	

Course Code:	USCHP2	Class:	FYBSC (CHEMISTRY)	Semester:	II
Course Name:	CHEMISTRY PRACTICAL				
Course Objectives:					
1.	To gain practical skills in applying physical chemistry concepts to solve problems through experimentation, data analysis, and interpretation, preparing them for further studies and research.				
2.	To develop strong analytical skills in inorganic chemistry, enabling them to identify unknown substances, analyze complex mixtures, and understand the principles of redox reactions				
3.	To acquire proficiency in organic compound characterization techniques, enabling them to determine the identity and properties of organic molecules, analyze complex mixtures, and understand structure-property relationships				
4.	To acquire practical skills and theoretical knowledge across different branches of chemistry.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will gain practical skills in applying physical chemistry concepts to solve problems through experimentation, data analysis, and interpretation, preparing them for further studies and research.		UNDERSTAND, APPLY		
CO2:	Learner will develop strong analytical skills in inorganic chemistry, enabling them to identify unknown substances, analyze complex mixtures, and understand the principles of redox reactions.		APPLY, UNDERSTAND,		
CO3:	Learner will acquire proficiency in organic compound characterization techniques, enabling them to determine the identity and properties of organic molecules, analyze complex mixtures, and understand structure-property relationships.		EVALUATE, CREATE		
CO4:	Learner will build practical skills and theoretical knowledge across different branches of chemistry.		CREATE, UNDERSTAND		

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science(Chemistry)				
Assessment:	College	Pattern:	75:25 Marks		
Objectives & Outcome Framed by:	Institute				
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2023/07/6.1-S.Y.B.Sc.-Chemistry-sem-III-IV.pdf				
Department	Chemistry				
Course Code:	USCH301	Class:	SYBSC (CHEMISTRY)	Semester:	III
Course Name:	CHEMISTRY PAPER-I				
Course Objectives:					
1.	To apply thermodynamic principles to analyze and predict chemical equilibria, understand the concepts of free energy, chemical potential, and their role in chemical reactions & able perform and interpret electrochemical measurements to gain insights into ionic properties and reactions.				
2.	To utilize ionic and covalent bonding theories to predict structures and properties of molecules & to develop problem-solving skills in applying MO theory to understand magnetic properties and bond orders of molecules and ions.				
3.	To gain knowledge of organic reaction mechanisms and factors influencing reactivity in organic molecules as well as predict the products and stereochemistry of organic reactions involving halogenated hydrocarbons, alcohols, phenols, and epoxides.				
4.	To acquire practical skills and theoretical understanding necessary for further studies				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to apply thermodynamic principles to analyze and predict chemical equilibria, understand the concepts of free energy, chemical potential, and their role in chemical reactions & able perform and interpret electrochemical measurements to gain insights into ionic properties and reactions.			APPLY, UNDERSTAND	
CO2:	Learner will be able to utilize ionic and covalent bonding theories to predict structures and properties of molecules & to develop problem-solving skills in applying MO theory to understand magnetic properties and bond orders of molecules and ions.			UNDERSTAND , EVALUATE	
CO3:	Learner will gain knowledge of organic reaction mechanisms and factors influencing reactivity in organic molecules as well as predict the products and stereochemistry of organic reactions involving halogenated hydrocarbons, alcohols, phenols, and epoxides.			UNDERSTAND ,CREATING	
CO4:	Learner will acquire practical skills and theoretical understanding necessary for further studies			UNDERSTAND	

Course Code:	USCH401	Class:	SYBSC (CHEMISTRY)	Semester:	IV
Course Name:	CHEMISTRY PAPER-I				
Course Objectives:					
1.	To analyze and interpret thermodynamic properties of electrochemical systems & apply of phase equilibria and their applications in various fields.				
2.	To predict the behavior of transition metal ions based on their electronic configurations & to develop skills in identifying and characterizing coordination compounds				
3.	To gain a thorough understanding of the chemistry of carboxylic acids and their derivatives				
4.	To develop skills in synthesizing and characterizing carboxylic acid derivatives and sulphonic acid derivatives.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will be able to analyze and interpret thermodynamic properties of electrochemical systems & apply phase equilibria and their applications in various fields.		ANALYZE, APPLY		
CO2:	Learner will be able to predict the behavior of transition metal ions based on their electronic configurations & to develop skills in identifying and characterizing coordination compounds.		CREATE		
CO3:	Learner will gain a thorough understanding of the chemistry of carboxylic acids and their derivatives		UNDERSTAND		
CO4:	Learner will develop skills in synthesizing and characterizing carboxylic acid derivatives and sulphonic acid derivatives.		UNDERSTAND		

Course Code:	USCH302	Class:	SYBSC (CHEMISTRY)	Semester:	III
Course Name:	CHEMISTRY PAPER-II				
Course Objectives:					
1.	To apply thermodynamic principles to analyze ideal and non-ideal solutions & basic knowledge of polymer structures and molecular weight determination.				
2.	To develop skills in understanding and interpreting chemical structures and bonding models.				
3.	To gain a comprehensive understanding of the structure, reactivity, and reactions of carbonyl compounds & be able to predict and explain the mechanisms of nucleophilic addition reactions.				
4.	To gain critical thinking and problem-solving skills				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to apply thermodynamic principles to analyze ideal and non-ideal solutions & basic knowledge of polymer structures and molecular weight determination.			APPLY , ANALYZE	
CO2:	Learner will develop skills in understanding and interpreting chemical structures and bonding models.			UNDERSTAND	
CO3:	Learner will gain a comprehensive understanding of the structure, reactivity, and reactions of carbonyl compounds & be able to predict and explain the mechanisms of nucleophilic addition reactions.			UNDERSTAND, CREATE	
CO4:	Learner will gain critical thinking and problem-solving skills.			APPLY	

Course Code:	USCH402	Class:	SYBSC (CHEMISTRY)	Semester:	IV
Course Name:	CHEMISTRY PAPER-II				
Course Objectives:					
1.	To acquire a fundamental understanding of the principles of crystallography, X-ray diffraction, and catalysis & understand the properties and uses of nanoparticles in catalysis.				
2.	To gain a comprehensive understanding of the acidity of cations and basicity of anions in aqueous solutions & to understand environmental impact of volatile oxides and oxo-acids.				
3.	To gain a deep understanding of the nomenclature, reactions, and synthetic methods of nitrogen-containing compounds like amines and diazonium salts.				
4.	To acquire knowledge of the classification, synthesis, reactivity, and reactions of heterocyclic compounds.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will acquire a fundamental understanding of the principles of crystallography, X-ray diffraction, and catalysis & understand the properties and uses of nanoparticles in catalysis.		UNDERSTAND		
CO2:	Learner will gain a comprehensive understanding of the acidity of cations and basicity of anions in aqueous solutions.		UNDERSTAND		
CO3:	Learner will gain a deep understanding of the nomenclature, reactions, and synthetic methods of nitrogen-containing compounds like amines and diazonium salts.		UNDERSTAND,		
CO4:	Learner will acquire knowledge of the classification, synthesis, reactivity, and reactions of heterocyclic compounds.		ANALYZE		

Course Code:	USCH303	Class:	SYBSC (CHEMISTRY)	Semester:	III
Course Name:	Basics of Analytical Chemistry				
Course Objectives:					
1.	To acquire knowledge of different types of analytical methods used for analysis & various techniques for minimizing errors, and calculating precision and accuracy.				
2.	To gain a comprehensive understanding of titrimetric and gravimetric analysis principles and techniques.				
3.	To choose and apply appropriate instrumental techniques for specific analytical problems, interpreting and analyzing the data obtained.				
4.	To develop a basic understanding of various instrumental methods and their principles.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will acquire knowledge of different types of analytical methods used for analysis & various techniques for minimizing errors, and calculating precision and accuracy.			UNDERSTAND, APPLY	
CO2:	Learner will gain a comprehensive understanding of titrimetric and gravimetric analysis principles and techniques.			UNDERSTAND,	
CO3:	Learner will be able to choose and apply appropriate instrumental techniques for specific analytical problems, interpreting and analyzing the data obtained.			CREATE, ANALYZE	
CO4:	Learner will develop a basic understanding of various instrumental methods and their principles.			UNDERSTAND,	

Course Code:	USCH403	Class:	SYBSC (CHEMISTRY)	Semester:	IV
Course Name:	Basics of Analytical Chemistry				
Course Objectives:					
1.	To gain a comprehensive understanding of the principles and applications of different separation methods.				
2.	To gain knowledge of the working principles and applications of various instrumental methods based on electrical properties.				
3.	To use statistical methods to analyze and interpret analytical data accurately.				
4.	To develop skills in evaluating the reliability and significance of analytical results.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will gain a comprehensive understanding of the principles and applications of different separation methods.			UNDERSTAND, APPLY	
CO2:	Learner will gain knowledge of the working principles and applications of various instrumental methods based on electrical properties.			APPLY	
CO3:	Learner will be able to use statistical methods to analyze and interpret analytical data accurately.			ANALYZE, EVALUATE	
CO4:	Learner will develop skills in evaluating the reliability and significance of analytical results.			EVALUATE, ANALYZE	

Course Code:	USCHP1,2,3	Class:	SYBSC (CHEMISTRY)	Semester:	III
Course Name:	CHEMISTRY PRACTICAL				
Course Objectives:					
1.	To acquire practical skills and theoretical knowledge in fundamental aspects of chemistry, to design, conduct, and analyze experiments in various areas of chemistry & critical thinking and problem-solving skills applicable to chemical phenomena.				
2.	To develop qualitative and quantitative analysis skills for inorganic compounds.				
3.	To develop practical skills in organic synthesis, purification, and characterization of organic compounds.				
4.	To gain theoretical knowledge and practical skills in using various tools and techniques for quantitative analysis in chemistry.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will acquire practical skills and theoretical knowledge in fundamental aspects of chemistry, to design, conduct, and analyze experiments in various areas of chemistry & critical thinking and problem-solving skills applicable to chemical phenomena.			UNDERSTAND, ANALYZE	
CO2:	Learner will develop qualitative and quantitative analysis skills for inorganic compounds.			UNDERSTAND, ANALYZE	
CO3:	Learner will develop practical skills in organic synthesis, purification, and characterization of organic compounds.			UNDERSTAND, ANALYZE	
CO4:	Learner will gain theoretical knowledge and practical skills in using various tools and techniques for quantitative analysis in chemistry.			UNDERSTAND, ANALYZE	

Course Code:	USCHP1,2,3	Class:	SYBSC (CHEMISTRY)	Semester:	IV
Course Name:	CHEMISTRY PRACTICAL				
Course Objectives:					
1.	To gain hands-on experience with electrochemical and kinetic techniques in physical chemistry.				
2.	To develop skills in microscale synthesis and characterization of inorganic compounds.				
3.	To develop qualitative analysis skills for identifying functional groups in organic compounds.				
4.	To gain theoretical knowledge and practical skills in various analytical techniques and instrumentation used in chemical analysis				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will gain hands-on experience with electrochemical and kinetic techniques in physical chemistry.			UNDERSTAND, APPLY	
CO2:	Learner will develop skills in microscale synthesis and characterization of inorganic compounds.			UNDERSTAND	
CO3:	Learner will develop qualitative analysis skills for identifying functional groups in organic compounds.			UNDERSTAND	
CO4:	Learner will gain theoretical knowledge and practical skills in various analytical techniques and instrumentation used in chemical analysis.			APPLY, UNDERSTAND	

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science (Chemistry)		
Assessment:	University	Pattern:	100 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	• http://old.mu.ac.in/wp-content/uploads/2016/06/4.41-T.Y.B.Sc.-Physical-Chemistry-6-Units.pdf • http://old.mu.ac.in/wp-content/uploads/2016/06/4.41-T.-Y.-B.Sc.-Inorganic-Chemistry-6-Units-Sem-V1.pdf • http://old.mu.ac.in/wp-content/uploads/2016/06/4.41-T.-Y.-B.Sc.-Organic-Chemistry-6-Units-Sem-V1.pdf • http://old.mu.ac.in/wp-content/uploads/2016/06/4.41-T.Y.B.Sc.-Analytical-Chemistry-6-Units.pdf • http://old.mu.ac.in/wp-content/uploads/2016/06/4.41-T.Y.B.Sc.-Drugs-and-Dyes.pdf		
Department	Chemistry		

Course Code:	USCH501	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Physical Chemistry				
Course Objectives:					
1.	To understand the principles of different spectroscopic techniques and their applications in determining molecular structure and dynamics.				
2.	To learn the different techniques used to determine molecular weight of nonvolatile substance, to understand different theories of kinetics.				
3.	To gain a fundamental understanding of the principles and applications of nuclear chemistry, including radioactivity, nuclear reactions, and fission and fusion processes.				
4.	To gain a comprehensive understanding of the fundamental concepts and principles governing surface phenomena and the behavior of colloidal systems.				
Course Outcome:					Level of Blooms Taxonomy
CO1:	Learner will understand the principles of different spectroscopic techniques and their applications in determining molecular structure and dynamics.				UNDERSTAND, APPLY
CO2:	Learner will learn the different techniques used to determine molecular weight of non-volatile substance, to understand different theories of kinetics.				UNDERSTAND, APPLY
CO3:	Learner will gain a fundamental understanding of the principles and applications of nuclear chemistry, including radioactivity, nuclear reactions, and fission and fusion processes.				UNDERSTAND, APPLY

CO4:	Learner will gain a comprehensive understanding of the fundamental concepts and principles governing surface phenomena and the behavior of colloidal systems.	UNDERSTAND, APPLY
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Course Code:	USCH601	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Physical Chemistry				
Course Objectives:					
1.	To gain a fundamental understanding of the concepts and principles governing electrochemical systems, including activity, conductivity, different types of cells, and their applications.				
2.	To gain a fundamental understanding of the structure, properties, and applications of various polymer materials.				
3.	To gain a fundamental understanding of the basic principles of quantum mechanics and its application in understanding renewable energy resources like solar and hydrogen.				
4.	To gain a fundamental understanding of the principles and applications of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy for characterizing molecules and materials.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learner will gain a fundamental understanding of the concepts and principles governing electrochemical systems, including activity, conductivity, different types of cells, and their applications.		UNDERSTAND, ANALYZE		
CO2:	Learner will gain a fundamental understanding of the structure, properties, and applications of various polymer materials.		UNDERSTAND, APPLY		
CO3:	Learner will gain a fundamental understanding of the basic principles of quantum mechanics and its application in understanding renewable energy resources like solar and hydrogen.		UNDERSTAND, APPLY		
CO4:	Learner will gain a fundamental understanding of the principles and applications of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy for characterizing molecules and materials.		UNDERSTAND, ANALYZE		

Course Code:	USCHP01	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Physical Chemistry Practical				
Course Objectives:					
1.	To understand how to apply colligative properties to determine molecular weight of compounds.				
2.	To understand how to investigate the order of a chemical reaction using the fractional change method.				
3.	To analyze adsorption behavior and verify adsorption isotherm through experiment.				
4.	To understand the use of conductometry, potentiometry, pH metry to study various reaction				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will understand to apply colligative properties to determine molecular weight of compounds.			UNDERSTAND, APPLY	
CO2:	Learner will understand how to investigate the order of a chemical reaction using the fractional change method.			UNDERSTAND, APPLY	
CO3:	Learner will learn to analyze adsorption behavior and verify adsorption isotherms through experiment.			UNDERSTAND, APPLY	
CO4:	Learner will understand the use of conductometry, potentiometry, pH metry to study various reactions.			UNDERSTAND, APPLY	

Course Code:	USCHP02	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Physical Chemistry Practical				
Course Objectives:					
1.	To determine reaction order and specific rate constant on the basis of experimental data and use of viscometer to determine molecular weight of polymer.				
2.	To learn the use of potentiometric titration in quantitative analysis of analytes.				
3.	To understand the application of conductometric titration to determine the amounts of individual acids in a mixture.				
4.	To understand the use of colorimetry to estimate the concentration of a metal ion in a complex.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Lerner will learn to determine reaction order and specific rate constant on the basis of experimental data and use of viscometer to determine molecular weight of polymer.		UNDERSTAND, EVALUATE		
CO2:	Learner will learn the use of potentiometric titration in quantitative analysis of analytes.		UNDERSTAND, APPLY		
CO3:	Learner will understand the application of conductometric titration to determine the amounts of individual acids in a mixture.		UNDERSTAND, APPLY		
CO4:	Learner will understand the use of colorimetry to estimate the concentration of a metal ion in a complex.		UNDERSTAND, APPLY		

Course Code:	USCH502	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Inorganic Chemistry				
Course Objectives:					
1.	To learn symmetry principles to classify and analyze different molecules based on their symmetry elements and operations & to study MOT of different molecules.				
2.	To learn structure and properties of solids based on their crystal lattices and point defects & applications of superconductivity.				
3.	To learn the properties, behavior, and applications of lanthanides and actinides.				
4.	To understand the use of non-aqueous solvents & to learn the comparative chemistry of main group elements.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will use symmetry principles to classify and analyze different molecules based on their symmetry elements and operations & to study MOT of different molecules.			UNDERSTAND, EVALUATE	
CO2:	Learner will learn the structure and properties of solids based on their crystal lattices and point defects & applications of superconductivity.			UNDERSTAND	
CO3:	Learner will be able to learn the properties, behavior, and applications of lanthanides and actinides.			UNDERSTAND, EVALUATE	
CO4:	Learner will understand the use of non-aqueous solvents to learn the comparative chemistry of main group elements.			UNDERSTAND, APPLY	

Course Code:	USCH602	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Inorganic Chemistry				
Course Objectives:					
1.	To study coordination complexes by using Crystal Field Theory (CFT)				
2.	To elucidate bonding and stability in coordination complexes, and recognize the limitations of CFT.				
3.	To learn synthesis, properties, reactivity, and catalytic applications of organometallic compounds.				
4.	To study the principles and processes involved in extracting and refining metals, considering environmental and economic aspects.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will used to study coordination complexes by using Crystal Field Theory (CFT)			UNDERSTAND	
CO2:	Learner will be used to elucidate bonding and stability in coordination complexes, and recognize the limitations of CFT.			EVALUATE	
CO3:	Learner will be able to learn synthesis, properties, reactivity, and catalytic applications of organometallic compounds.			UNDERSTAND, APPLY	
CO4:	Learner will be able to study the principles and processes involved in extracting and refining metals, considering environmental and economic aspects.			UNDERSTAND, APPLY	

Course Code:	USCHP05	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Inorganic Chemistry Practical				
Course Objectives:					
1.	To learn the technique of standardization				
2.	To develop skill for preparation of complex through systematic methodology				
3.	To study complexometric titration with example				
4.	To evaluate the purity of the sample.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will be able to learn the technique of standardization.			UNDERSTAND, APPLY	
CO2:	Learner will be able to develop skill for preparation of complex through systematic methodology			UNDERSTAND, CREATE	
CO3:	Learner will be able to study complexometric titration with examples.			UNDERSTAND, APPLY	
CO4:	Learner will be able to evaluate the purity of the sample.			EVALUATE	

Course Code:	USCHP06	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Inorganic Chemistry Practical				
Course Objectives:					
1.	To learn the preparation of inorganic complexes.				
2.	To understand the structure of complex and role of metal ion and ligands.				
3.	To develop analytical skills to identify unknown cations and anions in water-soluble salts.				
4.	To evaluate the purity of the sample.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will be able to learn the preparation of inorganic complexes.		UNDERSTAND, APPLY		
CO2:	Learner will be able to understand the structure of complex and role of metal ions and ligands.		UNDERSTAND		
CO3:	Learner will be able to develop analytical skills to identify unknown cations and anions in water-soluble salts.		UNDERSTAND, CREATE		
CO4:	Learner will be able to evaluate the purity of the sample.		EVALUATE		

Course Code:	USCH503	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Organic Chemistry				
Course Objectives:					
1.	To learn mechanism of elimination reaction, reaction of carbonyl compound with nucleophile and rearrangement reactions				
2.	To learn stereochemistry of various reactions and its types.				
3.	To understand the different rules to give nomenclature to organic compounds				
4.	To differentiate between photochemical and thermal reactions and study their mechanism.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will able to learn mechanism of elimination reaction, reaction of carbonyl compound with nucleophile and rearrangement reactions			UNDERSTAND	
CO2:	Learner will be able to learn stereochemistry of various reactions and its types.			UNDERSTAND	
CO3:	Learner will able to understand the different rules to give nomenclature to organic compounds			UNDERSTAND	
CO4:	Learner will be able to differentiate between photochemical and thermal reactions and study their mechanism.			UNDERSTAND, EVALUATE	

Course Code:	USCH603	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Organic Chemistry				
Course Objectives:					
1.	To apply stereo chemical concepts to analyze and predict outcomes of organic reactions to study structure, properties, and functions of amino acids and proteins.				
2.	To understand the mechanisms and stereochemistry of common molecular rearrangements and identify the structures and reactions of carbohydrates.				
3.	To understand the classification, properties, and applications of polymers				
4.	To know the roles of catalysts in organic transformations.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to apply stereo chemical concepts to analyze and predict outcomes of organic reactions to study structure, properties, and functions of amino acids and proteins.			UNDERSTAND	
CO2:	Learner will be able to understand the mechanisms and stereochemistry of common molecular rearrangements and identify the structures and reactions of carbohydrates.			UNDERSTAND, EVALUATE	
CO3:	Learner will be able to understand the classification, properties, and applications of polymers			UNDERSTAND, ANALYZE	
CO4:	Learner will be able to know the roles of catalysts in organic transformations.			UNDERSTAND, APPLY	

Course Code:	USCHP09	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Organic Chemistry Practical				
Course Objectives:					
1.	To apply knowledge of chemical properties and separation techniques to identify and isolate components of binary solid-solid mixtures.				
2.	To perform separation experiments safely and effectively.				
3.	To interpret experimental data to identify unknown components.				
4.	To develop critical thinking and problem-solving abilities.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to apply knowledge of chemical properties and separation techniques to identify and isolate components of binary solid-solid mixtures.			UNDERSTAND, APPLY	
CO2:	Learner will be able to perform separation experiments safely and effectively.			APPLY	
CO3:	Learner will be able to interpret experimental data to identify unknown components.			ANALYZE	
CO4:	Learner will be able to develop critical thinking and problem-solving abilities.			CREATE	

Course Code:	USCHP10	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Organic Chemistry Practical				
Course Objectives:					
1.	To apply knowledge of chemical properties and separation techniques to identify and isolate components of binary solid-liquid, liquid-liquid mixtures.				
2.	To perform separation experiments safely and effectively.				
3.	To interpret experimental data to identify unknown components.				
4.	To develop critical thinking and problem-solving abilities.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to apply knowledge of chemical properties and separation techniques to identify and isolate components of binary solid-solid mixtures.			UNDERSTAND, APPLY	
CO2:	Learner will be able to perform separation experiments safely and effectively.			APPLY	
CO3:	Learner will be able to interpret experimental data to identify unknown components.			ANALYZE	
CO4:	Learner will be able to develop critical thinking and problem-solving abilities.			CREATE	

Course Code:	USCH504	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Analytical Chemistry				
Course Objectives:					
1.	To use statistical methods in chemical analysis & learn different techniques of sampling of solid, liquid, and gasses.				
2.	To understand the basic concept of redox and complexometric titration.				
3.	To learn the principle of instrumentation, application of FES, AAS, Fluorescence phosphorescence spectroscopy, Turbidimetry, and Nephelometer.				
4.	To learn basic principles of HPLC & HPTLC.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to use statistical methods in chemical analysis & learn different techniques of sampling of solid, liquid, and gasses.			UNDERSTAND, ANALYZE	
CO2:	Learner will be able to understand the basic concept of redox and complexometric titration.			UNDERSTAND	
CO3:	Learner will be able to learn the principle of instrumentation, application of FES, AAS, Fluorescence phosphorescence spectroscopy, Turbidimetry, and Nephelometer.			UNDERSTAND, APPLY	
CO4:	Learner will be able to learn the basic principles of HPLC & HPTLC.			UNDERSTAND	

Course Code:	USCH604	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Analytical Chemistry				
Course Objectives:					
1.	To study electro analytical technique with reference to polarography and Amperometric titration and its applications.				
2.	To learn mechanism gas chromatography and ion exchange chromatography and its application.				
3.	To do analysis of food products and adulterants in milk, honey, tea, coffee and cosmetic products.				
4.	To study basic principle and applications of thermal methods.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to study electro analytical techniques with reference to polarography and Amperometric titration and its applications.			UNDERSTAND, APPLY	
CO2:	Learner will be able to learn mechanism gas chromatography and ion exchange chromatography and its application.			UNDERSTAND, APPLY	
CO3:	Learner will be able to do analysis of food products and adulterants in milk, honey, tea, coffee and cosmetic products.			UNDERSTAND, EVALUATE	
CO4:	Learner will be able to study basic principles, Classification, and applications of thermal methods.			UNDERSTAND, EVALUATE	

Course Code:	USCHP13	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Analytical Chemistry Practical				
Course Objectives:					
1.	To become a master in handling the instruments like Colorimeter, spectrophotometer, Turbidimeter.				
2.	To apply the concept of Calibration curve method practically.				
3.	To distinguish between blank and direct titration.				
4.	To gain practical skills in quantitative chemical analysis using various instrumental and classical techniques.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to become masters in handling instruments like Colorimeter, spectrophotometer, Turbidimeter.			APPLY, UNDERSTAND	
CO2:	Learner will be able to apply the concept of Calibration curve method practically.			APPLY	
CO3:	Learner will be able to distinguish between blank and direct titration.			APPLY, EVALUATE	
CO4:	Learner will be able to gain practical skills in quantitative chemical analysis using various instrumental and classical techniques.			EVALUATE, UNDERSTAND	

Course Code:	USCHP14	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Analytical Chemistry Practical				
Course Objectives:					
1.	To evaluate the amount of phosphoric acid in a cola sample.				
2.	To evaluate commercial vinegar samples.				
3.	To evaluate reducing sugar in honey samples.				
4.	To develop analytical skills in them				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will able to evaluate the amount of phosphoric acid in a cola sample.			UNDERSTAND, EVALUATE	
CO2:	Learner will be able to evaluate commercial vinegar sample.			UNDERSTAND, EVALUATE	
CO3:	Learner will be able to evaluate reducing sugar in honey samples.			UNDERSTAND, EVALUATE	
CO4:	Learner will be able to develop analytical skills in them.			UNDERSTAND, APPLY	

Course Code:	USACDD501	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Applied Component (Drugs & Dyes)				
Course Objectives:					
1.	To study the various dosage forms available for medications and the routes of administration				
2.	To understand the chemistry of drugs with respect to their pharmacological activity				
3.	To learn the Analgesics, Antipyretics and Anti-inflammatory Drugs.				
4.	To learn different dye stuff & unit processes.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will able to study the various dosage forms available for medications and the routes of administration			UNDERSTAND, APPLY	
CO2:	Learner will able to understand the chemistry of drugs with respect to their pharmacological activity			UNDERSTAND	
CO3:	Learner will be able to learn the Analgesics, Antipyretics and Anti-inflammatory Drugs.			UNDERSTAND	
CO4:	Learner will be able to learn different dye stuff & unit processes.			UNDERSTAND, EVALUATE	

Course Code:	USACDD601	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Applied Component (Drugs & Dyes)				
Course Objectives:					
1.	To learn Drug Metabolism, Chemotherapeutic Agents.				
2.	To Antitubercular and Antileprotic Drugs, Anti-HIV Drugs, use of Nanoparticles in Medicinal Chemistry				
3.	To classification of dye stuff, Health and Environmental Hazards of Synthetic Dyes				
4.	To learn application of dyes, different dyestuff industry.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will be able to learn Drug Metabolism, Chemotherapeutic Agents.			UNDERSTAND,	
CO2:	Learner will be able to learn Antitubercular and Antileprotic Drugs, Anti-HIV Drugs, use of Nanoparticles in Medicinal Chemistry.			APPLY, UNDERSTAND	
CO3:	Learner will be able to learn classification of dye stuff, Health and Environmental Hazards of Synthetic Dyes.			EVALUATE, UNDERSTAND	
CO4:	Learner will be able to learn application of dyes, different dyestuff industries.			EVALUATE	

Course Code:	USACDD5P1	Class:	TYBSC (chemistry)	Semester:	V
Course Name:	Applied Component (Drugs & Dyes) Practical				
Course Objectives:					
1.	To do synthesis of various commercial dyes as per pharmacopeia				
2.	To make useful arrangements for synthesis of drugs and dyes.				
3.	To apply back titration to quantify ibuprofen content in a pharmaceutical formulation.				
4.	To develop skills to synthesize a dye.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to do synthesis of various commercial dyes as per pharmacopeia.			UNDERSTAND, APPLY	
CO2:	Learner will be able to make useful arrangements for synthesis of drugs and dyes.			UNDERSTAND, APPLY	
CO3:	Learner will be able to apply back titration to quantify ibuprofen content in a pharmaceutical formulation.			UNDERSTAND, APPLY	
CO4:	Learner will be able to develop skills to synthesize a dye.			CREATE	

Course Code:	USACDD6P1	Class:	TYBSC (chemistry)	Semester:	VI
Course Name:	Applied Component (Drugs & Dyes) Practical				
Course Objectives:					
1.	To perform an O-methylation reaction and characterize the product				
2.	To synthesize paracetamol from a starting material				
3.	To perform a multi-step synthesis of a complex organic molecule and characterize its properties.				
4.	To read pharmacopeia and to write monographs of drugs.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learner will able to perform an O-methylation reaction and characterize the product			UNDERSTAND, APPLY	
CO2:	Learner will able to synthesize paracetamol from a starting material			UNDERSTAND, APPLY	
CO3:	Learner will be able to perform a multi-step synthesis of a complex organic molecule and characterize its properties.			UNDERSTAND, APPLY	
CO4:	Learner will be able to read pharmacopeia and to write monographs of drugs.			UNDERSTAND, APPLY	

Subjects Offered by the Institute			
First Year – Bachelor of Science			
Sr. No.	Semester – I	Sr. No.	Semester – II
1	Plant Diversity I	1	Plant Diversity I
2	Form and Function I	2	Form and Function I

Subjects Offered by the Institute			
Second Year – Bachelor of Science			
Sr. No.	Semester – III	Sr. No.	Semester – IV
1	Plant Diversity II	1	Plant Diversity II
2	Form and Function II	2	Form and Function II
3	Current Trends in Plant Science I	3	Current Trends in Plant Science I

Subjects Offered by the Institute			
Third Year – Bachelor of Science			
Sr. No.	Semester – V	Sr. No.	Semester – VI
1	Plant Diversity III	1	Plant Diversity III
2	Plant Diversity IV	2	Plant Diversity IV
3	Form and Function III	3	Form and Function III
4	Current Trends in Plant Science II	4	Current Trends in Plant Science II

FACULTY OF COMMERCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	100 Marks
Objectives & Outcome Framed by:	Institutes		
Syllabus Copy Link:	https://archive.mu.ac.in/syllabus/4.23%20Botany%20.pdf		
Department	Botany		

Course Code:	USBO101	Class:	FYBSC	Semester:	I
Course Name:	Plant Diversity - I				
Course Objectives:					
1.	To Grasp the Basic Concepts and Principles of Botany, Including Plant Anatomy, Physiology, Genetics, Evolution, and Ecology.				
2.	To Identify the Major Plant Groups and Understand their Characteristics and Life Cycles.				
3.	To Classify Plants Based on their Morphological and Anatomical Features.				
4.	To Understand the Interactions Between Plants and their Environments.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learner will be able to Understand the Structure and Function of Plant Cells, Tissues, and Organs.		Understand		
CO2:	Learner will be able to Identify the Major Plant Groups and Understand their Characteristics and Life Cycles.		Understand		
CO3:	Learner will be able to Gain Hands – On Experience with Laboratory Techniques, Including Microscopy, Staining, and Dissection of Plant Material.		Understand		
CO4:	Learner will be able to Develop Field Skills such as Plant collections, Identification, and Ecological Surveying.		Understand		

Course Code:	USBO201	Class:	FYBSC	Semester:	II
Course Name:	BOTANY				
Course Objectives:					
1.	To Classify Plants Based on their Morphological and Anatomical Features.				
2.	To Develop Skills in using Dichotomous keys and other Tools for Plant Identification.				
3.	To Understand the Importance of Medicinal Plants.				
4.	To Comprehend the Processes of Photosynthesis, Respiration, and Transpiration.				
5.	To Develop Field Skills such as Plant Collection, Identification, and Ecological Surveying.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learner will be able to understand the Classification of Plants Based on their Morphological and Anatomical Features.		Understand		
CO2:	Learner will be able to Create Dichotomous Keys and other tools for Plant Identification.		Create		
CO3:	Learner will be able to understand the role of medicinal plants in maintaining biodiversity and in health issues.		Understand		
CO4:	Learner will be able to understand the Processes of Photosynthesis, Respiration, and Transpiration.		Understand		
CO5:	Learner will be able to understand Ecosystems, Plant Communities, and the role of Plants in Ecological Processes.		Understand		

Course Code:	USBO301	CLASS	SYBSC	Semester:	III
Course Name:	BOTANY				
Course Objectives:					
1.	Learner will be able to Identify and Classify Major Plant Groups such as Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms, Understanding their Evolutionary Relationships.				
2.	Learner will be able to Understand the Dynamic Interactions Between Plants and their Environment, Including Principles of Plant Ecology such as Community Dynamics and Ecosystem Processes.				
3.	Learner will be able to Analyze How Environmental Factors Influence Plant Growth and Distribution.				
4.	Learner will be able to Apply Genetic Modification and Biotechnology Concepts to Plant Science, Considering Ethical and Ecological Implications.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	To understand the evolutionary relationship among the plant groups.		Understand		
CO2:	To understand the principles of plants, ecology including community dynamics and ecosystem process.		Understand		
CO3:	Analyze the effect of environmental factors on plant growth and distribution.		Understand		
CO4:	Understand the principles of plant genetics including inheritance patterns and gene expression.		Understand		

Course Code:	USBO401	Class:	SYBSC	Semester:	IV
Course Name:					
Course Objectives:					
1.	To Identify Common Plant Diseases and Understand their Causative Agents.				
2.	To Describe and Analyze Plant Defense Mechanisms Against Pathogens and Principles of Disease Management and Control.				
3.	To Perform Essential Laboratory Techniques, Related to Plant Anatomy, Physiology, and Genetics including the use of microscope and other scientific equipment.				
4.	To conduct and study the fieldwork and analyze the plant communities and ecosystem in their natural habits.				
5.					
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to identify common plant diseases and understand their causes.			Understand	
CO2:	Learner will be able to study the plant defense mechanism against pathogen.			Understand	
CO3:	Learner will be able to perform the laboratory techniques related to plants anatomy, physiology and genetics.			Understand	
CO4:	Learner will be able to collect, analyze and interpret scientific data.			Understand	

Course Code:	USBO501	CLASS	TYBSC	Semester:	V
Course Name:	BOTANY				
Course Objectives:					
1.	To Understand Plant Structure and Function				
2.	To Identify and Classify plant species based on morphological characteristics.				
3.	To study the ecological roles of plants within various ecosystems.				
4.	To understand Plant Genetics and Biotechnology				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Plant Physiology – To understand the fundamental processes in plants, including photosynthesis, respiration, transpiration and nutrient uptake and will be able to explain how these processes contribute to plant growth and development.			Understand	
CO2:	Taxonomy and Systematics – To classify and identify various plant species using morphological and genetic characteristics.			Understand	
CO3:	Ecology and Environmental Botany – To analyze the interactions between plants and their environments including ecosystem dynamics, plant adaptation to different environments and the impact of environmental changes on plant biodiversity.			Understand	
CO4:	Genetics and Biotechnology – To comprehend the principles of plant genetics and be familiar with modern biotechnological techniques used in plant science, such as genetic engineering and tissue culture.			Understand	

Course Code:	USBO601	CLASS	TYBSC	Semester:	VI
Course Name:	BOTANY				
Course Objectives:					
1.	To develop Research and Analytical skills.				
2.	To study Plant-Pathogen Interactions				
3.	To Explore the role of Plants in Climate regulation				
4.	To develop Practical skills in Horticulture and Crop Management				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to evaluate the economic importance of plants, including their uses in plant science, such as genetic engineering and tissue culture. Sustainability and Conservation – To understand the principles of plant conservation, sustainable agriculture and the role of plants in maintaining ecological balance and biodiversity.			Understand	
CO2:	Learner will be able to Understand plant defense mechanisms against pathogens. Identify common Plant diseases and their impacts. Learn and apply integrated pest management strategies.			Understand	
CO3:	Learner will be able to Analyze the role plants play in carbon sequestration. To understand the effect of deforestation and reforestation on climate. And evaluate plant species for climate change mitigation.			Analyze	
CO4:	Learner will be able to Gain hands-on experience in plant cultivation techniques. Learn soil management, irrigation and pest control. To understand and practice organic and sustainable farming methods.			Understand	

Subjects Offered by the Institute			
First Year – Bachelor of Science (Mathematics)			
Sr. No.	Semester – I	Sr. No.	Semester – II
1.	Calculus I	1	Calculus II
2.	Algebra I	2.	Discrete Mathematics

Subjects Offered by the Institute			
Second Year – Bachelor of Commerce			
Sr. No.	Semester – III	Sr. No.	Semester – IV
1	Calculus III	1	Multivariable Calculus I
2	Linear Algebra I	2	Linear Algebra II
3	Ordinary Differential Equations	3	Numerical Methods (Elective A)

Subjects Offered by the Institute			
Third Year – Bachelor of Commerce			
Sr. No.	Semester – V	Sr. No.	Semester – VI
1	Multivariable Calculus II	1	Basic Complex Analysis
2	Group Theory	2	Ring Theory
3	Topology of Metric Spaces	3	Topology of Metric Spaces & Real Analysis
4	Graph Theory (Elective C)	4	Graph Theory and Combinatorics (Elective C)

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	75 : 25
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2021/01/4.106-F.-Y-B.-Sc.-B.-A.-Maths.pdf		
Department	B.Sc.		

Course Code:	USMT101	Class:	FYBSC	Semester:	I
Course Name:	Calculus I				
Course Objectives:					
1.	To gain Knowledge of fundamental concepts of real numbers.				
2.	To verify the value of the limit of a function at a point using the definition of the limit, analyze and interpret the uniqueness of limits in a convergent sequence.				
3.	To solve first-order and first-degree differential equations, utilize integrating factors for non-exact equations.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to recall and define the order properties of the Real Number System (R) and examine AM-GM and Cauchy-Schwarz Inequalities.			Understand and Analyze	
CO2:	Learners will analyze and interpret convergence properties and explain the uniqueness of limits in convergent sequences.			Understand and Analyze	
CO3:	Learners will solve first-order and first-degree differential equations and utilize integrating factors for non-exact equations.			Apply	

Course Code:	USMT201	Class:	FYBSC	Semester:	II
Course Name:	Calculus II				
Course Objectives:					
1.	To understand differentiation and fundamental theorem in differentiation and various rules.				
2.	To find higher order derivatives, extreme values of function and apply the Leibnitz rule to solve problems				
3.	To solve problems based on MVT, Rolls theorem and limit problems using L’ Hospital’s rule.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will define differentiation and apply fundamental theorems for solving problems related to differentiation.		Understand and Analyze		
CO2:	Learners will apply the Leibnitz rule to solve n th order derivative problems and examine the first and second derivative tests to determine extreme values of functions.		Apply and Analyze		
CO3:	Learners will apply the Mean Value Theorem, Rolle’s Theorem, and L'Hôpital's Rule to solve diverse calculus problems		Apply		

Course Code:	USMT102	Class:	FYBSc	Semester:	I
Course Name:	Algebra I				
Course Objectives:					
1.	To provide an understanding of fundamental concepts in number theory and the Fundamental Theorem of Arithmeticand congruence.				
2.	To understand the foundational concepts in set theory and equivalence relations, including relations, functions and binary operations.				
3.	To develop a comprehensive understanding of polynomials and their properties.				
Course Outcome:			Level of Bloom’s Taxonomy		
CO1:	Learners will be able to understand and apply fundamental principles in number theory,thus enhancing their reasoning and problem-solving skills.		Understand Apply Analyze		
CO2:	Learners will be proficient in defining and analyzing relations and functions and competence in identifying and applying properties of functions.		Understand Apply Analyze		
CO3:	Learners will be able to demonstrate understanding of polynomials, enabling them to solve related problems effectively.		Understand Apply Analyze		

Course Code:	USMT202	Class:	FYBSC	Semester:	II
Course Name:	Discrete Mathematics				
Course Objectives:					
1.	To understand set theory and learn Stirling Numbers of the Second Kind and Pigeonhole Principle applications in mathematics.				
2.	To apply permutation and combination principles to solve diverse problems and to evaluate combinatorial identities.				
3.	To analyze permutations of objects and solve recurrence relations to obtain its solutions to enhance thinking and solving skills.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will be able to analyze sets and apply combinatorial principles enabling them to solve a wide range of mathematical problems.		Apply Analye		
CO2:	Learners will be able to demonstrate the ability to apply permutations and combinations and derive formulas for non-negative integer solutions of equations		Apply Analye		
CO3:	Learners will be able to evaluate permutations effectively and develop expertise in solving diverse recurrence relations.		Apply Evaluate		

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2021/10/6.17-AAMS-UG-97-Mathematics-CBCS.pdf		
Department	B.Sc (Mathematics)		

Course Code:	USMT.301	Class:	SYBSC	Semester:	III
Course Name:	Calculus III				
Course Objectives:					
1.	To be able to define and analyze the infinite series, its convergence & divergence.				
2.	To be able to recall and interpret the Riemann integrability of real valued functions.				
3.	To be able to apply the Riemann integrations and improper integrals.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to recall the infinite series and apply the different tests to check its convergence and divergence.			Remember Apply	
CO2:	Learners will be able to analyze the idea and properties of Riemann integrability of real valued functions.			Understand Analyze	
CO3:	Learners will be able to solve examples on applications of Riemann integrations and also be able to interpret and solve the examples on Gamma and Beta functions.			Apply Evaluate	

Course Code:	USMT 401	Class:	SYBSC	Semester:	IV
Course Name:	Multivariable Calculus I				
Course Objectives:					
1.	To define the properties of real and vector valued functions of several variables.				
2.	To define the differentiability of scalar fields and its basic properties.				
3.	To apply differentiation of scalar field and vector field.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will be able to analyze properties, limits and continuity of real and vector valued functions of several variables, Directional derivative.			Understand Analyze	
CO2:	Learners will demonstrate differentiability of scalar fields, Euler’s theorem, gradient and mixed partial derivatives.			Understand Evaluate	
CO3:	Learners will analyze and apply differentiation of scalar field and vector field to find maxima and minima.			Analyze Apply	

Course Code:	USMT302	Class:	SYBSC	Semester:	III
Course Name:	Linear Algebra - I				
Course Objectives:					
1.	To enable students to solve the System of Equations and Matrices efficiently.				
2.	To understand vector spaces over $\mathbb{R}$ and to analyze dimensions of vector spaces.				
3.	To comprehend determinants and to analyze linear equations and matrices.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to solve linear equations and apply elementary operations with proficiency.			Apply Evaluate	
CO2:	Learners will be able to understand vector space and determine dimensions of a vector space.			Understand Apply	
CO3:	Learners will be able to solve determinants and relate solutions of linear equations to matrix properties.			Apply Evaluate	

Course Code:	USMT402	Class:	SYBSC	Semester:	IV
Course Name:	Linear Algebra - II				
Course Objectives:					
1.	To analyze and apply fundamental concepts of linear transformations.				
2.	To apply the concept of inner product space and orthogonality to foster solving skills.				
3.	To understand eigen values, eigen vectors, diagonalization and their properties.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	To demonstrate proficiency in solving problems of linear transformations.		Apply Evaluate		
CO2:	To apply inner product space concepts to solve problems involving orthogonality.		Understand Apply Evaluate		
CO3:	To develop problem-solving skills with eigenvalues, eigenvectors and diagonalization.		Apply Evaluate		

Course Code:	USMT303	Class:	SYBSC	Semester:	III
Course Name:	Ordinary Differential Equations				
Course Objectives:					
1.	To understand general n-th Order LDE, solve Higher Order Homogeneous LDE and examine the properties of the differential operator.				
2.	To apply the existence and uniqueness theorem and to understand the Wronskian for homogeneous linear systems.				
3.	To apply Taylor’s Series Method, Picard’s method, Euler’s method and Runge-Kutta method of second order.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will understand the fundamentals of solving general n-th order LDE and utilize the concept of linear independence andWronskian for homogeneous linear systems.			Understand and Apply	
CO2:	Learners will apply the existence and uniqueness theorem and analyze homogeneous systems, understand the significance of the Wronskian, and solve non-homogeneous systems.			Understand, Apply and Analyze	
CO3:	Learners will develop skills in solving initial value problems for first-order ODE and understand how each technique works in terms of convergence.			Understand and Apply	

Course Code:	USMT403A	Class:	SYBSC	Semester:	IV
Course Name:	Numerical Methods (Elective A)				
Course Objectives:					
1.	To understand how to measure errors and solve problems using Iteration Methods and solve algebraic and transcendental equations.				
2.	To understand and apply interpolation techniques, grasp finite difference operators, and Numerical Integration.				
3.	To understand and apply the LU Decomposition Method, and Gauss-Seidel Iterative method for solving linear systems of equations.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will develop an understanding of error measurement techniques and iteration methods.			Understand, Apply, and Analyze	
CO2:	Learners will develop skills in interpolation, understand differences, and excel in practical numerical integration.			Understand and Apply	
CO3:	Learners will use LU Decomposition and Gauss-Seidel for solving systems and applying Jacobi's for eigenvalue problems.			Understand and Apply	

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	University	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2022/06/6.9-R-Syllabus-T.Y.B.Sc. B.A. Mathematics.pdf		
Department	B.Sc (Mathematics)		

Course Code:	USMT.501	Class:	TYBSC	Semester:	V
Course Name:	Multivariable CalculusII				
Course Objectives:					
1.	To be able to analyze and apply multiple integrals.				
2.	To be able to define and interpret the Line integrals of a vector field.				
3.	To be able to interpret and apply the surface integrals.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will be able to recall the infinite series and apply the different tests to check its convergence and divergence.			Remember Apply	
CO2:	Learners will be able to analyze and demonstrate properties of line integrals, applications of conservative vector fields & Green’s theorem to solve line integrals.			Understand Analyze	
CO3:	Learners will be able to analyze and evaluate the surface integrals, Stoke’s theorem, and Gauss divergence theorem.			Analyze Evaluate	

Course Code:	USMT 601	Class:	TYBSC	Semester:	VI
Course Name:	Basic Complex Analysis				
Course Objectives:					
1.	To analyze the complex-valued functions.				
2.	To define and evaluate complex line integral and Cauchy integral formula.				
3.	To analyze Complex power series, Laurent series, and isolated singularities.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will be able to analyze properties, limits, continuity, differentiability, and analyticity of complex-valued functions.		Understand Analyze		
CO2:	Learners will be able to interpret and evaluate the complex line integral, Cauchy integral formula, and hyperbolic functions.		Understand Evaluate		
CO3:	Learners will be able to analyze and demonstrate Complex power series, Laurent series, and isolated singularities.		Understand Analyze		

Course Code:	USMT502	Class:	TYBSC	Semester:	V
Course Name:	Group Theory				
Course Objectives:					
1.	To gain the knowledge of important mathematical concepts in Group theory.				
2.	To Extend group structure to finite permutation groups (Cayley Hamilton Theorem) and group of symmetries.				
3.	To apply and analyze the properties of cyclic groups and solve equations within these structures.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Students will have a working knowledge of important mathematical concepts in Group theory.			Understand and Apply	
CO2:	Learners will Extend group structure to finite permutation groups and groups of symmetries.			Understand and Apply	
CO3:	Learners will apply and analyze the properties of cyclic groups, identify generators, determine orders, and solve equations within these structures.			Apply	

Course Code:	USMT602	Class:	TYBSC	Semester:	VI
Course Name:	Ring Theory				
Course Objectives:					
1.	To gain the knowledge of important mathematical concepts in Ring theory.				
2.	To Study ideals and concepts related to ideals.				
3.	To Study various integral domains in ring.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Students will be able to understand fundamental concepts of ring theory, including definitions, properties, and examples.			Understand and Apply	
CO2:	Students will understand the connection and transition between previously studied mathematics and more advanced mathematics.			Understand and Apply	
CO3:	The students will actively participate in the transition of important concepts such as homomorphisms & isomorphisms from discrete mathematics to advanced abstract mathematics.			Apply	

Course Code:	USMT 503	Class:	TYBSC	Semester:	V
Course Name:	Topology of Metric Spaces				
Course Objectives:					
1.	To explore metric spaces, subspaces, and open set properties.				
2.	To understand sequences, convergence, and completeness in metric spaces, apply Cantor's Intersection Theorem and density of rational numbers.				
3.	To understand the concept of compactness in metric spaces.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will understand the principles of metric spaces and analyze the concept of distances, boundaries, closures, and limit points.			Understand and remember	
CO2:	Learners will understand the principles of sequences, convergence, and completeness, applying Cantor's Intersection Theorem.			Understand and remember	
CO3:	Learners will understand the concept of compactness in metric spaces, properties of compact sets, and relate equivalent statements in $\mathbb{R}$.			Understand and remember	

Course Code:	USMT 603	Class:	TYBSC	Semester:	VI
Course Name:	Topology of Metric Spaces and Real Analysis				
Course Objectives:					
1.	To recall continuity through epsilon-delta definition, sequences, and algebraic properties, uniform continuity, contraction mapping, and the fixed point theorem.				
2.	To analyze separated sets, connectedness, and application in subsets of $\mathbb{R}$ and connected spaces.				
3.	To Understand pointwise and uniform convergence in sequences of real-valued functions, explore series convergence, and analyze properties of uniform convergence.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will remember the epsilon-delta definition, sequence characterization, algebraic properties of continuity, uniform continuity, contraction mapping, and the fixed point theorem.			Remember	
CO2:	Learners will summarize the concepts of separated sets, connectedness, and subsets in $\mathbb{R}$, and practical application in connected spaces.			Understand	
CO3:	Learners will apply conditions for integral and derivative convergence, analyze power series, and comprehend the representation and properties of classical functions defined by power series.			Understand and Apply	

Course Code:	USMT5C4	Class:	TYBSc	Semester:	V
Course Name:	Graph Theory(Elective C)				
Course Objectives:					
1.	To provide a comprehensive understanding of basic graph theory concepts.				
2.	To facilitate understanding of trees and tree algorithms Dijkstra’s, BFS, DFS, MST and Huffman coding.				
3.	To enable students to comprehend advanced graph theory concepts of Eulerian and Hamiltonian graphs with their applications.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will demonstrate understanding of fundamental graph theory concepts, special graph classes, and isomorphic graphs and properties.		Understand Apply		
CO2:	Learners will be able to demonstrate different types of algorithms including Dijkstra’s, BFS, DFS, MST and Huffman coding.		Understand Apply Analyze		
CO3:	Learners will be able to understand the concept of Eulerian graphs and Hamiltonian graphs and Describe real-world applications of graph theory.		Understand Apply		

Course Code:	USMT6C4	Class:	TYBSc	Semester:	VI
Course Name:	Graph Theory and Combinatorics (Elective C)				
Course Objectives:					
1.	To engage students in advanced graph coloring concepts, and the application of key theorems like Whitney's theorem.				
2.	To explain planar graph properties, Euler's formula, duality, Platonic solids and network flow applications.				
3.	To delve into the broad applications of the combinatorics, and Hall’s theorem for SDR.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will understand graph coloring, chromatic number, chromatic polynomials, vertex and edge connectivity, and Whitney’s theorem.		Understand		
CO2:	Learners will understand planarity properties, Euler’s formula, geometric duals in planar graphs, and graph theory applications in network flows.		Understand		
CO3:	Learners will grasp SDR, matching theory applications and various concepts of combinatorics.		Understand		

Subjects Offered by the Board of Studies, Zoology University of Mumbai			
First Year – Bachelor of Science			
Sr. No.	Semester – I	Sr. No.	Semester – II
1	Wonders of Animal World, Biodiversity and its Conservation	1	Ecology and Wildlife Management
2	Instrumentation and Animal Biotechnology	2	Nutrition, Public Health And Hygiene

Subjects Offered by the Board of Studies, Zoology University of Mumbai			
Second Year – Bachelor of Science			
Sr. No.	Semester – III	Sr. No.	Semester – IV
1	Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids	1	Origin and Evolution of Life, Population Genetics and Evolution, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research
2	Nutrition and Excretion, Respiration and Circulation, Control and Coordination of Life Processes, Locomotion and Reproduction	2	Cell Biology, Endomembrane System ,Biomolecules
3	Ethology, Parasitology, Economic Zoology	3	Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms
4	Maintenance of Aquarium, Agricultural and Household pests and their control, Amazing animals	4	Dairy Industry, Sericulture and Aquaculture

Subjects Offered by the Board of Studies, Zoology University of Mumbai**Third Year – Bachelor of Science**

Sr. No.	Semester – V	Sr. No.	Semester – VI
1	Levels of organization, Taxonomy of Phylum Protozoa to Phylum Nematelminthes, Taxonomy of Phylum Annelida to Phylum Echinodermata, Type study : Sepia	1	Minor Phyla and Protochordata, Taxonomy – Pisces and Amphibia, Taxonomy – Reptilia, Aves and Mammals, Type study : Shark
2	Basic Hematology, Applied Hematology ,Basic Immunology, Applied Immunology	2	Enzymology ,Homeostasis (Temperature and Ionic regulation) , Histology , General Pathology
3	Molecular Biology, Genetic engineering, Human Genetics, Tissue Culture	3	Zoogeography, Toxicology, Biostatistics, Bioinformatics
4	Integumentary system and derivatives, Endocrine glands and, Human Osteology, Experimental and Chick Embryology	4	Environment management,Wildlife management ,Bioethics, Bioprospecting and Zoopharmacognosy , General Entomology

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	100 Marks
Objectives & Outcome Framed by:	Board of Studies, Zoology University of Mumbai		
Syllabus Copy Link:	http://old.mu.ac.in/wp-content/uploads/2016/06/4.70_Zoology_fybsc.pdf		
Department	Zoology		

Course Code:	USZO101	Class:	FYBSC	Semester:	I
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Course Name:	Wonders of Animal World, Biodiversity and its Conservation
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Course Objectives:

1.	To take learners through a captivating journey of hoarded wealth of marvellous animal world.
2.	To orient learners about the rich heritage of Biodiversity of India and make them understand the significance of its conservation.
3.	To teach learners about innovative and novel work of scientists in the field of biological sciences.

Course Outcome:		Level of Bloom's Taxonomy
CO1	Curiosity will be ignited in the minds of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.	Understand
CO2:	Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation	Apply
CO3:	Minds of learners would be impulsed to think differently and would be encouraged ipso factor to their original crude ideas from the field of biological sciences.	Create

Course Code:	USZO201	Class:	FYBSC	Semester	II
Course Name:	Ecology and Wildlife Management				
Course Objectives:					
1.	To facilitate the learning of population ecology, its dynamics and regulatory factors are important for its sustenance.				
2.	To impart knowledge of different components of the ecosystem and educate about essentials of coexistence of human beings with all other living organisms.				
3.	To enlighten learners about the current status of wildlife conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis the adversity of poaching and biopiracy.				
Course Outcome:			Level of Blooms Taxonomy		
CO1.	This unit would allow learners to study about the nature of the animal population, specific factors affecting its growth and its impact on the population of other life forms.		Understand		
CO2.	Learners will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment and will lead to better understanding about implications of loss of fauna specifically on human beings, erupting a spur of desire for conservation of all flora and fauna.		Understand		
CO3.	Learners would be inspired to choose career options in the field of wildlife conservation, research, photography and ecotourism		Judge		

Course Code:	USZO102	Class:	FYBSC	Semester	I
Course Name:	Instrumentation and Animal Biotechnology				
Course Objectives:					
1.	To make learners aware of risks involved in handling of different hazardous chemicals, sensitive (electrical/electronic) instruments and infectious biological specimens especially during practical sessions in the laboratory				
2.	To acquaint learners to the modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being				
3.	To provide all learners a complete insight about the structure and train them with operational skills of different instruments required in Zoology.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners would work safely in the laboratory and avoid occurrence of accidents which will boost their scholastic performance and economy in use of materials/chemicals during practical sessions			Understand	
CO2:	Learners would understand recent advances in the subject and their applications for the betterment of mankind; and that the young minds would be tuned to think out of the box			Knowledge.	
CO3:	Students will be skilled to select and operate suitable Instruments for the studies of different components of Zoology of this course and also of higher classes including research.			Analysis	

Course Code:	USZO 202	Class:	FYBSC	Semester	II
Course Name:	Nutrition, Public Health And Hygiene				
Course Objectives:					
1.	To make learners understand the importance of a balanced diet and essential nutrients of food at different stages of life.				
2.	To impart knowledge about source, quantum and need for conservation of fast depleting water resources and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.				
3.	To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases				
Course Outcome:			Level of Bloom's Taxonomy		
CO1.	Healthy dietary habits would be inculcated in the life style of learners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits		Remember		
CO2.	Promoting optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense.		Analyse		
CO3.	Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions which would lead to a psychologically strong mind set promoting positive attitude important for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.		Evaluate.		

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	100 Marks
Objectives & Outcome Framed by:	Board of Studies, Zoology University of Mumbai		
Syllabus Copy Link:	http://old.mu.ac.in/wp-content/uploads/2016/06/4.32-TYBScSem-V-VI-Syllabus-Final-9th-April-2018-26-April-2018-1-4.pdf		
Department	Zoology		

Course Code:	USZO301	Class:	SYBSC	Semester:	III
Course Name:	Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids				

Course Objectives:

1.	To introduce basic terms of genetics To develop conceptual clarity of Mendelian principles of inheritance and other forms and pattern of inheritance
2.	To familiarize the learners with the structure, types and classification of chromosomes. To introduce the concept of sex determination and its types, sex influenced and sex-limited genes
3.	To introduce the learner to the classical experiments proving DNA as the genetic material. To introduce the learner to the structure of nucleic acids and the concept of central dogma of molecular biology. To familiarize the learner with the concept of gene expression and regulation

Course Outcome:		Level of Bloom's Taxonomy
CO1.	Learner will understand the concept of multiple alleles, linkage and crossing over. Learner would comprehend and apply the principles of inheritance to study heredity.	Understand
CO2.	Learner will comprehend the structure of chromosomes and its types.	Understand

	Learner will understand the mechanisms of sex determination. Learner would be able to correlate the disorders linked to a particular sex chromosome.	
CO3.	Learner will understand the importance of nucleic acids as genetic material. Learner would comprehend and appreciate the regulation of gene expressions.	Analyse

Course Code:	USZO401	Class:	SYBSC	Semester:	IV
Course Name:	Origin and Evolution of Life, Population Genetics and Evolution, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research				
Course Objectives:					
1.	To impart scientific knowledge about how life originated on our planet				
2.	To develop an understanding of genetic variability within a population and learn as to how the change in the gene pool leads to evolution of species				
3.	To inculcate scientific temperament in the learner				
Course Outcome:				Level of Blooms Taxonomy	
CO1.	Learner will analyse and critically view the different theories of evolution Learner will gain insights into the origin of life.			Analyse	
CO2.	Learner would understand the forces that cause evolutionary changes in natural populations. Learner will be able to distinguish between microevolution, macroevolution and mega evolution			Understand	
CO3.	The learner would develop qualities such as critical thinking and analysis. The learner will imbibe the skills of scientific communication and will understand the ethical aspects of research			Understand	

Course Code:	USZO302	Class:	SYBSC	Semester:	III
Course Name:	Nutrition and Excretion, Respiration and Circulation, Control and Coordination of Life Processes, Locomotion and Reproduction				
Course Objectives:					
1.	To introduce the concepts of physiology of nutrition, excretion and osmoregulation				
2.	To introduce the concepts of physiology of respiration and circulation.				
	To expose the learner to various respiratory and circulatory organs in different classes of organisms				
3.	To introduce the concepts of physiology of control and coordination, locomotion and reproduction.				
Course Outcome:				Level of Blooms Taxonomy	
CO1.	Learner would understand the increasing complexity of nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy. Learner would be able to correlate the habit and habitat with nutritional, excretory and osmoregulatory structures.			Understand	
CO2.	Learner would understand the increasing complexity of respiratory and circulatory physiology in evolutionary hierarchy. Learner will be able to correlate the habit and habitat of animals with respiratory and circulatory organs.			Analyse	
CO3.	Learner would understand the process of control and coordination by nervous and endocrine regulation. Learner would be amazed by various locomotory structures found in the animal kingdom. Learner would be acquainted with various reproductive strategies present in animals.			Understand	

Course Code:	USZO402	Class:	SYBSC	Semester:	IV
Course Name:	Cell Biology, Endomembrane System,				
Course Objectives:					
1.	To study the structural and functional organization of cells with an emphasis on nucleus, plasma membrane and cytoskeleton.				
2.	To acquaint the learner with ultrastructure of cell organelles and their functions				
3.	To give learners insight into the structure of biomolecules and their role in sustenance of life.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1.	Learner would acquire insight into the composition of the transport mechanisms adopted by the cell and its organelles for its maintenance and composition of cell			Remember	
CO2.	Learner would understand the interlinking of the endomembrane system for functioning of cells. Learner would appreciate the intricacy of the endomembrane system.			Understand	
CO3.	The learner will realize the importance of biomolecules and their clinical significance.			Knowledge	

Course Code:	USZO303	Class:	S.Y.B.Sc.	Semester:	III
Course Name:	Ethology, Parasitology, Economic Zoology				
Course Objectives:					
1	To equip learner with a sound knowledge of how animals interact with one another and their environment.				
2	To enable the learner to understand different behavioural				
3	To acquaint the learner with the concepts of parasitism and its relationship in the environment.				
4	To introduce the learner to modes of transmission of				
5	To disseminate information on economic aspects of animals like apiculture, vermiculture and dairy science.				
6	To encourage young learner for self-employment				
Course Outcome:				Level of Blooms Taxonomy	
CO1.	Learner would gain insight into different types of animal behaviour and their role in biological adaptations. Learner would be sensitized to the feelings which are instrumental in social behaviour.			Remember	
CO2.	Learner would understand the general epidemiological aspects of parasites that affect humans and take simple preventive measures for the same. Learner would comprehend the life cycle of specific parasites, the symptoms of the disease and its treatment			Understand	
CO3.	Learner would gain knowledge on animals useful to mankind and the means to make the most of it. Learner would learn the modern techniques in animal husbandry. Learner would pursue entrepreneurship as a career.			Analyse	

Course Code:	USZOE1403	Class:	S.Y.B.Sc.	Semester:	IV
Course Name:	Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms				
Course Objectives:					
1	To acquaint the learner with key concepts of embryology.				
2	To acquaint the learners with different aspects of human reproduction.				
3	To make them aware of the causes of infertility, techniques to overcome infertility and the concept of birth control.				
4	To provide a panoramic view of the impact of human activities leading to pollution and its implications.				
Course Outcome:			Level of Blooms Taxonomy		
CO1.	Learner will be able to understand and compare the different types of eggs and sperms. Learner will be able to acquire and compare the different type of eggs and sperms		Understand		
CO2.	Learners will able to understand human reproductive physiology Learners will become familiar with advances in ART and related ethical issues.		Knowledge		
CO3.	The learners will be sensitized about the adverse effects of pollution and measures to control it		Remember		

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science		
Assessment:	College	Pattern:	100 Marks
Objectives & Outcome Framed by:	Board of Studies, Zoology University of Mumbai		
Syllabus Copy Link:	http://old.mu.ac.in/wp-content/uploads/2016/06/MScI_ZooSyllabus-Formatted_18Aug2019.pdf		
Department	Zoology		

Course Code:	USZO501	Class:	TYBSC	Semester:	V
Course Name:	Taxonomy - Invertebrates and Type Study				
Course Objectives:					
1.	To introduce the principles of taxonomy and modern system of classification in the animal kingdom with evolution point of view.				
2.	To comprehend the general characters and classification of Kingdom Animalia from Porifera to Nematoda and specific characters of organisms belonging to these phyla.				
3.	To introduce basic concepts of classification up to class in animal kingdom from phylum Annelida to Hemichordata and to familiarize with their characters.				
4.	To acquaint learners with the details of Sepia as a representative of invertebrate animals.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1.	Learners will apprehend the basis of classification and modern classification up to class of the lower invertebrate animals.			Understand	
CO2.	The learners will be familiarized with classification up to phylum Nematoda along with their examples.			Create	
CO3.	Students will get an idea of higher groups of invertebrate animal life, their classification and their peculiar aspects.			Evaluate	

CO4.	Learners should have get an idea of general characteristics and details of invertebrate animal systems.	Knowledge
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Course Code:	USZO601	Class:	T.Y.Bsc	Semester:	VI
Course Name:	Taxonomy - Chordates and Type Study				
Course Objectives:					
1.	To introduce basic concepts of modern Chordate classification with evolution point of view and to understand the concept of taxonomy in higher animal kingdom.				
2.	To describe general features and classify fish and amphibians.				
3.	To introduce the learners to the distinguishing characters of classes Reptilia, Aves and Mammalia and their adaptive features with reference to their habitat.				
4.	To study in depth one vertebrate animal type i. e. general characteristics and salient features of animal type - shark.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1.	Learners will get an idea of the origin of Chordates, its taxonomy up to class with reference to phylogeny and their special features.		Remember		
CO2.	Learners will understand the characteristic features and examples of fish and amphibians by their anatomical features.		Understand		
CO3.	Learners will understand the characteristic features and examples of the class of Reptilia, Aves and Mammalia.		Knowledge		
CO4.	Learners will get an idea of vertebrate animal life after studying one representative animal - sharks.		Understand		

Course Code:	USZO502	Class:	T.Y.B.Sc.	Semester:	V
Course Name:	Haematology and Immunology				
Course Objectives:					
1.	To introduce to the learner the composition of blood, haemorrhage and haematopoiesis. To acquaint the learner with the physiology of blood clotting and clinical aspects of haematology.				
2.	To Familiar the learner the basics of applied haematology and to impart knowledge of diagnostic techniques used in pathology.				
3.	To introduce the topic of immunology by emphasizing the basic concepts to build a strong foundation and to give an overview of the immune system that plays an important role in disease resistance.				
4.	To knowledge the concept of vaccines and vaccination. To familiarise the learner to immunological perspectives of organ transplantation.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1.	The learner shall comprehend basic haematology. The learner will be able to identify various components of haemostatic systems.		Understand		
CO2.	The learner will be familiar with the terminology used and diagnostic tests performed in a pathological laboratory. The learner shall be acquainted with diagnostic approaches in haematological disorders. The learner will be better equipped for further pathological courses or working in a diagnostic laboratory.		Remember		
CO3.	The students shall comprehend the types of immunity and the components of the immune system. The learner will realize the significant role of the immune system in giving resistance against diseases.		Understand		
CO4.	The learner shall understand immunopathology and the principles and applications of vaccines. The		Knowledge		

	learner will develop a basic understanding of immunology of organ transplantation.	
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Course Code:	USZO602	Class:	T.Y.Bsc	Semester:	VI
Course Name:	Physiology and Tissue Culture				
Course Objectives:					
1.	To introduce to the learner the fundamental concepts of enzyme biochemistry and to enable the learner to realize applications of enzymes in basic and applied sciences.				
2.	To acquire the learner the concept of homeostasis-thermoregulation and osmoregulation				
3.	To introduce to the learner the details of endocrine glands and its disorders.				
4.	To remember the fundamental concepts of tissue culture and guide them progressively to certain areas of animal tissue culture.				
Course Outcome:			Level of Bloom's Taxonomy		
CO1.	The learner shall understand fundamentals of enzyme structure, action and kinetics. The learner shall appreciate the enzyme assay procedures and the therapeutic applications of enzymes.		Remember		
CO2.	The students shall comprehend the adaptive responses of animals to environmental changes for their survival.		Analyse		
CO3.	The learner shall analysed the types and secretions of endocrine glands and their functions.		Knowledge		
CO4.	The learner shall understand the significance of tissue culture as a tool in specialized areas of research. The learner will appreciate its applications in various industries.		Understand		

Course Code:	USZO503	Class:	T.Y.B.Sc	Semester:	v
Course Name:	Histology, Toxicology, Pathology and Biostatistics				
Course Objectives:					
1.	To familiarize the learner with the cellular architecture of the various organs in the body. To make the learner understand the need and importance of different types of tissues in the vital organs and their functions.				
2.	To introduce the learner to the principles of toxicology with particular emphasis on toxic responses to chemical exposures, nature and effect of toxicity and toxicity testing. It also intends to develop amongst students an introductory understanding of regulatory affairs in toxicology.				
3.	Acquired the learner to basics of general pathology. To impart knowledge of retrogressive, necrotic, pathological conditions in the body. To explain the repair mechanism of the body.				
4.	To make learner familiar with biostatistics as an important tool of analysis and its applications.				
Course Outcome:				Level of Blooms Taxonomy	
CO1.	Learner would appreciate the well-planned organization of tissues and cells in the organ systems.			Remember	
CO2.	The course will prepare learner to develop a broad understanding of the different areas of toxicology. It will also develop critical thinking and assist students in preparation for employment in the pharmaceutical industry and related areas.			Understand	
CO3.	Students will be familiar with various medical terminologies pertaining to pathological conditions of the body caused due to diseases.			Analyze	
CO4.	The learner will be able to collect, organize and analyse data using parametric and non-parametric tests. They will also be able to set up a hypothesis and verify the same using limits of significance.			Analyze	

Course Code:	USZO603	Class:	T.Y.B.Sc.	Semester:	VI
Course Name:	Genetics and Bioinformatics				
Course Objectives:					
1.	To introduce learner to chemical and molecular processes that affect genetic material. To make learner understand the concept of DNA damage and repair, and how gene control is necessary for cell survival.				
2.	To familiarize learner to a set of techniques to modify an organism’s genome to produce improved or novel genes and organisms.				
3.	learner understand with genetic alterations in the human genome and their diagnosis.				
4.	learner acquired to bioinformatics - a computational approach to learning the structure and organization of genomes, phylogeny and metabolism.				
Course Outcome:			Level of Blooms Taxonomy		
CO1.	Learner shall get an insight into the intricacies of chemical and molecular processes that affect genetic material. The course shall prepare learner to recognize the significance of molecular biology as a basis for the study of other areas of biology and biochemistry. Learner shall also understand related areas in relatively new fields of genetic engineering and biotechnology.		Remember		
CO2.	The learner shall be acquainted with the vast array of techniques used to manipulate genes which can be applied in numerous fields like medicine, research, etc. for human benefit.		Apply		
CO3.	The learner shall become aware of the impact of changes occurring at gene level on human health and its diagnosis.		Understand		
CO4.	Learner shall become aware of the computational point of view of studying the genomes.		Analysed		

Course Code:	USZO504	Class:	T.Y.B.Sc.	Semester:	V
Course Name:	Anatomy and Developmental Biology				
Course Objectives:					
1.	To introduce the learner to understand different integumentary structures and derivatives in the vertebrates and to acquaint learners with special derivatives of integument.				
2.	To introduce the learner to different bones of the human skeleton and their functional importance.				
3.	To study long limb muscles involved in body movements. To identify various arrangements of the long limb muscles and to relate the arrangement with contraction and motion. To study muscle injuries and syndromes				
4.	To introduce the learner to the basics of developmental biology with reference to chick as a model and also familiarize with experiments related to it.				
Course Outcome:				Level of Blooms Taxonomy	
CO1.	Learner will be able to understand the importance of various types of epidermal and dermal derivatives along with their functions.			Understand	
CO2.	Learner will be able knowledge about the structure, types and functions of the human skeleton.			Remember	
CO3.	Learner will be able to understand the types of long limb muscles, its arrangement and their role in body movements.			Knowledge	
CO4.	Student will be able to understand the processes involved in embryonic development and practical applications of studying chick embryology.			Analyse	

Course Code:	USZO604	Class:	T.Y.B.Sc.	Semester:	VI
Course Name:	Environmental Biology and Zoopharmacognosy				
Course Objectives:					
1.	Learner should understand different factors affecting the environment and various methods to improve environmental stewardship.				
2.	To sensitize learner regarding the various threats to the wildlife To introduce learner various ways that can help in the protection, conservation, management, and enhancement of wildlife populations and habitat.				
3.	To introduce the learner to the concepts of bioprospecting and zoopharmacognosy. Learner will be made aware of the process of discovery and commercialization of new products based on biological resources and introduce learner with various ethological aspects by which non-human animals apparently self-medicate themselves.				
4.	To introduce learner to the geographic distribution (present and past) of animal species. To introduce learner to various ways of animal distribution				
Course Outcome:			Level of Bloom's Taxonomy		
CO1.	Learner will understand the different factors affecting the environment, its impact and environment management laws.		Understand		
CO2.	Learner will be able to understand various methods for wildlife conservation. Learner will be able to apply knowledge to overcome the issues related to wildlife conservation and management		Knowledge		
CO3.	Learner will equipped the paradigms of discovery and commercialization of biological resources and knowledge gained from self-medication observed in animals.		Analyse		
CO4.	The learners will become acquainted with how and why different animal species are distributed around the globe.		Understand		

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	F.Y.B.Sc. (Information Technology)		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	University		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2022/10/Revised-Syllabus-of-F.Y.B.Sc.-programme-in-Information-Technology-Sem.-I-II-CBCS-Vide-item-No.-6.10R-1.pdf		
Department	BSc. Information Technology		

Course Code:	USIT101	Class:	FYBSc.IT	Semester:	I
Course Name:	Programming Principles with C				
Course Objectives:					
1.	To develop the logical ability of the student.				
2.	Basic concepts to be cleared using suitable examples.				
3.	Different approach towards the problem.				
4.	To handle the errors and find suitable solutions.				
5.	Debugging the code.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to learn the basic principles of programming		Understand		
CO2:	Learners will be able to develop logic using algorithms and flowchart.		Apply & Create		
CO3:	Learners will be able to Acquire the information about data types.		Analyze		
CO4:	Learners will be able to understand input and output functions.		Understand and Remember		
CO5:	Learners will be able to enhance advanced concepts using the program.		Remember		

Course Code:	USIT201	Class:	FYBSc.IT	Semester:	II
Course Name:	Object Oriented Programming with C++				
Course Objectives:					
1.	To explain the difference between object oriented programming and procedural programming.				
2.	To program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc				
3.	To build C++ classes using appropriate encapsulation and design principles				
4.	To apply object oriented or non-object oriented techniques to solve				
5.	To solve bigger computing problems				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to Understand the concept of OOPs, features of C++ language.			Understand	
CO2:	Learners will be able to Understand and apply various types of Data Types, Operators, and Conversions while designing the program.			Apply	
CO3:	Learners will be able to Understand and apply the concepts of Classes & Objects, friend function, constructors & destructors in program design.			Understand & apply	
CO4:	Learners will be able to Design & implement various forms of inheritance, String class, calling base class constructors.			Implement & Apply	
CO5:	Learners will be able to Apply & Analyze operator overloading, runtime polymorphism, Generic Programming. Analyze and explore various Stream classes, I/O operations and exception handling.			Apply & Analyze	

Course Code:	USIT102	Class:	FYBScIT	Semester:	I
Course Name:	Digital Logic and Applications				
Course Objectives:					
1.	To introduce the basics of logic in digital electronics as an entry level course. To interpret and assess number systems and the conversions of number systems				
2.	To analyze the Boolean expressions and reduce the expression to the minimum.				
3.	To design simple logic circuits using tools such as Boolean Algebra and Karnaugh Mapping.				
4.	To understand the state of a memory cell and its types using flip-flops.				
5.	To create simple digital systems using counters, registers etc.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will be able to, Apply number conversion techniques in real digital systems			Apply	
CO2:	Learners will be able to solve Boolean algebra expressions			Apply	
CO3:	Learners will be able to derive and design logic circuits by applying minimization in SOP and POS forms			create	
CO4:	Learners will be able to design and develop Combinational and Sequential circuits			create	
CO5:	Learners will be able to understand and develop digital applications			Create & understand	

Course Code:	USIT202	Class:	FYBScIT	Semester:	II
Course Name:	Fundamentals of Microprocessor and Microcontrollers				
Course Objectives:					
1.	To understand the basic concept of Micro Computer Systems				
2.	To develop background knowledge in 8085 Microprocessor				
3.	To write Assembly language Programs of 8085				
4.	To understand the peripheral devices and interfacing to 8051 Microcontroller and design aspects of Micro Controller				
5.	Develop a well-structured embedded program				
Course Outcome:			Level of Bloom's Taxonomy		
CO1:	Learners will be able to Understand the basic concepts of Micro Computer Systems		Understand		
CO2:	Learners will be able to Understand the architecture and hardware aspects of 8085		Understand		
CO3:	Learners will be able to Write assembly language programs in 8085		Remember, Understand, Analyze & Apply		
CO4:	Learners will be able to Design elementary aspects of Micro Controller based systems		Create, Understand, Apply		
CO5:	Learners will be able to Interfacing peripherals using Microcontroller		Remember, Understand, Analyze, Apply		

Course Code:	USIT103	Class:	FYBSc IT	Semester:	I
Course Name:	Fundamentals of Database Management Systems				
Course Objectives:					
1.	to present an introduction to fundamentals of database management systems				
2.	with an emphasis on how to organize				
3.	Understand the concept of normalization and its purpose in database design, Learn about different normal forms (1NF, 2NF, 3NF, BCNF)				
4.	Understand the basics of SQL (Structured Query Language) syntax				
5.	Understand the concept of database transactions and the ACID properties, Describe methods of database recovery for ensuring data integrity after system failures.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will be able to define and describe the fundamental elements of relational database management systems.			Remember and Understand	
CO2:	Learners will be able to relate the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.			Apply	
CO3:	Learners will be able to design ER-models to represent simple database application scenarios.			Analyze	
CO4:	Learners will be able to transform the ER-model to relational tables, populate relational databases and formulate SQL queries on data. Improve the database design by normalization.			Remember, Understand, Apply	
CO5:	Learners will be able to understand basic database storage structures and access techniques: file and page organizations, indexing methods and hashing.			Understand	

Course Code:	USIT203	Class:	FYBScIT	Semester:	II
Course Name:	Web Applications Development				
Course Objectives:					
1.	Understand basic concepts of Internet and World Wide Web, Become familiar with concept of stylesheets and various CSS effects.				
2.	Comprehend different HTML elements that can be used to develop static web pages.				
3.	Peruse JavaScript as a tool to add dynamism to static HTML pages.				
4.	Explore how server-side script works on the web.				
5.	Learn how PHP can be connected to a database to store and retrieve data.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will be able to analyze the working of the Internet, Gain an insight into designing web pages.			Analyze	
CO2:	Learners will be able to use different ways of styling web pages using CSS.			Create, design	
CO3:	Learners will be able to implement basic and complex functionalities of JavaScript in a web page.			Create, evaluate, understand, apply	
CO4:	Learners will be able to employ PHP Scripts to execute dynamic tasks in a web page.			Create, evaluate, understand, apply	
CO5:	Learners will be able to perform various database tasks using PHP.			Create, apply, evaluate	

Course Code:	USIT104	Class:	FYBScIT	Semester:	I
Course Name:	Computational Logic and Discrete Structure				
Course Objectives:					
1.	overview of discrete mathematics.				
2.	Learn new topics such as logic and proofs, sets and functions,				
3.	Enhance problem-solving skills and logical reasoning.				
4.	Learn new topics such as recursion, graph theory				
5.	Detail about tress and other important discrete math concepts.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to use logical notation			Understand, Remember,	
CO2:	Learners will be able to perform logical proofs, apply recursive functions and solve recurrence relations			Analyze, Remember, Understand	
CO3:	Learners will be able to use graphs and trees, Apply basic and advanced principles of counting			Apply, Understand	
CO4:	Learners will be able to define sets and Relations			Create, Apply	
CO5:	Learners will be able to calculate discrete probabilities.			Apply	

Course Code:	USIT204	Class:	FYBScIT	Semester:	II
Course Name:	Numerical Methods				
Course Objectives:					
1.	Introduce the concept of mathematical modeling in the context of engineering problem-solving, explore concepts related to significant figures, accuracy, precision, and various error definitions.				
2.	Understand methods for finding roots of algebraic equations & Study methods for estimating values between known data points				
3.	Understand and apply iterative methods for solving systems of linear equations, Learn numerical techniques for approximating derivatives and integrals.				
4.	to solve ordinary differential equations, Understand the principles of least-squares regression for curve fitting.				
5.	Learn optimization techniques for linear programming problems, Study methods for solving partial differential equations numerically.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations.			Understand	
CO2:	Learners will be able to understand the difference operators and the use of interpolation.			Understand and Remember	
CO3:	Learners will be able to understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.			Create	
CO4:	Learners will be able to demonstrate proficiency in interpreting regression results and assessing the goodness of fit.			Understand	
CO5:	Learners will be able to formulate and solve linear programming problems to optimize resource allocation or decision-making.			Apply	

Course Code:	USIT105	Class:	FYBScIT	Semester:	I
Course Name:	Technical Communication Skills				
Course Objectives:					
1.	To recognize the importance of various types of communication in technical set up.				
2.	To understand the dynamics in different forms of formal communication.				
3.	To learn about active listening and the art of giving presentations and interviews.				
4.	To learn the art of business writing and ethics in business communication across functional areas.				
5.	To evaluate, analyze and interpret technical data.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to Analyze, synthesize and utilize the process and strategies from delivery to solving communication problem.		Understand		
CO2:	Learners will be able to Learn the communication methodologies at workplace and learning about importance of team collaboration.		Understand and Remember		
CO3:	Learners will be able to Learn about different technical communication such as presentations and interviews.		Analyze		
CO4:	Learners will be able to Understand and apply the art of written communication in writing reports, proposals.		Analyze		
CO5:	Learners will be able to Ground rules of ethical communication and MIS, Understand the functions of graphs, maps, charts.		Understand, Evaluate		

Course Code:	USIT205	Class:	FYBScIT	Semester:	II
Course Name:	Green IT				
Course Objectives:					
1.	To understand the concept of Green Technology, To learn Green IT regulating Green IT and different standards.				
2.	To understand the concept of minimizing power utilization in technology.				
3.	To know about Green PCs, Green notebooks and servers and Green data centers. To know how the way of work is changing and understand implementation of Paperless work.				
4.	To know the concept of Recycling.				
5.	To understand Metrics for Green IT				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to, Understand the concept of Green IT and problems related to it, Know different standards for Green IT.			Understand and Remember	
CO2:	Learners will be able to, Understand the how power usage can be minimized in Technology.			Apply, Remember	
CO3:	Learners will be able to learn about how the way of work is changing.			Apply, Remember	
CO4:	Learners will be able to, Understand the concept of recycling.			Apply and Analyze	
CO5:	Learners will be able to know how information system can stay Green Information system.			Remember	

FACULTY OF SCIENCE – UNDERGRADUATE

DEPARTMENT OF INFORMATION TECHNOLOGY

Program Name:	Bachelor of Science (Information Technology)		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	University		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2023/07/6.4-S.Y.B.Sc.-I.T.pdf		
Department	BSc. Information Technology		

Course Code:	USIT301	Class:	SYBScIT	Semester:	III
Course Name:	Python Programming				
Course Objectives:					
1.	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements				
2.	Express proficiency in the handling of strings and functions				
3.	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets				
4.	Identify the commonly used operations involving file systems and regular expressions.				
5.	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to, Aware of the variables, expressions, looping and conditions used in Python programming			Remember	
CO2:	Learners will be able to implement functions, strings			Understand	
CO3:	Learners will be able to implement lists, tuples and directories			Understand	

CO4:	Learners will be able to apply the programming skillset learnt here into various domains by having advance programming skillset of Python and usage of libraries.	Apply
CO5:	Learners will be able to create GUI forms and add widgets, Use MySQL to store data.	Create

Course Code:	USIT401	Class:	SYBScIT	Semester:	IV
Course Name:	Core Java				
Course Objectives:					
1.	Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading. Identify classes, objects, members of a class and the relationships among them needed for a specific problem.				
2.	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, automatic documentation through comments, error exception handling)				
3.	Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing				
4.	Develop programs using the Java Collection API as well as the Java standard class library.				
5.	Apply object-oriented programming concepts in problem solving through JAVA				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to earn the architecture of Java			Understand	
CO2:	Learners will be able to identify data types, control flow, classes, inheritance, exceptions and event handling			Understand	
CO3:	Learners will be able to use object-oriented concepts for problem solving real-life applications			Apply	
CO4:	Learners will be able to build GUI programs			Create	
CO5:	Learner will be able to create event driven programs using java.			create	

Course Code:	USIT302	Class:	SYBScIT	Semester:	III
Course Name:	Data Structures				
Course Objectives:					
1.	Ability to analyze the performance of algorithms				
2.	Ability to choose appropriate algorithm design techniques for solving problems				
3.	Understand how a stack & queue can be implemented using an array or a linked list.				
4.	Understand the importance of sorting in organizing data for efficient retrieval.				
5.	Understand how the choice of data structures and the algorithm design methods impact the performance of programs				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to identify and distinguish data structure classification, data types, their complexities			Understand	
CO2:	Learners will be able to implement array, linked list			Apply	
CO3:	Learners will be able to implement stack and queue.			Apply	
CO4:	Learners will be able to implement trees, various hashing techniques and graph for various applications			Apply	
CO5:	Learners will be able to compare various sorting and searching techniques			Analyze	

Course Code:	USIT402	Class:	SYBScIT	Semester:	IV
Course Name:	Introduction to Embedded Systems				
Course Objectives:					
1.	To introduce the Building Blocks of Embedded System				
2.	To Educate in Various microcontrollers used in Embedded Development				
3.	To Introduce Bus Communication in processors, Input/output interfacing.				
4.	To impart knowledge in sensors and actuators.				
5.	To familiar with the real world application development using embedded system				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to do differentiate between general purpose and embedded systems			Understand	
CO2:	Learners will be able to enables interoperability between different embedded systems.			Understand	
CO3:	Learners will be able to discuss the characteristics and quality attributes of embedded systems			Understand	
CO4:	Learners will be able to use different types of sensors for appropriately			Apply	
CO5:	: Learners will be able to design and develop embedded systems			Create	

Course Code:	USIT303	Class:	SYBScIT	Semester:	III
Course Name:	Computer Networks				
Course Objectives:					
1.	Knowledge of uses and services of Computer Network.				
2.	Ability to identify types and topologies of network.				
3.	Understanding of analog and digital transmission of data				
4.	Familiarization with the techniques of routing				
5.	Understand the functioning of networking application				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to identify various data communication standards, topologies and terminologies			Remember	
CO2:	Learners will be able to describe how signals are used to transfer data and communication aspects between nodes			Understand, Remember	
CO3:	Learners will be able to configure IP addresses using routing protocols			Apply	
CO4:	Learners will be able to configure IP addresses using TCP/IP protocol suit			Apply	
CO5:	Learners will be able to use different application layer protocols			Apply	

Course Code:	USIT403	Class:	SYBScIT	Semester:	IV
Course Name:	Computer Oriented Statistical Techniques				
Course Objectives:					
1.	To learn the different methods of calculating the central tendencies				
2.	To introduce the moments, skewness and kurtosis.				
3.	To learn scientific view to conduct the survey in proper way to collect the data about specific perspective.				
4.	To Learn variety of probability sampling methods for selecting a sample from a population.				
5.	To learn the sampling theory and testing of hypothesis and making inferences. To introduce the students with understanding of the curve fitting, regression and correlation techniques.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to calculate and apply measures of central tendencies and measures of dispersion -- grouped and ungrouped data cases.			Apply	
CO2:	Learners will be able to calculate the moments, skewness and kurtosis by various methods.			Apply	
CO3:	Learners will be able to apply discrete and continuous probability distributions to various business problems.			Apply	
CO4:	Learners will be able to perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values			Apply	
CO5:	Learners will be able to apply simple linear regression and correlation model to real life examples.			Analyze	

Course Code:	USIT304	Class:	SYBScIT	Semester:	III
Course Name:	Operating Systems				
Course Objectives:					
1.	Analyze the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.				
2.	Identify the dead lock situation and provide appropriate solution so that protection and security of the operating system is also maintained				
3.	Analyze memory management techniques, concepts of virtual memory and disk scheduling. Understand the implementation of file systems and directories along with the interfacing of IO devices with the operating system.				
4.	Ability to apply CPU scheduling algorithms to manage tasks.				
5.	Knowledge of methods of prevention and recovery from a system deadlock				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will be able to Role of Operating System Computer System.			Understand	
CO2:	Learner will be able to Use the different types of Operating System and their services.			Understand	
CO3:	Learner will be able to configure process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.			Apply, Analyze	
CO4:	Learner will be able to Apply virtual memory concepts.			Apply	
CO5:	Learner will be able to Effectively use and manage secondary memory			Apply	

Course Code:	USIT404	Class:	SYBScIT	Semester:	IV
Course Name:	Software Engineering				
Course Objectives:					
1.	Develop the software projects or prototypes by understanding the requirements				
2.	Meet the project deadlines along with the number of resources and type of tasks to be carried out. Evaluate and analyze the SDLC and basic architecture SRS documents.				
3.	Help to understand the software design and coding techniques.				
4.	Understand the concept project management, Understand the software testing principles.				
5.	Identify various concepts of Advanced UML techniques				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	The Learner will be able to Understand software engineering			Understand	
CO2:	The Learner will be able to Apply software engineering principles			Apply	
CO3:	The learner will be able to understand quality management, project management			Understand	
CO4:	Learners will be able to discuss various approaches to verification and validation of software including testing, measurements and estimation of software products			Understand	
CO5:	Learners will be able to create software using different software development models			Create	

Course Code:	USIT305	Class:	SYBScIT	Semester:	III
Course Name:	Applied Mathematics				
Course Objectives:					
1.	Apply the knowledge of matrices to solve the problems.				
2.	Know and to understand various types of numerical methods.				
3.	Ability to interpret the mathematical results in physical or practical terms for complex numbers.				
4.	Inculcate the habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion				
5.	Solve and analyze the Partial derivatives and its application in related field of engineering				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to solve the matrix operations, identify the linear dependence and independence of a vectors			Apply	
CO2:	Learners will be able to familiar with the various forms and operations of a complex number.			Understand	
CO3:	Learners will be able to find the Laplace transform of a function and Inverse Laplace transform of a function using definition also solve ordinary differential equations using Laplace transform.			Apply	
CO4:	Learners will be able to evaluate the multiple integrals in Cartesian, Polar coordinates, change the order of the integral, Apply integration methods to calculate the areas and volumes of solids.			Apply	
CO5:	Learners will be able to evaluate the Beta, Gamma, Differentiation Under integral sign and error functions			Apply	

Course Code:	USIT405	Class:	SYBScIT	Semester:	IV
Course Name:	Computer Graphics and Animation				
Course Objectives:					
1.	To train the students to acquire skills in generating marketable computer graphics and animated pictures, especially in the area of advertisements.				
2.	To train the students to acquire skills and mastery in the use of different software producing graphics and animation.				
3.	The course introduces the basic concepts of computer graphics.				
4.	It provides the necessary theoretical background and demonstrates the application of computer science to graphics.				
5.	The course further allows students to develop programming skills in computer graphics through programming assignments				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand the basics of computer graphics, different graphics systems and applications of computer graphics			Understand	
CO2:	Learners will be able to explore projections and visible surface detection techniques for display of 3D scene on 2D screen. Render projected objects to naturalize the scene in 2D view and use of illumination models			Understand, Apply	
CO3:	Learners will be able to apply and compare the algorithms for drawing 2D images also explain aliasing, anti-aliasing and half toning techniques. Discuss OpenGL application programming Interface and apply it for 2D & 3D computer graphics			Apply, Analyze	
CO4:	Learners will be able to understand the core concepts and mathematical foundations of computer graphics			Understand	
CO5:	Learners will be able to solve the problems on viewing transformations and explain the projection and hidden surface removal algorithms, Apply basic ray tracing			Apply, Analyze	

	algorithm, shading, shadows, curves and surfaces and also solve the problems of curves	
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FACULTY OF SCIENCE – UNDERGRADUATE

DEPARTMENT OF INFORMATION TECHNOLOGY

Program Name:	Bachelor of Science (Information Technology)		
Assessment:	University	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	https://old.mu.ac.in/wp-content/uploads/2016/06/4.49-Final-TYBSc-IT-Syllabus-2.pdf		
Department	BSc. Information Technology		

Course Code:	USIT501	Class:	TYBScIT	Semester:	V
Course Name:	Software Project Management				
Course Objectives:					
1.	Maintain accurate and comprehensive documentation, including project plans, progress reports, and meeting minutes.				
2.	Improve project planning, create & manage project expectation & budget				
3.	To plan and schedule activities for a project, identify, assess, and mitigate risks that could impact the project and identify, allocate resources (e.g., people, equipment, materials) required for the project.				
4.	To track project progress, establish and manage contracts with vendors and other stakeholders involved in the project, and also create a positive and productive work environment for the project team.				
5.	To understand the importance of teamwork in software development projects, significance of software quality, importance and process of closing out a software development project effectively.				
Course Outcome:			Level of Blooms Taxonomy		

CO1:	The learner will be able to do the successful delivery of the project within the defined scope, timeline, and budget.	Apply
CO2:	The learner will be able to do efficient resource allocation & improved project control	Apply
CO3:	Learners will be able to improved project planning, Reduced project risks, improved risk management plan, improved project control.	Apply
CO4:	Learners will be able to improved project visibility, Clear understanding of rights and responsibilities, reduced contractual risks, Improved team morale	Understand
CO5:	Learners will be able to learn about effective team structures, communication strategies, and leadership approaches, reasons for project closure, software quality models.	Remember, Understand

Course Code:	USIT601	Class:	TYBScIT	Semester:	VI
Course Name:	Software Quality Assurance				
Course Objectives:					
1.	Introduce the Concept of Quality in Software Development, Understand the Principles of Software Quality				
2.	Introduce software testing				
3.	Learn about Unit Testing in Software Development, Explore Data Flow Testing Techniques				
4.	Understand Software Validation and Verification Processes, Introduce the V-Test Model in Software Testing				
5.	Understand Different Levels of Testing, Explore Specialized Testing Techniques				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to understand the importance of quality in software product, and evaluate software quality using established principles.		Apply, Knowledge		
CO2:	Learners will be able to understand the various types of testing, apply knowledge to recognize situations where testing is essential.		Apply, Knowledge		
CO3:	Learners will be able to implement and execute basic unit tests, apply data flow testing techniques to identify potential issues.		Apply, Knowledge		
CO4:	Learners will be able to implement validation and verification processes in a software project, Understand the rationale behind the V-Test model.		Apply, Knowledge		
CO5:	Learners will be able to understand the scope and objectives of each testing level, Assess the effectiveness of specialized testing in addressing specific concerns.		Evaluate, Apply, Knowledge		

Course Code:	USIT502	Class:	TYBScIT	Semester:	V
Course Name:	Internet of Things				
Course Objectives:					
1.	Introduce the concept of IoT, overview of technology, & explore potential application of IoT				
2.	Introduce the concept of prototyping various related topics in the context of embedded devices, physical design.				
3.	Introduce the concept of prototyping various related topics in the context of embedded devices, and online components.				
4.	Understand Techniques for Writing Embedded Code, Explore Business Models in IoT				
5.	Understand the Process of Moving to Manufacture in IoT, Explore Ethics in IoT				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	The learners will be able to gain basic knowledge of IoT, how it works, & identify uses of IoT.			Remember, Understand, Apply	
CO2:	The learners will be able to gain basic knowledge of different prototyping concepts, including sketching, cost considerations, open-source vs. closed-source options.			Remember	
CO3:	The learners will be able to gain basic knowledge of different prototyping concepts and API integration.			Remember	
CO4:	The learners will be able to Identify and comprehend various techniques, Understand different business models applicable to IoT.			Knowledge, Apply	
CO5:	The learners will be able to Grasp the steps involved in transitioning from design to manufacturing in IoT., Understanding the steps in moving to manufacture., Applying manufacturing principles to IoT development.			Knowledge, Apply	

Course Code:	USIT602	Class:	TYBScIT	Semester:	VI
Course Name:	Security in Computing				
Course Objectives:					
1.	Understand the fundamental principles of computer security and the CIA triad (Confidentiality, Integrity, Availability), Understand the process of identifying, assessing, and mitigating security risks, Learn and apply secure design principles for software, hardware, and network systems				
2.	Understand different methods for user authentication (e.g., passwords, multi-factor authentication), the concept of access control and authorization mechanisms, basic concepts of encryption, decryption, and different encryption algorithms ,the importance of securing storage devices and data at rest and security threats and best practices for securing databases				
3.	Understand principles of designing secure networks, including segmentation and demilitarized zones (DMZs), importance of securing network devices such as routers and switches, functionality and different types of firewalls, security risks associated with wireless networks and different security protocols				
4.	Understand the concepts of intrusion detection and prevention systems, security considerations and best practices for securing VOIP communications, different operating system security models and their access control mechanisms				
5.	Understand the importance of physical security measures to protect IT infrastructure, security considerations and best practices for securing virtual machines and cloud environments principles and best practices for developing secure software applications				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to apply secure design principles to develop or evaluate the security of a system, Identify and analyze potential security risks in a given scenario, Explain the importance of security in computing systems and the CIA triad			Understand, Apply, Analyze	

CO2:	Learners will be able to explain the purpose and benefits of different authentication methods, implement basic access control mechanisms to define user permissions Explain the use cases and benefits of encryption in secure communication Implement best practices for securing data storage, such as encryption and access control, identify potential security vulnerabilities in a database system and suggest mitigation strategies	Understand, Apply, Analyze
CO3:	Learners will be able to apply secure network design principles to a specific network topology Configure basic security settings on network devices Choose and configure appropriate firewalls for specific network security needs Configure secure wireless networks using appropriate encryption and authentication mechanisms	Apply, Evaluate
CO4:	Learners will be able to explain the role of intrusion detection and prevention systems in network security, Identify potential security vulnerabilities in VOIP implementations and propose mitigation strategies, Compare and contrast different operating system security models	Understand, Analyze
CO5:	Learners will be able to develop a basic physical security plan for an IT environment Evaluate the security posture of a virtualized or cloud environment and suggest improvements Apply secure coding practices to identify and prevent common application vulnerabilities	Create, Evaluate, Apply

Course Code:	USIT503	Class:	TYBScIT	Semester:	V
Course Name:	Advanced Web Programming				
Course Objectives:					
1.	Understand the basics of .NET, fundamentals of c# language,				
2.	Understand the Basics of Web Forms in ASP.NET, Learn About Form Controls in Web Forms				
3.	Implement Error Handling in ASP.NET, Understand State Management in ASP.NET				
4.	Learn ADO.NET for Data Access in ASP.NET, Implement Data Binding in ASP.NET				
5.	Understand the Role of XML in ASP.NET, Implement Security Measures in ASP.NET, Explore ASP.NET AJAX for Enhanced User Experience				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand the principles of object-oriented programming in C#, Apply knowledge to recognize suitable situations for using .NET.			Knowledge, Apply	
CO2:	Learners will be able to create a simple web form, Understand the life cycle events of a web form.			Knowledge, Apply	
CO3:	Learners will be able to identify common errors and exceptions in web applications, Understand the pros and cons of various state management methods.			Knowledge, Apply, Analysis	
CO4:	Learners will be able to understand the basics of ADO.NET and its role in data access, Implement data binding techniques in a web application.			Knowledge, Apply, Analysis	
CO5:	Learners will be able to implement authentication and authorization mechanisms, improving the user experience, Create and parse XML documents in a web application.			Knowledge, Apply, Analysis	

Course Code:	USIT603	Class:	TYBScIT	Semester:	VI
Course Name:	Business Intelligence				
Course Objectives:					
1.	Understand the core concepts of Business Intelligence and its role in organizational decision-making, become familiar with different types of DSS and their functionalities				
2.	Understand the application of mathematical models in data analysis and decision-making and introduce the basic concepts and techniques of data mining and recognize the importance of data preparation and its steps				
3.	Learn about different classification algorithms and their applications and understand the concept of clustering and its applications				
4.	Explore various use cases of BI in different industries and introduce common marketing models used for customer segmentation, market research, and campaign analysis, the use of models in logistics and production planning Introduce the concept and applications of DEA in performance evaluation				
5.	Understand the importance of knowledge management in organizations and its relation to BI and Introduce the use of AI and expert systems in BI applications				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to explain the benefits and limitations of implementing BI systems in an organization and identify the appropriate type of DSS to address a specific business problem			Understand, Apply	
CO2:	Learners will be able to apply basic mathematical models to analyze data and support decision-making and explain the different data mining tasks and their potential applications and perform basic data cleaning and pre-processing tasks			Understand, Apply	
CO3:	Learners will be able to choose and apply appropriate classification techniques to categorize data			Apply	

	Apply clustering algorithms to group similar data points	
CO4:	Learners will be able to identify potential applications of BI within a specific business context, Explain the purpose and application of specific marketing models in practical scenarios apply basic models to optimize logistics or production processes and explain the methodology and limitations of using DEA for efficiency measurement	Understand, Analyze, Apply
CO5:	Learners will be able to identify strategies for effectively capturing and sharing organizational knowledge and also explain the potential benefits and challenges of integrating AI into BI systems	Understand, Apply, Remember

Course Code:	USIT504	Class:	TYBScIT	Semester:	V
Course Name:	Artificial Intelligence				
Course Objectives:					
1.	Understand the Basics of Artificial Intelligence, Define and Explain Intelligent Agents in AI.				
2.	Understand basic search algorithms, Explore limitations of classical search and advanced techniques				
3.	Understand game playing as a search problem, Introduce the use of logic for reasoning				
4.	Understand the syntax and semantics of FOL, learn methods to draw conclusions from FOL knowledge bases				
5.	Understand the process of generating plans for achieving goals, understand different methods for representing knowledge in AI				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand the significance and applications of AI in various domains, identify real-world examples where AI is currently applied, Identify and describe examples of intelligent agents in practical scenarios			Remember, Knowledge, Apply	
CO2:	Learners will be able to apply search algorithms to solve simple problems, analyze scenarios where advanced search techniques are required			Apply, Remember, Analyze	
CO3:	Learners will be able to implement and evaluate game playing algorithms, apply logical reasoning to simplify problems			Apply, Understand, Remember	
CO4:	Learners will be able to express complex knowledge and relationships using FOL, apply inference rules to solve logic puzzles and answer queries			Understand, Create, Analyze	
CO5:	Learners will be able to formulate and evaluate plans for solving problems in simple domains, Choose appropriate knowledge representation for specific tasks			Understand, Evaluate	

Course Code:	USIT604	Class:	TYBScIT	Semester:	VI
Course Name:	Principles of Geographic Information Systems				
Course Objectives:					
1.	Introduce the basic concepts of GIS and its applications				
2.	Understand the different types of hardware and software used in GIS Provide a comprehensive overview of the core components and functionalities of GIS				
3.	Introduce different methods for data input and data preparation in GIS				
4.	Understand various analytical capabilities of GIS for exploring and manipulating spatial data and introduce methods for classifying and measuring spatial features in GIS				
5.	Understand the role of data visualization in GIS and its various techniques Introduce the relationship between GIS and maps, and the map creation process and understand the different stages involved in the GIS visualization process and explore different visualization approaches depending on the intended audience and purpose and introduce common cartographic elements and tools used in map creation				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to explain the purpose and benefits of using GIS in various fields			Understand	
CO2:	Learners will be able to identify the appropriate hardware and software components for specific GIS tasks explain the different stages involved in a typical GIS workflow			Understand, Apply	
CO3:	Learners will be able to perform basic data cleaning and formatting tasks for use in GIS software			Apply	
CO4:	Learners will be able to apply basic spatial analysis techniques (e.g., overlay, buffering) to answer geographic questions and classify spatial data based on specific criteria and perform basic measurements (e.g., area, distance)			Apply	

CO5:	Learners will be able to choose and apply appropriate visualization methods to effectively communicate spatial information, Explain the key elements of a map and describe the process of creating maps using GIS Plan and create basic maps using appropriate visualization techniques, Choose and justify the most suitable visualization strategy for a specific communication goal and apply basic cartographic principles to enhance the clarity and effectiveness of visualizations	Understand, Apply, Evaluate
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Course Code:	USIT507	Class:	TYBScIT	Semester:	V
Course Name:	Next Generation Technologies				
Course Objectives:					
1.	Introduce emerging technologies with a focus on data management, Understand the concept of big data, its challenges, and potential solutions, Get familiar with the basic functionalities and core concepts of MongoDB, Introduce NoSQL databases and their differences from relational databases				
2.	Learn basic commands to interact with MongoDB through the shell, Understand the document-oriented data model used in MongoDB , Understand the overall architecture of MongoDB, including its components and communication flow				
3.	Learn about different storage engine options available in MongoDB, Explore various real-world applications where MongoDB is a suitable choice, Understand the limitations and trade-offs associated with using MongoDB.				
4.	Assuming basic knowledge of JavaScript				
5.	Understand the JSON data format and its use in data exchange				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	The learners will be able to Explain the advantages and disadvantages of NoSQL databases for specific use cases, Analyze real-world examples of big data applications and their implications			Remember, understand, Apply, Analyze	
CO2:	The learner will be able to explain the purpose and functionality of different components within the MongoDB architecture, write simple queries and manipulate data using the MongoDB shell			Remember, understand, Apply	
CO3:	The learner will be able to choose the appropriate storage engine based on specific data access patterns and performance requirements, Identify potential use cases for MongoDB in different industry domains			Remember, Understand, Evaluate, Analyze	

CO4:	The learner will be able to introduce the jQuery library and its functionalities for interacting with web pages	Remember
CO5:	The learners will be able to Parse and manipulate JSON data using JavaScript	Understand, Apply

Course Code:	USIT606	Class:	TYBScIT	Semester:	VI
Course Name:	IT Service Management				
Course Objectives:					
1.	Understand the core concepts of ITSM , Understand the fundamental principles guiding service strategy, Analyze risks associated with service strategy				
2.	Understand the goals and principles of service design, identify challenges associated with service design				
3.	Understand the purpose and goals of service transition, explain key concepts within service transition				
4.	Understand the principles guiding service operation, explain core service operation processes				
5.	Understand the importance and goals of CSI, different methods and techniques used in CSI				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	The learner will be able to explain the benefits of ITSM for organizations and different ITIL processes, develop a list of CSFs for implementing service strategy			Understand, Remember, Analyze	
CO2:	The learner will be able to apply service design principles to create a basic service design plan, develop strategies to overcome challenges			Understand, Remember, Analyze, Create	
CO3:	The learner will be able to describe the steps involved in transitioning new or changed services into a live environment, apply service transition principles within a given scenario			Remember, Understand, Apply	
CO4:	The learner will be able to describe the purpose and activities within each service operation process, analyze how service operation processes impact the overall IT service delivery			Understand, Remember, Analyze	

CO5:	The learner will be able to recommend solutions for improving IT services, Select appropriate CSI methods and techniques for a given scenario	Understand, Evaluate
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Subjects Offered by the Institute			
First Year – Bachelor of Science (Biotechnology)			
Sr. No.	Semester – I	Sr. No.	Semester – II
1	Fundamentals of biotechnology-I	1	Fundamentals of Biotechnology-II
2	Microbiology-I	2	Cell biology and Microbiology-II
3	Basic Chemistry-I	3	Basic Chemistry-II
4	Biochemistry: Concept of	4	Biochemistry: Concept of Biomolecules-II and Basic analytical techniques
5	Genetics	5	Physiology and Immunology
6	Molecular biology-I	6	Basic Computers and Biostatistics
7	Ability enhancement course - Communication skills	7	Ability enhancement course - Sustainable development and Environmental biotechnology
8	Practicals of USBT101 & USBT102	8	Practicals of USBT201 & USBT202
9	Practicals of USBT103 & USBT104	9	Practicals of USBT203 & USBT204
10	Practicals of USBT105 & USBT106	10	Practicals of USBT205 & USBT206

Subjects Offered by the Institute			
Second Year – Bachelor of Science (Biotechnology)			
Sr. No.	Semester – III	Sr. No.	Semester – IV
1	Biophysics	1	Biochemistry
2	Applied Chemistry- I	2	Applied Chemistry- II
3	Immunology	3	Medical Microbiology
4	Cell Biology and Cytogenetics	4	Environmental Biotechnology
5	Molecular Biology	5	Biostatistics and Bioinformatics
6	Bioprocess Technology	6	Molecular Diagnostics
7	Research Methodology	7	Entrepreneurship Development
8	Practicals of USBT301 and USBT302	8	Practicals of USBT401 and USBT402
9	Practicals of USBT303 and USBT304	9	Practicals of USBT403 and USBT404
10	Practicals of USBT305 and USBT306	10	Practicals of USBT405 and USBT406

Subjects Offered by the Institute			
Third Year – Bachelor of Science (Biotechnology)			
Sr. No.	Semester – V	Sr. No.	Semester – VI
1	Cell biology	1	Biochemistry
2	Medical Microbiology & Instrumentation	2	Industrial Microbiology
3	Genomes and Molecular Biology	3	Pharmacology and Neurochemistry
4	Marine Biotechnology	4	Environmental Biotechnology
5	Practical - Cell biology & Medical Microbiology & Instrumentation	5	Practical - Biochemistry & Industrial Microbiology
6	Practical - Genomes and Molecular Biology of Marine Biotechnology	6	Practical - Pharmacology - Neurochemistry and Environmental Biotechnology (50M) + Project work (50M)
7	Biosafety	7	Agri Biotechnology
8	Practical - Biosafety	8	Practical - Agri Biotechnology

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science (Biotechnology)		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	University		
Syllabus Copy Link:	https://mu.ac.in/wp-content/uploads/2022/02/AAMAug172202122.pdf		
Department	Biotechnology		

Course Code:	USBT101	Class:	FYBIOTECH	Semester:	I
Course Name:	FUNDAMENTALS OF BIOTECHNOLOGY-1				
Course Objectives:					
1.	To introduce the students about the scope of biotechnology.				
2.	To familiarize the students with the potential and different applications of biotechnology				
3.	To equip students with the knowledge of fermentation technology.				
Course Outcome:				Level of Bloom's Taxonomy	
CO1:	Learners will demonstrate a solid understanding of the principles and scope of biotechnology, including developments in various fields of Biotechnology			Understanding	
CO2:	Learners will be able to relate to applications and benefits of Biotechnology in the fields of agriculture, livestock, human health and environment			Applying	
CO3:	Learners will be able to discuss the basics of fermentation-like design and operations			Creating	

Course Code:	USBT201	Class:	FYBIOTECH	Semester:	II
Course Name:	FUNDAMENTALS OF BIOTECHNOLOGY-II				
Course Objectives:					
1.	To acquaint students with the applications of biotechnology in the field of food.				
2.	To introduce learners to the fundamentals of medical biotechnology.				
3.	To provide an in-depth knowledge of genetic engineering techniques.				
CO1:	Learners will develop an understanding of the application of biotechnology in the food industry.		Understanding		
CO2:	Learners will gain detailed knowledge of genetic engineering.		Applying		
CO3:	Learners will be able to discuss tools and techniques used in medical biotechnology.		Applying		

Course Code:	USBT102	Class:	FYBIOTECH	Semester:	I
Course Name:	MICROBIOLOGY-1				
Course Objectives:					
1.	To build a firm foundation in microbiology.				
2.	To gain knowledge about the sterilization techniques.				
3.	To develop skills in microscopic and staining techniques.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to develop an understanding of cultivation of microorganisms.			Understanding	
CO2:	Learners will understand the role of sterilization and disinfection in the field of microbiology			Analyzing	
CO3:	Learners will develop skills towards use of microscopy and staining techniques			Understanding	

Course Code:	USBT202	Class:	FYBIOTECH	Semester:	II
Course Name:	CELL BIOLOGY AND MICROBIOLOGY-II				
Course Objectives:					
1.	To provide a comprehensive understanding of the ultrastructure of prokaryotic and eukaryotic cells.				
2.	To build a firm foundation of concepts related to microbiology.				
3.	To introduce the principles of virology.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able discuss the ultrastructure, function and location of organelles in prokaryotic and eukaryotic cells.			Analyzing	
CO2:	Learners will understand microbial growth and enumeration.			Understanding	
CO3:	Learners will acquire knowledge in the basics of virology.			Understanding	

Course Code:	USBT103	Class:	FYBIOTECH	Semester:	I
Course Name:	BASIC CHEMISTRY- I				
Course Objectives:					
1.	To introduce the fundamental concepts of chemistry like nomenclature and chemical bonds.				
2.	To acquire practical skills of titrimetry and gravimetry techniques.				
3.	To gain detail knowledge about stereochemistry				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to develop an understanding of chemical bonds.			Understanding	
CO2:	Learners will develop skills towards use of titrimetric and gravimetric analysis			Analyzing	
CO3:	Learners will be able to differentiate between chiral and achiral molecules and different enantiomers			Applying	

Course Code:	USBT203	Class:	FYBIOTECH	Semester:	II
Course Name:	BASIC CHEMISTRY-II				
Course Objectives:					
1.	To provide students with a comprehensive understanding of the fundamental principles of thermodynamics.				
2.	To equip students with the skills necessary to apply the laws of thermodynamics to various physical and biochemical systems.				
3.	To introduce students to the basics of chemical kinetics like oxidation and reduction reactions				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to develop an understanding of thermodynamics.			Understanding	
CO2:	Learners will gain knowledge about reaction kinetics and order of reaction			Analyzing	
CO3:	Learners will gain insight into the details of oxidation and reduction reactions			Applying	

Course Code:	USBT104	Class:	FYBIOTECH	Semester:	I
Course Name:	BIOCHEMISTRY: CONCEPT OF BIOMOLECULES-I				
Course Objectives:					
1.	To provide a comprehensive understanding of the preparation of standard solutions and the concept of buffers.				
2.	To equip students with a solid foundation in carbohydrate chemistry.				
3.	To introduce the basics of lipid chemistry, focusing on the classification and biological functions of fatty acids and lipids.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will develop skills towards preparation of standard solutions in the laboratory.			Understanding	
CO2:	Learners will understand the role of buffers.			Applying	
CO3:	Learners will discuss the basics of carbohydrate and lipid biochemistry.			Analyzing	

Course Code:	USBT204	Class:	FY BIOTECH	Semester:	II
Course Name:	BIOCHEMISTRY: CONCEPT OF BIOMOLECULES-II AND BASIC ANALYTICAL TECHNIQUES				
Course Objectives:					
1.	To provide a comprehensive understanding of the structure, properties, and functions of amino acids and proteins.				
2.	To apply biochemical principles in the analysis of enzyme kinetics, enzyme inhibition, and the use of enzymes as diagnostic tools.				
3.	To introduce the fundamental concepts and applications of analytical techniques such as chromatography, spectroscopy, and electrophoresis in biochemical analysis.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn about fundamental structures and functions of amino acids & proteins.		Understanding		
CO2:	Learners will develop an understanding of protein biochemistry and enzymology.		Applying		
CO3:	Learners will learn to apply various analytical techniques for the separation, identification, and quantification of biochemical substances		Analyzing		

Course Code:	USBT105	Class:	FYBIOTECH	Semester:	I
Course Name:	GENETICS				
Course Objectives:					
1.	To introduce students to the fundamental concepts of genetics.				
2.	To develop an understanding of the microbial genetic mechanisms.				
3.	To equip students with the ability to apply genetic principles and techniques in solving complex biological problems.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will develop a comprehensive understanding of the basic principles of mendelian genetics.			Understanding	
CO2:	Learners will be able to discuss the different processes in microbial genetics and their role in mapping genes.			Analyzing	
CO3:	Learners will understand the relevance of population genetics.			Evaluating	

Course Code:	USBT205	Class:	FYBIOTECH	Semester:	II
Course Name:	PHYSIOLOGY AND IMMUNOLOGY				
Course Objectives:					
1.	To introduce the fundamental concepts and mechanisms of plant physiology.				
2.	To understand the role and mechanisms of different animal body fluids in maintaining life processes.				
3.	To explore the principles of immunology, including the innate and acquired immune systems.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will gain a comprehensive understanding of the Physiological Processes of Plants and functions of plant growth regulators.		Understanding		
CO2:	Learners will develop a comprehensive and deep understanding of the vital physiological processes of animals.		Applying		
CO3:	Learners will develop an understanding of the immune system's components and functions		Analyzing		

Course Code:	USBT106	Class:	FYBIOTECH	Semester:	I
Course Name:	MOLECULAR BIOLOGY-I				
Course Objectives:					
1.	To introduce students to the structural and functional aspects of chromosomes.				
2.	To provide a comprehensive understanding of DNA replication mechanisms.				
3.	To elucidate the concepts of mutations and DNA repair mechanisms.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will develop an understanding of structure and organization of the hereditary material			Understanding	
CO2:	Learners will be able to discuss the different processes involved in replication of DNA			Applying	
CO3:	Learners will understand the relevance of physical, chemical and biological factors in mutations			Evaluating	

Course Code:	USBT206	Class:	FYBIOTECH	Semester:	II
Course Name:	BASIC COMPUTERS AND BIOSTATISTICS				
Course Objectives:					
1.	To introduce the fundamental concepts and operations of computer systems.				
2.	To develop proficiency in utilizing computer networking.				
3.	To familiarize students with the principles of biostatistics.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will develop an understanding of computer networking and internet			Applying	
CO2:	Learners will develop skills to use word processing, spreadsheet, presentation software.			Understanding	
CO3:	Learners will gain insights about the use of statistics in the field of biotechnology			Analyzing	

Course Code:	USBT107	Class:	FYBIOTECH	Semester:	I
Course Name:	ABILITY ENHANCEMENT COURSE-COMMUNICATION SKILLS				
Course Objectives:					
1.	To equip students with foundational knowledge in grammar, professional communication, and presentation skills.				
2.	To develop students' soft skills.				
3.	To enhance students' professional skills in creativity, ethical decision-making, leadership, and stress management.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand the communication skills required to excel in the real work environment and corporate life.			Applying	
CO2:	Learners will gain insight into technical and non-technical qualities in career planning.			Analyzing	
CO3:	Learners will learn about Leadership, team building, decision making and stress management			Creating	

Course Code:	USBT207	Class:	FYBIOTECH	Semester:	II
Course Name:	ABILITY ENHANCEMENT COURSE SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL BIOTECHNOLOGY				
Course Objectives:					
1.	To develop an understanding of ecological principles, including the structure and function of ecosystems, biodiversity, and ecological interactions such as predation, competition, and mutualism.				
2.	To familiarize students with the concepts of pollution, climate change, and sustainable development.				
3.	To introduce renewable sources of energy, focusing on their importance, types, and the role they play in promoting a sustainable lifestyle and reducing dependency on non-renewable resources.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will learn about the structure and functioning of the ecosystems.			Understanding	
CO2:	Learners will gain insights about the concept of pollution, climate change and sustainable development			Analyzing	
CO3:	Learners will understand the relevance of renewable energy sources and conservation of biodiversity.			Applying	

Course Code:	USBTP101	Class:	FYBIOTECH	Semester:	I
Course Name:	PRACTICAL’S OF USBT101 AND USBT102				
Course Objectives:					
1.	To introduce students to the fundamental concepts and techniques of various branches of biotechnology, including microbial, agricultural, and medical biotechnology.				
2.	To develop practical skills in handling, observing, and analyzing biological specimens using advanced microscopy techniques and staining methods.				
3.	To enhance understanding of the principles and applications of genetic engineering, fermentation technology, and bioprocessing in biotechnological research and industry.				
4.	To promote the ability to critically analyze recent advancements in biotechnology through case studies and research papers, and understand their impact on society and the environment.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will gain a comprehensive understanding of the scope and applications of biotechnology in various fields, preparing them for careers in biotechnological research, industry, or further study.		Understanding		
CO2:	Learners will acquire hands-on experience in using a range of microscopy techniques, preparing and staining biological specimens, and understanding the implications of these techniques in research and diagnostics.		Applying		
CO3:	Learners will develop the ability to critically evaluate recent biotechnological advancements and innovations through case studies, identifying their potential benefits and limitations		Evaluating		
CO4:	Learners will demonstrate proficiency in laboratory techniques such as media preparation, sterilization, microbial isolation, and fermentation, essential for biotechnological experiments and production processes.		Creating		

Course Code:	USBTP201	Class:	FYBIOTECH	Semester:	II
Course Name:	PRACTICAL’S OF USBT201 AND USBT202				
Course Objectives:					
1.	To introduce the principles and techniques involved in the microbiological examination, isolation, and characterization of microorganisms from food samples.				
2.	To impart knowledge on the principles of food safety, Good Manufacturing Practices (GMP), and Standard Operating Procedures (SOPs) in the food industry.				
3.	To provide a comprehensive understanding of the unit operations involved in the processing of different food products, including the production of fermented foods.				
4.	To educate on the methods for detecting food adulterants, determining food preservative concentrations, and understanding the microbial aspects of food spoilage and preservation.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn how to perform microbial examination and accurately detect pathogenic bacteria in food samples		Applying		
CO2:	Learners will learn the development and implementation of food safety procedures compliant with Good Manufacturing Practices		Analyzing		
CO3:	Learners will learn to critically evaluate the quality parameters of food products during processing, such as in sauerkraut production		Evaluating		
CO4:	Learners will learn the techniques for isolating and characterizing organisms causing food spoilage and fermenting organisms from food samples		Creating		

Course Code:	USBTP102	Class:	FYBIOTECH	Semester:	I
Course Name:	PRACTICAL’S OF USBT101 AND USBT102				
Course Objectives:					
1.	To equip students with the foundational knowledge and skills necessary for safe practices in the chemistry laboratory, including understanding the appropriate dress code, first aid, and handling chemicals safely.				
2.	To introduce students to the preparation and quantification of chemical solutions, teaching them how to make normal, molar, molal, percent solutions, as well as solutions measured in parts per million (PPM) and parts per billion (PPB).				
3.	To develop students' understanding of the structural differences and functional properties of carbohydrates, lipids, and proteins, including the ability to perform qualitative and quantitative analyses on these biomolecules.				
4.	To enhance students' analytical skills through the practice of titrimetric, gravimetric, and complexometric methods for the determination of chemical substances and reaction rates in various samples.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn the principles of laboratory safety, including proper laboratory attire, handling of chemicals, and emergency response procedures.		Understanding		
CO2:	Learners will learn to accurately prepare and quantify chemical solutions, developing the ability to apply mathematical and chemical principles in the creation of specific solution concentrations.		Applying		
CO3:	Learners will learn to distinguish between different types of carbohydrates, lipids, and proteins, and will be able to conduct basic laboratory tests to identify these biomolecules.		Analyzing		
CO4:	Learners will learn to apply various analytical techniques such as titrimetric, gravimetric, and complexometric analysis, enhancing their proficiency in quantitative analysis and interpretation of results.		Evaluating		

Course Code:	USBTP202	Class:	FYBIOTECH	Semester:	II
Course Name:	PRACTICALS OF USBT203 AND USBT204				
Course Objectives:					
1.	To introduce students to the fundamental principles and experimental techniques of food technology and microbiology, focusing on the analysis, characterization, and processing of food products.				
2.	To equip students with practical skills for conducting various biochemical and microbiological assays to assess food quality, safety, and nutritional value.				
3.	To develop the ability to critically analyze and solve problems related to food spoilage, preservation, and the development of new food products through hands-on laboratory experiences.				
4.	To foster an understanding of the regulatory and ethical considerations in food science, including Good Manufacturing Practices and food safety protocols.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn to conduct qualitative and quantitative analyses of food components, demonstrating proficiency in laboratory techniques such as chromatography, titration, and microbial examination.		Applying		
CO2:	Learners will learn to evaluate the effectiveness of food preservation methods and safety procedures, employing critical thinking to assess and improve food product quality.		Evaluating		
CO3:	Learners will learn to design and execute experiments related to food science, including the development of new food products and the optimization of processing techniques.		Creating		
CO4:	Learners will learn to interpret experimental data and scientific literature in food technology and microbiology, developing the ability to communicate		Analyzing		

	findings effectively through written and oral presentations.	
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Course Code:	USBTP103	Class:	FYBIOTECH	Semester:	I
Course Name:	PRACTICALS OF USBT105 AND USBT106				
Course Objectives:					
1.	To introduce students to the fundamental concepts and processes of mitosis and meiosis, including the stages involved and their significance in cell division and genetic variation.				
2.	To provide hands-on experience in the extraction and qualitative analysis of DNA from plant materials, enhancing understanding of molecular genetics.				
3.	To develop skills in identifying and analyzing genetic mutations, understanding their sources, and evaluating their impacts on organisms using various laboratory techniques.				
4.	To equip students with the ability to construct and analyze pedigree charts for the study of human genetic traits, fostering an understanding of inheritance patterns and genetic disorders.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to accurately describe and differentiate between the processes of mitosis and meiosis, including the biological significance and outcomes of each process.		Understanding		
CO2:	Learners will learn the techniques for DNA extraction, purification, and analysis, enabling them to practically assess genetic material from plant samples.		Applying		
CO3:	Learners will learn to identify genetic mutations from given DNA sequences and understand the effects of mutagens on genetic material.		Analyzing		
CO4:	Learners will learn to apply genetic concepts to human inheritance by constructing and analyzing pedigree charts, thereby gaining insights into genetic disorders and traits.		Applying		

Course Code:	USBTP203	Class:	FYBIOTECH	Semester:	II
Course Name:	PRACTICALS OF USBT205 AND USBT206				
Course Objectives:					
1.	To understand the fundamental concepts and techniques used in plant physiology experiments, including photosynthesis, pigment extraction, and plant growth regulation.				
2.	To acquire practical skills in conducting laboratory experiments related to human physiology such as blood count estimation, urine analysis, and understanding the effects of solutions on red blood cells.				
3.	To develop proficiency in using software tools for data analysis, document processing, spreadsheet manipulation, and presentation creation.				
4.	To enhance research and analytical skills through the application of statistical methods to biological data, including measures of central tendency and dispersion.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will learn to design and execute experiments related to plant and human physiology, demonstrating proficiency in using laboratory equipment and accurately interpreting results.			Applying	
CO2:	Learners will learn to effectively use various software tools for data organization, analysis, and presentation, including word processors, spreadsheets, and presentation software.			Understanding	
CO3:	Learners will learn to critically analyze scientific data, using statistical methods to interpret and present findings in a clear and concise manner.			Analyzing	
CO4:	Learners will learn to collaborate effectively in team settings, sharing responsibilities and combining knowledge from various disciplines to achieve common goals in experimental and project work.			Creating	

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science (Biotechnology)		
Assessment:	College	Pattern:	75:25 Marks
Objectives & Outcome Framed by:	University		
Syllabus Copy Link:	http://old.mu.ac.in/wp-content/uploads/2016/06/4.234-S.Y.B.Sc.-Biotechnology.pdf		
Department	Biotechnology		

Course Code:	USBT301	Class:	SYBIOTECH	Semester:	III
Course Name:	BIOPHYSICS				
Course Objectives:					
1.	To provide a comprehensive understanding of the fundamental principles of biophysics.				
2.	To equip students with the knowledge to apply biophysical theories to solve biological problems.				
3.	To enhance the ability of students to critically evaluate the applications and limitations of biophysical techniques in research.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn to integrate principles of classical Physics with biological systems		Applying		
CO2:	Learners will learn to analyze and interpret data from biophysical experiments, such as those involving Microscopy, Spectroscopy, and Electrophoresis		Analyzing		
CO3:	Learners will learn to design experiments and create new approaches for solving complex problems in the field of biophysics		Creating		

Course Code:	USBT401	Class:	SYBIOTECH	Semester:	IV
Course Name:	BIOCHEMISTRY				
Course Objectives:					
1.	To understand the fundamental metabolic pathways involved in the catabolism of carbohydrates, amino acids, lipids, and nucleotides.				
2.	To identify the key regulatory mechanisms that control metabolic processes.				
3.	To explore the role and significance of ATP and other energy-rich molecules in metabolic pathways.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn to articulate the various steps involved in the metabolic breakdown of carbohydrates, amino acids, lipids, and nucleotides.		Understanding & Analyzing		
CO2:	Learners will learn to explain the regulatory mechanisms of metabolism and the impact of these mechanisms on the metabolic fate of nutrients.		Understanding		
CO3:	Learners will learn to describe the importance of ATP and other high-energy molecules in the context of cellular metabolism and energy transfer.		Evaluating		

Course Code:	USBT302	Class:	SYBIOTECH	Semester:	III
Course Name:	APPLIED CHEMISTRY –I				
Course Objectives:					
1.	To have a firm foundation of the fundamentals and applications of Organic and Green Chemistry.				
2.	To develop an understanding of the different aspects of Organic and Green Chemistry.				
3.	To discuss the role of Organic Compounds in Biology and Synthesis of Organic Compounds.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will learn develop an understanding of the different aspects of Organic and Green Chemistry		Understanding		
CO2:	Learners will learn to discuss the role of Organic Compounds in Biology and Synthesis of Organic Compounds.		Applying		
CO3:	Learners will learn to discuss the role of Green Chemistry and its application in Industry.		Creating		

Course Code:	USBT402	Class:	SYBIOTECH	Semester:	IV
Course Name:	APPLIED CHEMISTRY –II				
Course Objectives:					
1.	To establish a solid understanding of the principles and applications of modern Chemical Theories as they apply to the Physical World.				
2.	To develop a comprehensive knowledge of Analytical Chemistry, Natural Product Chemistry, and their respective methodologies.				
3.	To introduce the basic concepts of Polymer Chemistry and Nanomaterials, emphasizing their significance and applications in today’s technological landscape.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learner will develop an understanding of the different aspects of Analytical Chemistry			Understanding	
CO2:	Learners will gain knowledge of Natural Product Chemistry and related acquired skills.			Applying	
CO3:	Learners will gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials.			Understanding	

Course Code:	USBT303	Class:	SYBIOTECH	Semester:	III
Course Name:	IMMUNOLOGY				
Course Objectives:					
1.	Learners will learn to explain the underlying principles of Immunotechniques and their applications in research and diagnostics.				
2.	Learners will learn to analyze and interpret data from Immunotechniques to solve problems related to immune responses.				
3.	Learners will learn to explain the underlying principles of Immunotechniques and their applications in research and diagnostics.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.		Understanding		
CO2:	Learners will learn to explain the underlying principles of Immunotechniques and their applications in research and diagnostics.		Analyzing		
CO3:	Learners will learn to analyze and interpret data from Immunotechniques to solve problems related to immune responses.		Applying		

Course Code:	USBT403	Class:	SYBIOTECH	Semester:	IV
Course Name:	MEDICAL MICROBIOLOGY				
Course Objectives:					
1.	To understand the fundamental factors that contribute to disease development.				
2.	To explore the relationship between microorganisms and diseases, including identification and disease mechanisms.				
3.	To develop skills in the laboratory techniques for isolating, identifying, and handling various pathogens.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to list the factors playing a role in causing a disease			Understanding	
CO2:	Learners will be able to Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.			Analyzing	
CO3:	Learners will be able to Gain the technical capability of handling, isolating and identifying various Bacteria.			Applying	

Course Code:	USBT304	Class:	SYBIOTECH	Semester:	III
Course Name:	CELL BIOLOGY AND CYTOGENETICS				
Course Objectives:					
1.	To provide a comprehensive understanding of the fundamental concepts in Cell Biology and Cytogenetic.				
2.	To equip students with the knowledge of Chromosomal structures and their abnormalities.				
3.	To impart an understanding of the mechanisms of Sex Determination, Linkage, and Genetic Mapping.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to explain the structure and function of the Cytoskeleton and Cell Membrane.		Understanding		
CO2:	Learners will be able to identify various types of Chromosomal Aberrations and discuss their implications.		Applying		
CO3:	Learners will be able to analyze the principles of Sex Determination, Linkage, and Genetic Mapping and apply them in practical scenarios.		Analyzing		

Course Code:	USBT404	Class:	SYBIOTECH	Semester:	IV
Course Name:	ENVIRONMENTAL BIOTECHNOLOGY				
Course Objectives:					
1.	To develop a comprehensive understanding of the causes and effects of various types of environmental pollution.				
2.	To explore the role and effectiveness of different pollution control and management strategies.				
3.	To investigate the application and impact of bioremediation and other green technologies in addressing environmental pollution.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to identify and describe the major types of environmental pollution and their sources			Understanding	
CO2:	Learners will be able to evaluate the effectiveness of various pollution control methods and strategies			Evaluating	
CO3:	Learners will be able to design and propose innovative solutions for pollution mitigation using green technologies			Creating	

Course Code:	USBT305	Class:	SYBIOTECH	Semester:	III
Course Name:	MOLECULAR BIOLOGY				
Course Objectives:					
1.	To provide a comprehensive understanding of the mechanisms involved in Gene Expression and Regulation.				
2.	To elucidate the processes of Transcription and Translation as they relate to Gene Expression.				
3.	To explore the regulatory mechanisms of Gene Expression in both Prokaryotes and Eukaryotes.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.		Understanding		
CO2:	Learners will be able to describe the processes involved in the Regulation of Gene Expression in Prokaryotes and Eukaryotes		Applying		
CO3:	Learners will be able to analyze and interpret the roles of various genetic components in the Regulation of Gene Expression		Analyzing		

Course Code:	USBT405	Class:	SYBIOTECH	Semester:	IV
Course Name:	BIOINFORMATICS and BIOSTATISTICS				
Course Objectives:					
1.	To provide a foundational understanding of the principles and concepts in Bioinformatics and Biostatistics.				
2.	To familiarize students with the use of various computational tools and databases integral to Bioinformatics.				
3.	To develop skills in applying statistical methods for the analysis of biological data.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to gain an understanding of the basic concepts of Bioinformatics and Biostatistics			Understanding	
CO2:	Learners will be able to understand the tools used in Bioinformatics.			Applying	
CO3:	Learners will be able to apply the various Statistical Tools for Analysis of Biological Data			Analyzing	

Course Code:	USBT306	Class:	SYBIOTECH	Semester:	III
Course Name:	BIOPROCESS TECHNOLOGY				
Course Objectives:					
1.	To introduce the fundamental skills and principles in Fermentation Technology and lay the groundwork for advanced studies in Bioprocess Technology.				
2.	To provide an understanding of the diverse aspects of Bioprocess Technology, focusing on microorganisms used in industrial processes.				
3.	To equip learners with the knowledge and skills necessary for the design of fermenters and the optimization of fermentation processes.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will develop a comprehensive understanding of the different dimensions of Bioprocess Technology.		Understanding		
CO2:	Learners will acquire the ability to screen and maintain industrially important microbial strains.		Applying		
CO3:	Learners will understand the principles underlying the design of a fermenter and the optimization of fermentation processes.		Analyzing		

Course Code:	USBT406	Class:	SYBIOTECH	Semester:	IV
Course Name:	MOLECULAR DIAGNOSTICS				
Course Objectives:					
1.	To provide a comprehensive understanding of the principles used in Molecular Diagnosis.				
2.	To enhance critical thinking and analytical skills to comprehend and innovate in the field of Diagnostic Methods.				
3.	To equip students with the knowledge and practical skills necessary for the development of new Diagnostic Kits.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will gain an in-depth understanding of the basic principles utilized in Molecular Diagnosis		Understanding		
CO2:	Learners will develop critical thinking and analytical skills necessary for the evaluation and application of new Diagnostic Methods		Analyzing		
CO3:	Learners will be able to apply the knowledge and skills acquired to contribute to the development of innovative Diagnostic Kits		Creating		

Course Code:	USBT307	Class:	SYBIOTECH	Semester:	III
Course Name:	RESEARCH METHODOLOGY				
Course Objectives:					
1.	To develop an understanding of Research Methodology and identify a Research Problem.				
2.	To acquire knowledge about Research Design and Data Collection methods.				
3.	To enhance skills in Interpretation and Report Writing.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to understand basic principles of Research Methodology and identify a research problem.			Understanding	
CO2:	Learners will learn to design a research study and effectively collect data using various methodologies.			Applying	
CO3:	Learners will be able to interpret research findings and proficiently communicate them through written reports.			Creating	

Course Code:	USBT407	Class:	SYBIOTECH	Semester:	IV
Course Name:	ENTERPRENEURSHIP DEVELOPMENT				
Course Objectives:					
1.	To develop an entrepreneurial mindset that enables the identification and creation of new business opportunities.				
2.	To understand the process of setting up an enterprise, including planning, location selection, and financial management.				
3.	To acquire skills in market research, marketing strategies, and international market exploration.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to systematically select and evaluate business ideas, applying critical thinking skills.		Analyzing		
CO2:	Learners will learn to design and implement effective strategies for the successful launch and management of their business ventures, demonstrating problem-solving abilities.		Applying		
CO3:	Learners will be able to conduct comprehensive market research and develop a marketing plan, showcasing their capability in decision-making and strategic planning.		Analyzing and Creating		

Course Code:	USBTP301	Class:	SYBIOTECH	Semester:	III
Course Name:	PRACTICALS OF USBT 301 AND USBT 302				
Course Objectives:					
1.	To introduce the principles and applications of spectroscopy and chromatography in the analysis of chemical compounds.				
2.	To develop skills in the extraction, purification, and analysis of DNA and proteins using biotechnological techniques.				
3.	To provide hands-on experience in the synthesis and purification of organic compounds, emphasizing the understanding of reaction mechanisms.				
4.	To familiarize students with the operation and application of advanced microscopy techniques in the study of biological and chemical samples.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will gain proficiency in utilizing spectroscopic methods to analyze and characterize chemical compounds, enhancing their analytical skills.			Analyzing	
CO2:	Learners will be able to perform DNA extraction and gel electrophoresis procedures, demonstrating proficiency in fundamental biotechnological methods.			Applying	
CO3:	Learners will learn to synthesize and purify organic compounds, applying their knowledge of organic chemistry in practical settings.			Evaluation	
CO4:	Learners will acquire the ability to operate electron and fluorescence microscopes, and interpret the images obtained, expanding their skills in microscopy.			Creating	

Course Code:	USBTP401	Class:	SYBIOTECH	Semester:	IV
Course Name:	PRACTICALS OF USBT401 AND USBT402				
Course Objectives:					
1.	To provide comprehensive understanding and practical skills on the determination of biochemical markers in blood and urine, highlighting their significance in assessing organ function and disease states.				
2.	To introduce the principles and applications of chromatography and spectrophotometry in the analysis of biological molecules and secondary metabolites from plant sources.				
3.	To impart knowledge and laboratory skills related to the isolation, identification, and analysis of organic compounds and the synthesis of nanoparticles.				
4.	To cultivate an appreciation for the role of biochemistry in the qualitative and quantitative analysis of essential oils and the evaluation of plant-based medicinal properties through modern analytical techniques.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to apply techniques for the determination of biochemical markers in blood and urine, supporting the diagnosis and monitoring of health conditions.		Applying		
CO2:	Learners will acquire the skills to isolate, identify, and analyze organic compounds, and synthesize nanoparticles, demonstrating proficiency in laboratory techniques and safety protocols.		Analyzing and creating		
CO3:	Learners will gain expertise in the use of chromatography and spectrophotometry for the analysis of biological molecules, enhancing their analytical and interpretative skills.		Analyzing		
CO4:	Learners will develop the ability to conduct qualitative and quantitative analyses of essential oils and evaluate the medicinal properties of plants, fostering		Understanding and evaluating		

	a comprehensive understanding of plant biochemistry and its applications.	
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Course Code:	USBTP302	Class:	SYBIOTECH	Semester:	III
Course Name:	PRACTICALS OF USBT 303 AND USBT 304				
Course Objectives:					
1.	To introduce the principles and methodologies of various immunological and genetic tests including ELISA, Western Blotting, and Chromosomal Analysis.				
2.	To develop an understanding of genetic variations, chromosomal aberrations, and their implications in human diseases.				
3.	To enhance skills in analyzing and interpreting data from immunological assays and genetic experiments.				
4.	To foster the ability to apply knowledge of genetics and immunology in solving complex biological problems.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to demonstrate proficiency in conducting and interpreting results from advanced immunological assays like ELISA and Western Blotting.			Applying and Analyzing	
CO2:	Learners will learn to identify and explain the significance of various chromosomal aberrations and their roles in genetic disorders.			Analyzing	
CO3:	Learners will be able to apply genetic and immunological concepts to analyze and solve case studies related to human diseases.			Applying and Analyzing	
CO4:	Learners will learn to critically evaluate scientific literature in genetics and immunology, enhancing their research and analytical skills.			Evaluating	

Course Code:	USBTP402	Class:	SYBIOTECH	Semester:	IV
Course Name:	PRACTICALS OF USBT 403 AND USBT 404				
Course Objectives:					
1.	To introduce the techniques and principles involved in the isolation and identification of common pathogenic and non-pathogenic microorganisms.				
2.	To develop the skills necessary for performing and interpreting various microbiological tests, including biochemical, serological, and molecular methods.				
3.	To understand the principles and applications of environmental microbiology, including the assessment of water and air quality.				
4.	To expose students to the practical aspects of microbiology, including bioremediation and the operation of sewage treatment plants.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to accurately isolate and identify different microorganisms using various microbiological techniques, advancing their knowledge in identifying pathogens versus non-pathogens.		Remembering and Understanding		
CO2:	Learners will learn to proficiently perform and interpret a range of biochemical, serological, and molecular tests, enhancing their skills in diagnostic microbiology.		Applying and Analyzing		
CO3:	Learners will gain an understanding of environmental microbiology practices, including BOD and COD measurements, and will be able to apply these methods in assessing water and air quality.		Applying		
CO4:	Learners will become familiar with the principles of bioremediation and the operational aspects of sewage treatment plants, equipping them with the knowledge to contribute to environmental sustainability efforts.		Applying and Creating		

Course Code:	USBTP303	Class:	SYBIOTECH	Semester:	III
Course Name:	PRACTICALS OF USBT 305 AND USBT 306				
Course Objectives:					
1.	To understand the fundamental principles of microbial growth and metabolism, focusing on diauxic growth patterns and gene expression in E.coli.				
2.	To gain practical skills in the cultivation, screening, and genetic manipulation of microorganisms for the production of antibiotics and alcohols.				
3.	To develop proficiency in the laboratory techniques required for the extraction, purification, and quantification of biochemical products like penicillin and ethanol.				
4.	To critically analyze experimental results, understand the implications of biotechnological processes, and apply bioassays and chemical methods for product estimation.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to explain the mechanisms of microbial growth and the regulation of gene expression in response to environmental changes.		Understanding		
CO2:	Learners will be able to perform microbial cultivation, genetic engineering, and screening techniques to isolate strains of interest for industrial applications.		Applying		
CO3:	Learners will learn to execute protocols for the extraction and purification of biochemical products, demonstrating proficiency in laboratory techniques and equipment.		Analyzing		
CO4:	Learners will be able to interpret experimental data, evaluate the efficiency of biotechnological processes, and accurately estimate product concentrations using various analytical methods.		Applying and Analyzing		

Course Code:	USBTP403	Class:	SYBIOTECH	Semester:	IV
Course Name:	PRACTICALS OF USBT 405 AND USBT 406				
Course Objectives:					
1.	To introduce the fundamentals of molecular biology databases such as NCBI, EMBL, DDBJ, PIR, and KEGG, and their applications in bioinformatics.				
2.	To equip learners with practical skills in the use of bioinformatics tools like NCBI BLAST for sequence analysis and alignment.				
3.	To provide a comprehensive understanding of protein classification using databases such as CATH and SCOP, and the visualization of protein structures.				
4.	To impart hands-on experience in molecular biology techniques including DNA/RNA isolation, PCR, and restriction enzyme digestion.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to effectively navigate and utilize major bioinformatics databases and tools for biological data analysis, enhancing their understanding of sequence alignment and phylogeny.			Understanding and Applying	
CO2:	Learners will gain proficiency in performing and interpreting the results of various molecular biology experiments, including DNA/RNA isolation, PCR, and enzyme digestion, through practical laboratory sessions.			Analyzing	
CO3:	Learners will develop the ability to classify proteins and visualize molecular structures using specialized databases and software, facilitating a deeper comprehension of protein function and structure.			Understanding	
CO4:	Learners will acquire the skills to design primers and conduct DNA amplification, equipping them with the foundational techniques necessary for genetic research and analysis.			Applying and Analyzing	

FACULTY OF SCIENCE – UNDERGRADUATE

Program Name:	Bachelor of Science (Biotechnology)		
Assessment:	University	Pattern:	100 Marks
Objectives & Outcome Framed by:	Institute		
Syllabus Copy Link:	http://old.mu.ac.in/wp-content/uploads/2016/06/4.38-TYBSC-Biotech-revised-2018-191.pdf		
Department	Biotechnology		

Course Code:	USBT501	Class:	TYBIOTECH	Semester:	V
Course Name:	CELL BIOLOGY				
Course Objectives:					
1.	To provide an understanding of the cell cycle, including the differences between prokaryotic and eukaryotic cells, and the molecular genetics of cell-cycle control.				
2.	To introduce the principles of cell signaling and signal transduction, emphasizing the mechanisms of signaling via G-protein-linked and enzyme-linked cell-surface receptors.				
3.	To explore the fundamental concepts of developmental biology, including the stages of development, mechanisms of differentiation, and pattern formation.				
4.	To examine the biology of cancer, focusing on its molecular genetics, the micro evolutionary process of cancer development, and current strategies for diagnosis and treatment.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to describe the key stages and regulatory mechanisms of the cell cycle, analyzing its importance in both prokaryotic and eukaryotic cells.		Analyzing		
CO2:	Learners will gain the ability to explain the general principles of cell signaling and the specific mechanisms of action for different types of cell-surface receptors.		Understanding		

CO3:	Learners will develop an understanding of the processes involved in developmental biology, including embryonic stem cells, differentiation, and pattern formation, demonstrating their ability to apply these concepts to various model organisms.	Applying
CO4:	Learners will learn to identify the genetic alterations leading to cancer, understand the role of viruses in cancer, and analyze current approaches to cancer diagnosis and treatment.	Analyzing and Evaluating

Course Code:	USBT601	Class:	TYBIOTECH	Semester:	VI
Course Name:	BIOCHEMISTRY				
Course Objectives:					
1.	To provide an in-depth understanding of protein structure, including tertiary and quaternary structures, and the significance of protein folding and denaturation.				
2.	To explore the metabolic pathways involved in carbohydrate biosynthesis, its regulation in different organisms, and the biosynthesis and regulation of cholesterol.				
3.	To explain the mechanism of action of hormones, their biochemical functions, and the disorders associated with hormonal imbalances in the human body.				
4.	To examine the role of vitamins and minerals in human nutrition, their dietary sources, functions, and the health consequences of deficiencies and excesses.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to describe the process of protein folding and recognize the factors that lead to protein denaturation.			Understanding	
CO2:	Learners will learn how to elucidate the pathways of carbohydrate and cholesterol biosynthesis and their regulation, thereby applying knowledge to understand metabolic disorders.			Applying	
CO3:	Learners will learn to identify the biochemical functions of different hormones, understand their mechanisms of action, and assess the impact of hormonal imbalances on health.			Analyzing	
CO4:	Learners will learn to evaluate the importance of vitamins and minerals in diet, identify symptoms of their deficiencies and excesses, and recommend dietary adjustments to prevent malnutrition and over nutrition.			Evaluating	

Course Code:	USBT502	Class:	TYBIOTECH	Semester:	V
Course Name:	MEDICAL MICROBIOLOGY AND INSTRUMENTATION				
Course Objectives:					
1.	To introduce the fundamental concepts and properties of viruses, including their structure, classification, and mechanisms of replication.				
2.	To provide a comprehensive understanding of the discovery, design, and mechanisms of action of chemotherapeutic drugs, including antibiotics and antivirals.				
3.	To elucidate the principles, instrumentation, and applications of various spectroscopic techniques in biological research.				
4.	To familiarize students with bio analytical techniques, including chromatography and radioactivity-based methods, for the purification, analysis, and quantification of biomolecules.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to describe the structural characteristics and classification of viruses, and explain their cultivation and mechanisms of infection.			Understanding and Applying	
CO2:	Learners will gain knowledge on the design and function of antimicrobial and chemotherapeutic agents, including their mechanisms of action and the principles of drug resistance.			Remembering	
CO3:	Learners will develop the ability to apply spectroscopic techniques for the analysis and characterization of biological samples, enhancing their experimental skills.			Applying and Analyzing	
CO4:	Learners will acquire proficiency in employing bio analytical techniques for the separation and analysis of biomolecules, contributing to their research capabilities.			Applying	

Course Code:	USBT602	Class:	TYBIOTECH	Semester:	VI
Course Name:	INDUSTRIAL MICROBIOLOGY				
Course Objectives:					
1.	To introduce the foundational concepts of dairy technology, including the normal flora of milk, changes in raw milk, and the enumeration and factors affecting the bacteriological quality of milk.				
2.	To equip students with an understanding of down-stream processing (DSP) techniques, including foam separation, types of precipitation, filtration, centrifugation, and chromatography.				
3.	To familiarize students with the fermentation process, including the development of bacterial and fungal inoculums, scale-up and down techniques, and the production of various fermentation products.				
4.	To instill a comprehensive understanding of quality assurance (QA), quality control (QC), and good manufacturing practices (GMP), focusing on their implementation, documentation, and regulatory certification.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will develop the ability to analyze and evaluate the quality of milk, understanding the impacts of its normal flora and the factors affecting its bacteriological quality.		Analyzing and Evaluating		
CO2:	Learners will gain practical skills in applying various down-stream processing techniques, including foam separation, filtration, and chromatography, to purify and process biological materials.		Applying		
CO3:	Learners will learn to apply knowledge of fermentation technology in developing inoculums and scaling production processes for the manufacture of key fermentation products like streptomycin, protease, and ethanol.		Applying		
CO4:	Learners will acquire the skills to implement, document, and ensure compliance with quality		Applying		

	assurance and good manufacturing practices within the dairy and fermentation industries.	
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Course Code:	USBT503	Class:	TYBIOTECH	Semester:	V
Course Name:	GENOMICS AND MOLECULAR BIOLOGY				
Course Objectives:					
1.	To provide a comprehensive understanding of the methodologies involved in the genetic engineering of plants and animals.				
2.	To equip students with the knowledge of various physical and vector-based methods for gene transfer in plants and animals.				
3.	To familiarize students with the tools and techniques used in molecular biology for gene cloning, sequencing, and editing.				
4.	To enhance the understanding of the applications and implications of genetic engineering in health, agriculture, and environmental conservation.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to apply various genetic engineering techniques for plant and animal transformation.		Applying		
CO2:	Learners will learn to proficiently use molecular biology tools for gene cloning and editing.		Applying and Analyzing		
CO3:	Learners will be able to critically analyze the implications of genetic modifications in organisms.		Evaluating		
CO4:	Learners will learn to design and implement genetic engineering projects.		Creating		

Course Code:	USBT603	Class:	TYBIOTECH	Semester:	VI
Course Name:	BASIC PHARMACOLOGY AND NEUROCHEMISTRY				
Course Objectives:					
1.	To introduce the fundamental principles of pharmacology, including the mechanism of drug action, drug receptors, biological responses, and the chemistry of drug–receptor binding.				
2.	To understand the processes involved in drug absorption, distribution, and the factors that affect these processes, including physiological barriers to drug distribution.				
3.	To provide a basic understanding of toxicology, including the identification and management of poisonings, and the impact of drugs on chronic organ toxicity and reproduction.				
4.	To explore the neurochemistry related to the anatomy and functioning of the brain, including neuronal pathways, excitation, inhibition, and the action of neurotoxins and neurotransmitters.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will gain a comprehensive understanding of how drugs interact with the body to elicit a therapeutic effect, including an in-depth exploration of drug–receptor interactions and second-messenger systems.			Understanding	
CO2:	Learners will be able to analyze the pharmacokinetic properties of drugs, including their absorption, distribution, metabolism, and excretion, and understand the implications of these properties on drug therapy.			Analyzing	
CO3:	Learners will learn the principles of toxicology and regulatory toxicology, enabling them to identify and manage adverse drug reactions and poisonings effectively.			Applying	
CO4:	Learners will develop an understanding of the neurochemical processes in the brain, including how			Understanding	

	drugs can modify these processes to treat neurological and psychiatric disorders.	
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Course Code:	USBT504	Class:	TYBIOTECH	Semester:	V
Course Name:	MARINE BIOTECHNOLOGY				
Course Objectives:					
1.	To provide an introductory understanding of marine biotechnology, focusing on the marine ecosystem, its functioning, and the significance of hydrothermal vents.				
2.	To explore the concept of bio prospecting, highlighting the biotechnological potential of marine microbes and the bioactive compounds derived from marine organisms.				
3.	To delve into the development and application of drugs and enzymes extracted from marine sources, emphasizing their pharmaceutical and biotechnological relevance.				
4.	To examine the role of marine bio resources in the production of functional foods, nutraceuticals, and cosmetics, underscoring the importance of marine-derived ingredients in these industries.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will gain a foundational understanding of marine ecosystems and their biotechnological applications, aligning with the Bloom's taxonomy level of understanding.			Understanding	
CO2:	Learners will learn to identify and analyze the potential of marine microbes and other organisms for bio prospecting, achieving the Bloom's taxonomy level of analyzing.			Analyzing	
CO3:	Learners will be able to comprehend and evaluate the process of developing marine-derived pharmaceuticals and enzymes, reaching the Bloom's taxonomy level of evaluating.			Evaluating	
CO4:	Learners will learn to appreciate the significance of marine bio resources in creating functional foods, nutraceuticals, and cosmetics, fostering skills at the Bloom's taxonomy level of applying.			Applying	

Course Code:	USBT604	Class:	TYBIOTECH	Semester:	VI
Course Name:	ENVIRONMENTAL BIOTECHNOLOGY				
Course Objectives:					
1.	To introduce students to various renewable sources of energy and their application in sustainable development.				
2.	To educate students on the principles and processes involved in the biological treatment of industrial effluents.				
3.	To provide comprehensive knowledge on the methods and technologies for wastewater treatment and heavy metal removal.				
4.	To impart understanding of hazardous waste management, focusing on biodegradation techniques for various industrial wastes.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to identify and explain the different types of renewable energy sources and their roles in energy sustainability.		Understanding		
CO2:	Learners will learn the fundamental concepts and operational mechanisms of biological processes for treating industrial effluents and solid wastes.		Applying		
CO3:	Learners will gain the ability to analyze the effectiveness of various wastewater treatment methods and propose suitable solutions for heavy metal pollution.		Analyzing		
CO4:	Learners will learn to assess the environmental impacts of hazardous wastes from different industries and apply biodegradation techniques for waste management.		Applying		

Course Code:	Applied Component	Class:	TYBIOTECH	Semester:	V
Course Name:	BIOSAFETY				
Course Objectives:					
1.	To provide an understanding of biosafety principles, including the identification and management of biological risks in laboratory settings.				
2.	To impart knowledge on Good Laboratory Practices (GLP) and the importance of adherence to these practices in research and development environments.				
3.	To educate about the detection, identification, and testing of contaminants in food and pharmaceutical products.				
4.	To explore the ethical, regulatory, and safety considerations involved in biotechnology, especially in the context of genetically modified organisms and recombinant DNA technology.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to assess and manage biological risks associated with various agents and laboratory procedures		Applying		
CO2:	Learners will learn to implement Good Laboratory Practices, including documentation, calibration, and validation of methods		Applying		
CO3:	Learners will learn to effectively detect and test for microbial contaminants in food and pharmaceuticals		Analyzing		
CO4:	Learners will learn to critically evaluate the ethical, regulatory, and safety aspects of biotechnology applications		Evaluating		

Course Code:		APPLIED COMPONENT	Class:	TYBIOTECH	Semester:	VI
Course Name:		AGRIBIOTECHNOLOGY				
Course Objectives:						
1.	To introduce students to the fundamentals and applications of Precision Agriculture and Greenhouse Technology, including design, construction, and environmental control systems.					
2.	To provide an understanding of Plant Stress Biology, focusing on both abiotic and biotic stresses, their impact on plants, and the physiological and molecular responses of plants.					
3.	To familiarize students with the principles and applications of Molecular Markers in Plant Breeding, including classical markers, DNA markers, and the use of molecular markers for quantitative trait locus (QTL) mapping.					
4.	To educate students on the significance and application of Bio fertilizers and Bio pesticides, including their types, mechanisms of action, and roles in sustainable agriculture.					
Course Outcome:				Level of Blooms Taxonomy		
CO1:	Learners will be able to comprehend and apply the principles of Precision Agriculture and Greenhouse Technology, enhancing their capability to design and manage advanced agricultural systems.			Applying		
CO2:	Learners will gain insights into the mechanisms of plant responses to various stresses and will be able to apply this knowledge to improve plant resilience and productivity.			Applying		
CO3:	Learners will acquire the skills to utilize molecular markers in plant breeding effectively, contributing to the development of improved crop varieties.			Analyzing and Evaluating		
CO4:	Learners will understand the importance and application of Bio fertilizers and Bio pesticides in sustainable agriculture, enabling them to implement			Understanding		

	environmentally friendly pest management and soil fertility enhancement strategies.	
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Course Code:	P501+502	Class:	TYBIOTECH	Semester:	V
Course Name:	CELL BIOLOGY+ MEDICAL MICROBIOLOGY & INSTRUMENTATION				
Course Objectives:					
1.	To equip students with the theoretical and practical knowledge required to perform and understand different chromatography techniques such as Affinity, Ion Exchange, and Size Exclusion Chromatography.				
2.	To provide hands-on experience in High-Performance Liquid Chromatography (HPLC) method validation, enhancing the analytical skills necessary for pharmaceutical and biotechnological applications.				
3.	To introduce the methodologies and principles behind antibiotic sensitivity testing, including MIC, MLC, and various sensitivity testing methods, to assess the effectiveness of antibiotics.				
4.	To familiarize students with basic concepts in Cancer Biology and developmental biology techniques, emphasizing practical exposure through field visits and chick embryo candling and inoculation methods.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to apply their knowledge of various chromatography techniques to separate components from mixtures, demonstrating proficiency in laboratory skills and understanding of the underlying principles.			Understanding and Applying	
CO2:	Learners will learn to validate HPLC methods, ensuring they can conduct accurate and reliable analyses critical for research and industry standards.			Analyzing	
CO3:	Learners will learn to conduct antibiotic sensitivity tests using different methodologies, enabling them to determine the efficacy of antibiotics and understand resistance mechanisms, contributing to better clinical decision-making.			Applying	
CO4:	Learners will learn to critically analyze scientific literature and reports, particularly in the areas of			Evaluating	

	Cancer Biology and developmental biology, enhancing their ability to synthesize information and draw informed conclusions.	
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Course Code:	P 601-P 602	Class:	TYBIOTECH	Semester:	VI
Course Name:	BIOCHEMISTRY & INDUSTRIAL MICROBIOLOGY				
Course Objectives:					
1.	To introduce the principles and techniques involved in the biochemical analysis of food, with a focus on milk and its derivatives.				
2.	To equip students with the skills necessary to conduct microbial analysis and understand its implications in food safety and quality.				
3.	To provide an understanding of the methods used for the analysis of human biological samples for health assessment.				
4.	To enhance critical thinking and analytical skills through the practical application of biochemical and microbiological testing methods.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to accurately perform and interpret the results of biochemical tests such as the estimation of milk protein using the Pynes method and the determination of vitamin C in food samples.		Applying		
CO2:	Learners will learn to effectively conduct microbial analyses of milk using MBRT and RRT, and understand their importance in assessing milk quality and safety.		Understanding		
CO3:	Learners will be able to apply analytical techniques to assess human health indicators, such as blood glucose levels and serum cholesterol		Analyzing		
CO4:	Learners will develop the ability to isolate and identify normal flora from milk and curd		Creating		

Course Code:	USBT P 503-504	Class:	TYBIOTECH	Semester:	V
Course Name:	GENOMES AND MOLECULAR BIOLOGY+ MARINE BIOTECHNOLOGY				
Course Objectives:					
1.	To introduce the fundamental techniques of molecular biology including transformation in E. coli, genomic DNA extraction, and PCR.				
2.	To provide hands-on experience with methods for studying gene expression, enzyme activity, and biochemical properties of marine organisms.				
3.	To enhance understanding of the principles behind molecular cloning, including restriction digestion, ligation, and vector design.				
4.	To develop skills in analyzing and interpreting data from experiments involving marine bacteria and algae, including their biochemical and genetic properties.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to apply basic and advanced techniques of molecular biology to study the genetic and biochemical properties of organisms.			Applying	
CO2:	Learners will learn how to design and conduct experiments, including the extraction of DNA, RNA, and proteins, and the analysis of their activities and functions.			Analyzing	
CO3:	Learners will be able to critically analyze and interpret data from molecular biology experiments, and effectively communicate their findings.			Analyzing	
CO4:	Learners will gain practical experience in applying molecular biology techniques to real-world problems in marine biology and biotechnology.			Creating	

Course Code:	USBT P 603-604	Class:	TYBIOTECH	Semester:	VI
Course Name:	PHARMACOLOGY - NEUROCHEMISTRY AND ENVIRONMENTAL BIOTECHNOLOGY (50M)+ PROJECT WORK (50M)				
Course Objectives:					
1.	To provide comprehensive knowledge on the evaluation of LD 50 and ED 50 using suitable models such as Daphnia.				
2.	To impart understanding on the impact of heavy metals on bacterial growth and ecosystem health.				
3.	To train students in the analytical techniques required for the determination of total solids and the estimation of specific pollutants like chromium in effluent samples.				
4.	To equip students with the skills necessary for conducting physico-chemical analysis of industrial effluents, understanding their environmental implications, and learning about the operations of Effluent Treatment Plants (ETP)/Common Effluent Treatment Plants (CETP).				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to apply standard methodologies to assess the toxicity and effectiveness of substances using model organisms.		Applying		
CO2:	Learners will gain the ability to critically analyze the influence of environmental contaminants on microbial life.		Analyzing		
CO3:	Learners will learn how to conduct essential environmental monitoring techniques, such as measuring total solids.		Applying		
CO4:	Learners will be equipped to undertake independent research projects through a combination of theoretical knowledge and practical exposure.		Creating		

Course Code:		Class:	TYBIOTECH	Semester:	V
Course Name:		BIOSAFETY PRACTICAL (APPLIED COMPONENT- BIOSAFETY PRACTICAL)			
Course Objectives:					
1.	To impart theoretical knowledge and practical skills required for the validation and calibration of laboratory instruments such as micropipettes, pH meters, and weighing balances.				
2.	To educate students on the principles and methodologies involved in conducting bioassays, with a focus on Vitamin B12.				
3.	To enable understanding of food safety standards and techniques for identifying adulterants in food products.				
4.	To provide comprehensive training on developing Standard Operating Procedures (SOPs) for major laboratory instruments and ensuring the sterility of pharmaceutical injectable.				
Course Outcome:			Level of Blooms Taxonomy		
CO1:	Learners will be able to perform validation and calibration of laboratory instruments, ensuring accurate measurements and reliable experimental results.		Remembering and Understanding		
CO2:	Learners will learn how to design and conduct bioassays, specifically Vitamin B12 bioassays, applying their knowledge to real-world scenarios.		Applying		
CO3:	Learners will acquire the ability to detect adulterants in food products, enhancing their understanding of food safety and quality control measures.		Understanding		
CO4:	Learners will learn to develop and implement Standard Operating Procedures (SOPs) for laboratory equipment and ensure the sterility of injectable, contributing to their proficiency in laboratory management and pharmaceutical quality assurance.		Applying		

Course Code:		Class:	TYBIOTECH	Semester:	VI
Course Name:	AGRIBIOTECHNOLOGY PRACTICAL (APPLIED COMPONENT AGRIBIOTECHNOLOGY PRACTICAL)				
Course Objectives:					
1.	To provide an understanding of the principles and applications of RAPD analysis and its role in genetic diversity studies.				
2.	To equip students with the skills necessary for the isolation and characterization of agriculturally important microorganisms such as Rhizobium, Azotobacter, and Phosphate solubilizing bacteria.				
3.	To explore the physiological and biochemical responses of plants to abiotic stress conditions and the mechanisms of stress tolerance.				
4.	To introduce the concepts of antioxidant defense mechanisms in plants, including the estimation of antioxidants and antioxidant enzymes.				
Course Outcome:				Level of Blooms Taxonomy	
CO1:	Learners will be able to perform RAPD analysis and interpret the results for assessing genetic diversity.			Analyzing	
CO2:	Learners will gain proficiency in isolating and identifying key agriculturally beneficial microorganisms, enhancing their practical microbiology skills.			Applying	
CO3:	Learners will understand the impacts of abiotic stresses on plant growth and development and will be able to evaluate plant responses to these stresses.			Understanding	
CO4:	Learners will learn how to quantify antioxidant molecules and enzymes in plant tissues, providing insights into the plants' defense mechanisms against stress.			Analyzing	