

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce, and Science College, Ahmednagar
(Autonomous)
(Affiliated to Savitribai Phule Pune University, Pune)**



**National Education Policy (NEP)
Choice Based Credit System (CBCS)**

**Programme Skeleton and Syllabus of
B.Sc. Wine, Brewing and Alcohol Technology (Major)**

Implemented from
Academic Year 2023-24

Credit Distribution: B.Sc. Wine, Brewing and Alcohol Technology (Major) including Minor and OE and other courses.

	Type of Courses	III Yr	IV Yrs (Honours)	IV Yrs Research
Major WBAT	Discipline-Specific Courses (DSC)	46	74	66
	Discipline Specific Elective (DSE)	08	16	16
	Skill Enhancement Courses (SEC)	06	06	06
	Vocational Skill Courses (VSC)	08	08	08
	On-Job Training (OJT)	04	08	04
	Field Project (FP)	04	04	04
	Community Engagement and Service (CEP)	02	02	02
	Research project	00	00	12
	Research Methodology	00	04	04
	Indian Knowledge System	02	02	02
	Total (I, II and III Year)	80	124	124
Minor	Minor	20	20	20
Other Courses	Open Elective (OE)/ Multidisciplinary Courses	12	12	12
	Co-Curricular Courses	08	08	08
	Ability Enhancement Courses	08	08	08
	Value Education Courses	04	04	04
	Total	132	176	176

B. Sc. Programme Framework: Credit Distribution

Y e a r	S e m e s t e r	L e v e l	Major										M i n o r	O E	C C	A E C	V E C	T o t a l	
			D S C		D S E		SEC		VSC		FP /O JT /IN/C EP								I K S
I	I	4.5	T	P	T	P	T	P	T	P	T	P		T/P	-	-	-	-	-
I	II	4.5	4	2	-	-	-	2	-	-	-	-	2	03	3	2	2	2	22
			6	-	-	-		2	-	2	-	-		03	3	2	2	2	22
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with Major and Minor																			
II	III	5.0	6	2	-	-		2	-	-	-	2		03	3	2	2	-	22
II	IV	5.0	6	2	-	-		-	-	2	-	2		03	3	2	2	-	22
Exit Option: Award of UG Diploma in Major with 88 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																			

III	V	5.5	8	2	2	2	-	-	-	2		2		04	-	-	-	-	-	22
III	VI	5.5	6	2	2	2	-	-	-	2		4		04	-	-	-	-	-	22
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																				
IV	VII	6.0	8	6	2	2	RM-4	-	-	-	-			-	-	-	-	-	-	22
IV	VII I	6.0	8	6	2	2	-	-	-	-	-	4		-	-	-	-	-	-	22
Four Year UG Degree(Honours) with Major and Minor with 176 credits																				
IV	VII	6.0	6	4	2	2	RM-4	-	-	-	4			-	-	-	-	-	-	22
IV	VII I	6.0	6	4	2	2	-	-	0	-	-	8		-	-	-	-	-	-	22
Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits																				

B. Sc. Programme Framework: Course Distribution

Year	Semester	Level	Major										Minor	OE	CC	AEC	VEC	Total		
			DSC		DSE		SEC		VSC		FP/OJT/IN/CEP								IKS	
I	-	-	T	P	T	P	T	P	T	P	T	P		T	P	-	-	-		-
I	I	4.5	2	1	-	-	-	1	-	-	-	-	1	1	1	1	1	1	1	10
	II	4.5	2	-	-	-		1	-	1	-	-		1	1	1	1	1	1	09
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																				
II	III	5.0	2	1	-	-		1	-	-	-	1		1	1	1	1	-		09
II	IV	5.0	2	1	-	-		-	-	1	-	1		1	1	1	1	-		09
Exit Option: Award of UG Diploma in Major with 88 credits and an \additional 4 credit core NSQF course /Internship or Continue with major and minor																				
III	V	5.5	2	1	1	1	-	-	-	1		1		1	-	-	-	-		08
III	VI	5.5	2	1	1	1	-	-	-	1		1		1	-	-	-	-		08
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																				
IV	VII	6.0	3	3	1	1	0	1	-	-	-	-		-	-	-	-	-		09
IV	VII	6.0	3	3	1	1	-	-	-	-	-	1		-	-	-	-	-		09

	I																			
Four Year UG Degree(Honours) with Major and Minor with 176 credits																				
IV	VII	6.0	2	2	1	1	0	1	-	-	-	1		-	-	-	-	-	-	08
IV	VII I	6.0	2	2	1	1	-	-	-	-	-	1		-	-	-	-	-	-	07
Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits																				

Programme Framework (Course Distribution): B.Sc. Wine, Brewing and Alcohol Technology (Major)

Y e a r	Se me ste r	L e v e l	Major											Total	
			DS C		DS E		SEC		VSC		FP/OJT /IN/CEP/P R		IKS		
			T	P	T	P	T	P	T	P	T	P	T	T	P/P R
I	I	4.5	2	1	-	-	-	1	-	-	-	-	01	03	02
I	II	4.5	2	-	-	-		1	-	1	-	-		02	02
II	III	5.0	2	1	-	-		1	-	-	-	1		02	03
II	IV	5.0	2	1	-	-		-	-	1	-	1		02	03
III	V	5.5	2	1	1	1	-	-	-	1		1		03	04
III	VI	5.5	2	1	1	1	-	-	-	1		1		03	04
B.Sc. Honours															
IV	VII	6.0	3	3	1	1	RM-1		-	-	-	-		05	04
IV	VIII	6.0	3	3	1	1	-	-	-	-	-	1		04	05
B.Sc. Honours with Research															
IV	VII	6.0	2	2	1	1	RM-1		-	-	-	1		04	04
IV	VIII	6.0	2	2	1	1	-	-	-	-	-	1		03	04

Programme Framework (Credit Distribution): B.Sc. Wine, Brewing and Alcohol Technology (Major)

Y ea r	Sem ester	L ev el	Major											Total
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP/RP		IKS	
			T	P	T	P	T	P	T	P	T	P	T	
I	I	4.5	4	2	-	-	-	2	-	-	-	-	02	10

I	II	4.5	6	-	-	-		2	-	2	-	-		10
II	III	5.0	6	2	-	-		2	-	-	-	2		12
II	IV	5.0	6	2	-	-		-	-	2	-	2		12
III	V	5.5	8	2	2	2	-	-	-	2		2		18
III	VI	5.5	6	2	2	2	-	-	-	2		4		18
IV	VII	6.0	8	6	2	2	RM-4		-	-	-	-		22
IV	VIII	6.0	8	6	2	2	-	-	-	-	-	4		22
IV	VII	6.0	6	4	2	2	RM-4	-	-	-	-	4		22
IV	VIII	6.0	6	4	2	2	-	-	-	-	-	8		22

Programme Framework (Courses and Credits): B.Sc. Wine, Brewing and Alcohol Technology (Major)

Sr. No.	Year	Sem	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-1	BS-WT111T	Fundamentals Of Biochemistry	02
2.	I	I	4.5	DSC-2	BS-WT112T	Introduction To Microbial World	02
3.	I	I	4.5	DSC-3	BS-WT113P	Practical's In Biochemistry	02
4.	I	I	4.5	SEC-1	BS-WT114P	Practical's In Microbiology	02
5.	I	I	4.5	IKS-1	BS-WT115T	Indian Beverage System	02
6.	I	II	4.5	DSC-4	BS-WT121T	Plant Biology	03
7.	I	II	4.5	DSC-5	BS-WT122T	Introduction To Alcoholic Beverages And Sensory Evaluation	03
8.	I	II	4.5	SEC-2	BS-WT123P	Practical's In Plant Biology	02
9.	I	II	4.5	VSC-1	BS-WT124P	Practical's In Wine Technology	02
10	II	III	5.0	DSC-6	BS-WT231T	Vineyard Management	03
11	II	III	5.0	DSC-7	BS-WT232T	Yeast Technology	03
12	II	III	5.0	DSC-8	BS-WT233P	Practical's In Vineyard Management	02
13	II	III	5.0	SEC-3	BS-WT234P	Practical's In Yeast Technology	02
14	II	III	5.0	FP-01	BS-WT235P	-	02
15	II	IV	5.0	DSC-9	BS-WT241T	Fermentation Technology	03
16	II	IV	5.0	DSC-10	BS-WT242T	Basics Of Oenology	03
17	II	IV	5.0	DSC-11	BS-WT243P	Practical's In Fermentation Technology	02
18	II	IV	5.0	VSC-2	BS-WT244P	Practical's In Oenology	02

19	II	IV	5.0	CEP-01	BS-WT245P	-	02
20	III	V	5.5	DSC-12	BS-WT351T	Basic Brewing And Alcohol Technology	04
21	III	V	5.5	DSC-13	BS-WT352T	Basic Chemical Engineering And Equipment's	04
22	III	V	5.5	DSC-14	BS-WT353P	Practical's In Brewing And Alcohol Technology	02
23	III	V	5.5	DSE-01	BS-WT354T (A) BS-WT354T (B)	Health Benefits Of Alcoholic Beverages OR Fruit And Fortified Wines	02
24	III	V	5.5	DSE-02	BS-WT355P (A) BS-WT355P (B)	Practical's In Health Benefits Of Alcoholic Beverages OR Practical's In Fruit And Fortified Wines	02
25	III	V	5.5	VSC-3	BS-WT356P	Practical's In Chemical Engineering And Equipment's	02
26	III	V	5.5	FP-02	BS-WT357P	--	02
27	III	VI	5.5	DSC-15	BS-WT361T	Marketing And Regulations Of Alcoholic Beverages	03
28	III	VI	5.5	DSC-16	BS-WT362T	Microbial Spoilage And Defects In Alcoholic Beverages	03
29	III	VI	5.5	DSC-17	BS-WT363P	Practical's In Marketing And Regulations Of Alcoholic Beverages	02
30	III	VI	5.5	DSE-03	BS-WT364T (A) BS-WT364T (B)	Waste Management OR Food Technology	02
31	III	VI	5.5	DSE-04	BS-WT365P (A) BS-WT365P (B)	Practical's In Waste Management OR Practical's In Food Technology	02
32	III	VI	5.5	VSC-4	BS-WT366P	Practical's In Microbial Spoilage And Defects In Alcoholic Beverages	02
33	III	VI	5.5	OJT-01	BS-WT367P	-	04

B.Sc. Wine, Brewing and Alcohol Technology (Major with Honours)

34.	IV	VII	6.0	DSC-18	BS-WT471T	Advanced Microbiology	03
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35.	IV	VII	6.0	DSC-19	BS-WT472T	Advanced Biochemistry	03
36.	IV	VII	6.0	DSC-20	BS-WT473T	Viticulture	02
37.	IV	VII	6.0	DSC-21	BS-WT474P	Practical's In Industrial Microbiology	02
38.	IV	VII	6.0	DSC-22	BS-WT475P	Practical's In Advanced Biochemistry	02
39.	IV	VII	6.0	DSC-23	BS-WT476P	Practical's In Viticulture	02
40.	IV	VII	6.0	DSE-05	BS-WT477T	Bioprocess Engineering Or Environmental Science	02
41.	IV	VII	6.0	DSE-06	BS-WT478P (A) BS-WT478P (B)	Practical's In Bioprocess Engineering Or Practical's In Environmental Science	02
42.	IV	VII	6.0	RM-01	BS-WT479T/P	Research Methodology (Instrumentation)	04
43.	IV	VII I	6.0	DSC-24	BS-WT481T	Applied Alcohol Technology	03
44.	IV	VII I	6.0	DSC-25	BS-WT482T	Applied Brewing Technology	03
45.	IV	VII I	6.0	DSC-26	BS-WT483T	Applied Oenology	02
46.	IV	VII I	6.0	DSC-27	BS-WT484P	Practical's In Applied Alcohol Technology	02
47.	IV	VII I	6.0	DSC-28	BS-WT485P	Practical's In Applied Brewing Technology	02
48.	IV	VII I	6.0	DSC-29	BS-WT486P	Practical's In Applied Oenology	02
49.	IV	VII I	6.0	DSE-07	BS-WT487T (A) BS-WT487T (B)	Chemical Engineering and Plant Management OR Biostatistics	02
50.	IV	VII I	6.0	DSE-08	BS-WT488P (A) BS-WT488P (B)	Practical's In Chemical Engineering and Plant Management OR Practical's In Biostatistics	02
51.	IV	VII I	6.0	OJT-02	BS-WT487P	--	04

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
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Board of Studies in B.Sc. Wine, Brewing and Alcohol Technology

Sr. No.	Name	Designation
1.	Dr. Sanjay Tukaram Moharekar	Chairman
2.	Dr. Shubhangi Sanjay Moharekar	Member
3.	Dr. Sarika Ramesh Rao Deshmukh	Member
4.	Mr. Ashish Sadanand Wani	Member
5.	Prof. Syed S. Dastager	Vice-Chancellor Nominee
6.	Prof. Sanjay V. Patil	Academic Council Nominee
7.	Mr. Rajendra G. Chaure	Academic Council Nominee
8.	Mr. Manoj Madhukarrao Mukkirwar	Industry Expert
9.	Mr. Prasad Vinod Rajale	Alumni
10.	Ms. Dipali D. Giramkar	Member (co-opt)
11.	Ms. Supriya P Salve	Member (co-opt)

1. Prologue/ Introduction of the programme:

Wine, Beer and Alcohol Technology, being one of the youngest branches of Life Science, has expanded and established as applied science. Global and local focus has slowly shifted to not only current “Century of Knowledge” but also on to technology development and application in life sciences. Although, wine has traditionally been consumed throughout history with evidence dating back to Harappan civilization, commercial wine production is a pretty recent phenomenon, with the first commercial grape wine plant being set up only in the 1980s. Since then, three major players – Chateau Indage, Grover Vineyards and Sula Vineyards – emerged in the domestic winemaking scene and the last few decades saw vineyards cropping up all over the country. Then came the tide of globalization and India, bowing to WTO’s demands, had to reduce tariffs on imported liquor with the consequence that the market was suddenly flooded with incredibly refined Italian and French wines of unmatched quality – much to the delight of the wine lovers and to the woe of the Indian

winemakers. Coming back to the present times, finding a foothold in an area that has been eternally dominated by European players (read: France, Italy, and Spain, in that order) has been quite an uphill task for Indian winemakers. However, the recent growth numbers – the wine market is currently growing at a rate of 25-30 per cent – have given them some cause to celebrate. A larger market translates to more demand, which in turn means that Indian wines can, now, share a shelf with their French and Italian counterparts. Moreover, Indian wines are considerably cheaper than their Western counterparts; thus, enabling it to achieve a particular target audience of its own. Back home, statistics reveal that India's rich and prosperous are finally warming up to this delicious drink; India has a wine market of roughly 1.2 million cases, while experts predict that consumption will grow at a CAGR of around 30% during 2009-2013. Lastly, right marketing strategies and increased awareness will go a long way to ensure that this historically significant drink finally conquers Indian hearts.

The syllabus for Wine, Brewing, and Alcohol Technology is designed in accordance with the guidelines outlined in the New Education Policy (NEP) of India. The syllabus covers a wide range of topics and aims to provide a holistic and multidisciplinary education to students in this field. It focuses on the development of practical skills, critical thinking, and creativity, while also promoting entrepreneurship and innovation. The syllabus aligns with the NEP's emphasis on flexibility, integration of vocational education, and the use of technology in teaching and learning. It includes curricular reforms that reduce content overload and promote conceptual understanding, as well as examination reforms that emphasize continuous assessment and application-based evaluation. The syllabus also emphasizes the importance of teacher training and professional development to enhance the quality of education in this domain. It recognizes the significance of preserving and promoting Indian languages as mediums of instruction and encourages the use of digital tools and resources for effective learning. Additionally, the syllabus incorporates higher education reforms, such as multidisciplinary approaches, research integration, and industry-academia collaboration. Overall, the syllabus for Wine, Brewing, and Alcohol Technology reflects the principles and objectives of the NEP, providing students with a comprehensive and contemporary education that prepares them for the evolving demands of the industry.

2. Programme Outcomes (POs)

1. To introduce the concepts in various allied subjects
2. To enrich students' knowledge

3. To help the students to build interdisciplinary approach
4. To help the students to build interdisciplinary approach
5. To help the students to build interdisciplinary approach
6. To inculcate sense of scientific responsibilities and social and environment awareness
7. To help student's build-up a progressive and successful career
8. To help student for building up their careers in industry and research
9. Syllabi will provide extensive practical skill sets will help a graduate student to avail the opportunities in the applied fields (research, industry or institutions), without any additional training.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Fundamentals of Biochemistry								
Year: I					Semester: I			
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-1	BS-WT111T	02	00	02	30	15	35	50

Learning Objectives:

To understand types of biomolecules

To learn biological functions of biomolecules

To understand structures of biomolecules

Course Outcomes (Cos)

1. Learn the basic knowledge of structure of water
2. Learn the basic knowledge of structure and functions of major bio-molecules.
3. To understand the concept of Carbohydrate, Lipids and proteins in details.

Detailed Syllabus:

Unit I: Water

(4)

Structure of water, ionization of water, osmosis, pH, titration curves, buffer

Types of bond- Covalent and non-covalent bonds

Unit II: Carbohydrates

(7)

Definition of carbohydrates, Monosaccharides: ketoses and aldoses, D and L

configuration, epimers, anomers, Oligosaccharides: glycosidic bond e. g. Maltose,

Polysaccharides: classification based on function, Storage polysaccharide: e. g. starch,

Structural polysaccharides: e.g. cellulose

Biological Functions of Carbohydrate

Unit III: Lipid

(7)

Definition of lipid, Fatty acids- Classification, nomenclature, Classification of lipids:

Simple, complex lipids and derived lipids, Simple lipids- Oil, Fat and wax, Complex

lipids: Phospholipids and Glycolipids, Derived lipids: Steroids, terpenoids and

carotenoids, Biological Function of lipids

Unit IV: Proteins

(7)

Classification of amino acids, zwitterion, titration curve of amino acid, Isoelectric point.

Protein structure: Primary structure and peptide bond formation, Secondary structure (alpha helix and beta sheet), Tertiary structure (e.g. Myoglobin) and Quarternary structure (e.g. Haemoglobin)

Biological Functions of proteins

Unit V: Nucleic acids

(5)

Purine, Pyrimidines, Nucleosides, Nucleotides, Polynucleotide, Covalent structure of DNA

Types of RNA- mRNA, tRNA and rRNA

Suggested Readings/Material:

1. Outlines of Biochemistry: 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Fundamentals of Biochemistry. 3rd Edition, (2008), Donald Voet & Judith Voet, John Wiley and Sons, Inc. USA
3. Principles of Biochemistry, 4th edition (1997), Jeffory Zubey, McGraw-Hill College, USA
4. Biochemistry: 7th Edition, (2012), Jeremy Berg, Lubert Stryer, W.H. Freeman and company, NY
5. Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W.H. Freeman and company, NY.
6. Biochemistry. 5th Edition, (copyright 2013), Reginald Garrett and Charles Grisham, Brook/Cole, Cengage Learning, Boston, USA.
7. An Introduction to Practical Biochemistry.3rd Edition, (2001), David Plummer, Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India
8. Biochemical Methods.1st, (1995), S.Sadashivam, A.Manickam, New Age International Publishers, India

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Syllabus

B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Introduction to Microbial World								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-2	BS-WT112T	02	00	02	30	15	35	50

Learning Objectives:

1. To gain knowledge about classification and characteristics of microorganisms.
2. To compare the anatomy and physiology of prokaryotic and eukaryotic cells.
3. To define the nutrition and types of microorganisms.
4. To explain the growth and reproduction of microbial populations.
5. To study microscopy and staining technique

Course Outcomes (Cos)

1. Students will learn about history and scope of microbiology.
2. Students will learn classification, nomenclature & identification of microorganisms.
3. Students will learn principle and working of Bright field, Dark field and Phase contrast microscopy.
4. Students will learn bacterial classification and isolation methods.
5. Students will learn the life cycle, different modes of reproduction and industrial applications of yeast.

Detailed Syllabus:

Unit I: Introduction, History, Branches and Scope of Microbiology (6)

Biogenesis and Abiogenesis, Milestones and scope of microbiology, Importance, occurrence and types of microorganisms (Archaeobacteria, Eubacteria, fungi, viruses, protozoa and algae), Prokaryotic and Eukaryotic cells, nutritional classification of microorganisms.

Unit II: Ultra Structure of Bacterial and yeast cell (8)

Cell wall, cell membrane, capsule, endospore, flagella and its types, Cell inclusions.

Yeast cell structure and functions of various cellular components

Unit III: Microscopy (6)

Introduction and definition of Microscopy, Types of Microscopy, Different concepts in Microscopy-resolving power, resolution, contrast, numerical aperture, working distance and magnification.

Unit IV: Microbial Growth, Reproduction and Measurement (6)

Reproduction in bacteria (binary fission) and molds (spore production), Growth curve, generation time, growth rate, Methods of enumeration: Microscopic methods (Direct count), Plate counts (Total viable count).

Unit V: Staining Techniques (4)

Definitions of Stain, Basic stains and Acidic stains, Concept and types of Fixatives, Definition and examples of Mordant, Decolourisers and Accentuators. Types of staining technique- Monochrome staining, Negative (Relief) staining and Differential staining - Gram staining and Special staining (LPCB).

Suggested Readings/Material:

1. Brock Biology of Microorganisms (14th Edition) 14th Edition by Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, Thomas Brock
2. Stanier, Y., Doudoroff, M., & Adelberg, E. A. (1958). General microbiology. General microbiology.
3. Prescott's Microbiology 10th Edition. By Joanne Willey and Linda Sherwood and Christopher J. Woolverton
4. Black, J. G. (2017). Microbiology: principles and explorations. John Wiley & Sons.
5. Talaro, K. P., & Chess, B. (2018). Foundations in microbiology. McGraw-Hill.
6. Foster, J. W., & Slonczewski, J. L. (2017). Microbiology: an evolving science. WW NORTON.
7. Microbiology. by Michael J. Pelczar Jr., Roger D. Reid, et al.
8. Microbiology: An Introduction, Global Edition. Edited by Gerard J. Tortora

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Practical's in Biochemistry								
Year: I					Semester: I			
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
DSC-3	BS-WT113P	00	02	02	60	15	35	50

Learning Objectives:

To learn safety measures in chemical laboratory

To study the concept of Molarity, molality, normality, pH measurement

To study the qualitative analysis of biomolecules

Course Outcomes (Cos)

1. Isolation of starch and lipids from plant/animal sources and their confirmation by confirmatory tests
2. Understand the concept of estimation of protein by Biuret method and sugars by DNSA methods.

Detailed Syllabus:

1. Safety Measures and practices in laboratory (1)
2. Biochemical calculations (Preparation of molar, normal, percent solutions (1)
3. Preparation of solutions and buffers (1)
4. Measurement of pH of various solutions using pH indicator and pH meter. (1)
5. Isolation of starch from plant source and its qualitative detection by iodine reagent. (1)
6. Oil extraction from plant source and estimation of free fatty acids. (1)
7. Qualitative tests- (1)
Spot tests for sugars
Spot tests for lipids

8. Spot tests for amino acids and proteins (1)
9. To estimate concentration of reducing sugar in given sample by DNSA method (1)
10. Estimation of concentration of protein by Biuret method (1)
11. Determination of Ascorbic acid (2)

Suggested Readings/Material:

1. An Introduction to Practical Biochemistry.3rd Edition, (2001), David Plummer, Tata McGraw Hill Edu. Pvt. Ltd. New Delhi, India
2. Biochemical Methods.1st, (1995), S. Sadashivam, A. Manickam, New Age International Publishers, India
3. An introduction to practical biochemistry,David plummer
4. Introductory practical biochemistry, S.K. Sawhoey, Randhir singh

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(Autonomous)
Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Practicals in Microbiology								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
SEC-1	BS-WT114P	00	02	02	60	15	35	50

Learning Objectives:

1. To study glassware's used in microbiology laboratory and its cleaning.
2. To study preparation of nutrient medium for isolation of microorganisms.
3. Isolation of microorganism by streak plate method, pour plate, spread plate method and Staining.
4. To study isolation, enumeration and staining techniques.

Course Outcomes (Cos)

1. Student will study good laboratory practices
2. Students will learn the isolation techniques
3. Students will learn the fungi isolation technique and its morphological study
4. Students will study different staining techniques used in microbiology

Detailed Syllabus:

- 1 Introduction to common microbiology laboratory instruments, glass wares and safety measures, good laboratory practices in microbiology laboratory (2)
- 2 Learning basic techniques in microbiology: Wrapping of glassware, Cotton plugging, Cleaning and washing of glassware. (1)
- 3 Study of different microscopes (compound, dissecting, inverted, phase contrast). (1)
- 4 Preparation of nutrient media (nutrient agar, nutrient broth) (1)
- 5 Isolation and enumeration of microorganism by spread plate method (1)
- 6 Isolation and enumeration of microorganism by streak plate method (1)
- 7 Isolation and enumeration of microorganism by pour plate method (1)

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|----|---|-----|
| 8 | Study of slide culture technique of fungi and LPCB staining | (1) |
| 9 | Morphological study of bacteria by monochrome staining | (1) |
| 10 | Morphological study of bacteria by negative staining | (1) |
| 11 | Morphological study of bacteria by Gram staining | (1) |

Suggested Readings/Material:

1. P. Gunasekaran (2005) Laboratory Manual in Microbiology B.Sc. Wine, Brewing and Alcohol Technology 2021-22 [18]
2. Stanbury, P. F., Whitaker A. & Hall S. T. (2008) Principles of Fermentation Technology
3. Anuradha De. (2009) Practical and applied microbiology
4. John Grainger (2001), Basic practical microbiology Panda U. N. (2005) Handbook of Microbiology and parasitology
5. Anuradha De. (2009) Practical and applied microbiology
6. Prescott Hurley Kline's (2008) Microbiology
7. Sathe S. T., Pharande S. R. (2010) Introduction to Microbiology

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Indian Beverage System								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
IKS-1	BS-WT115T	02	00	02	30	15	35	50

Learning objectives

- To study about traditional and modern Indian beverages.
- To know about fermented and non-fermented products.
- To study different raw materials for fermented beverages.

Course outcomes (CO's)

- a. Students will understand Indian beverage culture.
- b. Students will understand origin and process of various beverages consumed in India
- c. Students will develop knowledge about production of Indian beverages.
- d. Students will learn health benefits of fermented and non-fermented beverages.
- e. Students will gain knowledge of production of indigenous alcoholic beverages.

Detailed Syllabus:

Unit I: Introduction to Indian beverage industry (6)

Traditional Indian beverages: Fermented and Non-Fermented, modern Indian beverages: Fermented and Non-Fermented, Historical, geographical, And economical perspective of Indian beverage system

Unit II: Non-Fermented beverages consumed in India (8)

Raw material, Process of production, geographical consumption pattern, and health benefits;

- i. Tea, Coffee, Decoctions/kadha
- ii. Coconut water, Neera, Sugarcane juice
- iii. Fruit juices, Sharbat, Panna:

Unit III: Fermented Non-Alcoholic beverages in India: (6)

Raw material, Process of production, geographical consumption and production pattern, and health benefits

1. Milk based: Curd, Lassi, Chaas
2. Root based: Kanji
3. Leaves based: Kombucha

Unit IV: Fermented Alcoholic beverages in India (10)

Raw material, Process of production, geographical consumption and production pattern, and effect on health; Toddy, Feni, Arrack, Chhang, Mahua, Handia, Laupani, different types of Asavam, Madira.

Reference books:

1. Fermented Foods and Beverages of the World by H.K. Parashar
2. Fermented Foods and Beverages of the World by Jyoti Prakash Tamang and Kasipathy Kailasapathy
3. Traditional Fermented Foods and Beverages of India by Jyoti Prakash Tamang
4. Traditional Indian Beverages: A Collection of Recipes by Tara Deshpande Tennebaum
5. Wild Fermentation: The Flavor, Nutrition, and Craft of Live-Culture Foods by Sandor Ellix Katz
6. Fermented Alcoholic Beverages: A Global Perspective edited by Arvind Battu and Ramesh C. Ray
7. Indian Moonshine: Liquor, Love, and the Law by Akaash Maharaj
8. Indian Drinks: An Introduction to the Pleasures of India's Drinks and Punches by Charmaine O'Brien
9. The Indian Drinks: How to Prepare and Serve Them by Ramesh Chandra Sen:
10. Mocktails, Punches, and Shrubs: Over 80 Non-Alcoholic Drinks to Savour and Enjoy by Vikas Khanna
11. Cooler, Smoother, and Refreshing: The Non-Alcoholic Drinks Guidebook by Rachael Rayner

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Plant Biology								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
DSC-4	BS-WT121T	02	00	02	30	15	35	50

Learning Objectives:

1. To study basic concepts of botany.
2. To study plant water relation and primary metabolism
3. To study the various plants used in beverage industry

Course Outcomes (Cos)

1. Students will learn concept of Botany.
2. Students will understand the concepts of plant physiology such as Osmotic pressure (OP), turgor pressure (TP) and wall pressure (WP), etc.
3. Students will study the physiology of flowering.
4. Students will study the various plants used in beverage industry

Detailed syllabus

Unit I: Introduction to Plant Biology

(10)

Importance of plants in ecosystems and human life, Basic plant structure and organization, A general account of different groups (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms), Overview of plant reproduction and their economic importance with example

Plant Cells and Tissues system: Structure and functions of plant cells, Cell cycle: mitosis and meiosis, Types and functions of plant tissues (Meristematic, Permanent-Simple and complex, epidermal), internal structures of roots, stems, and leaves.

Unit II: Basics of Plant Physiology

(10)

Water and Mineral Nutrition: Plant-water relations, water uptake, and transport, Mineral

uptake and nutrient transport in plants, Absorption of water: Ascent of sap –Cohesion-tension theory, Phloem loading and unloading

Photosynthesis: Light reactions and Calvin cycle, Factors affecting photosynthesis, Photorespiration and C4 and CAM pathways

Respiration and Metabolism: Cellular respiration and ATP production

Unit III: Plant Growth and Development: (10)

Essential nutrients for Plant growth and their role, Plant hormones and their functions, Regulation of plant growth and development: Photo-biology (movement and photo-morphogenesis (vegetative)

Introduction to physiology of flowering: Photoperiodism and Vernalization

Seed germination and metabolic changes during seed germination

Types of Fruits and Fruit ripening

Unit IV Plant & its interaction: Plant & its interaction with surrounding (Biotic & (08)

Abiotic components), Response of plants to biotic stresses (Host–pathogen interaction) and abiotic stresses (light, temperature, draught and salinity)

General classification & role of secondary metabolites

Unit V. Plants used in beverage industry (07)

Cereals e.g. Barley, Wheat, Millets, etc.

Fruit crops e.g. Grape,

Aromatic/flavoring plants e.g. Hops, Cinnamon

Suggested Readings:

1. Dutta A.C. (2000) A Classbook of Botany (Oxford University Press, UK)
2. Ganguli, Das Dutta (2011) – College Botany Vol I, II and III (New Central Book Agency, Kolkata)
3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi. Co. Ltd.
4. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
5. Nobel P. S. (1998), Physiochemical and Environmental Plant Physiology (Second Edition), Academic Press, San Diego, USA.
6. De, K. K.(2004). An Introduction to Plant Tissue Culture. New Central Book Agency (P.) Ltd. Kolkata.

7. Albert F Hill; O P Sharma (1996) Hills Economic Botany, New Delhi: Tata McGraw-Hill, ©1996.
8. Jha Timir Baran, Ghosh Biswajit (2016) Plant Tissue Culture: Basic and Applied Revised 2nd edition Platinum Publishers.

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Introduction to alcoholic beverages and sensory evaluation								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-5	BS-WT122T	03	00	03	45	30	70	100

Learning Outcomes:

1. To learn the concept of alcoholic fermentation
2. To understand the process of sensory evaluation.
3. To acquire the knowledge of art of tasting wine
4. To learn the beneficial and harmful effects of alcoholic beverages

Course Outcomes (COs)

1. Students will understand the process of sensory evaluation.
2. Students will acquire the knowledge of art of tasting wine
3. Learn the methods of Wine marketing.
4. To learn the beneficial and harmful effects of alcoholic beverages

Detailed Syllabus:

Unit I: Introduction and history of alcoholic beverages (6)

Introduction, history of alcoholic fermentation, Various substrates used for alcoholic fermentation, Basic terminologies associated with alcoholic fermentation

Unit II: Introduction to foreign liquors: (7)

Overview of raw material used and production process: Wine, Beer, Vodka, Gin, Brandy, Whiskey, Rum.

Unit III: Sensory evaluation and terminologies (10)

The basic tastes of alcoholic beverages: bitterness, acidity, salt, sweetness, and alcohol on the tongue.

Sensory perception -study of tongue anatomy with reference to sensory response, study of olfactory organ with reference to sense of smell.

Factors influencing taste perception.

Unit IV: The art of tasting wine – Appearance, aroma and taste (10)

Sensory evaluation and scorecard: Rose worthy scorecard, Davis scorecard and Sparkling wine score-card. Types of Additives in alcoholic beverages

Introduction to tasting sheet of wines, beer and other alcoholic beverages.

Classification of Aroma: Primary, Secondary and Tertiary aroma Introduction to aroma wheel, beer aroma and flavor wheel

Tasting exercises – Duo –trio test, blind tasting, triangular taste.

Unit V: Design of tasting room, timing of tasting wine (12)

Taste the wine on the basis of three important senses i.e. vision, smell and palate structure.

Pre-tasting organization– tasting area, number of samples replicates, temperature, cork removal, decanting, dispensers, glasses, number of tasters.

Tasting situations– wine competitions, trade tasting, wine appreciation courses, home tasting.

Suggested Readings:

1. Ronald S. Jackson (2002) Wine Testing a professional handbook. Academic Press.
2. Roger B. Boulton, Vernon L. Singleton, Linda F. Bisson, Ralph E. Kunkee (1996) Principles and practices of wine making, Springer.
3. Emile Peynalld (1984) Knowing & making wine. Wiley, ISBN 047188149X, 9780471881490
4. Patrice I and and Peter Gago (1997) Australian wine from the grap vine to the glass Patrick and Wine Promotions, ISBN 06463185

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Practicals in Plant Biology								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
SEC-2	BS-WT123P	00	02	02	60	15	35	50

Learning Objectives:

1. To study plant and its parts.
2. To study different physiological processes.
3. To study the role of plant growth regulators on plant development.

Course Outcomes (Cos)

1. Students will learn the concept of osmosis, diffusion pressure and turgor pressure using potato tubers.
 2. Students will study extraction and spectrophotometric estimation of leaf pigments.
 3. Students will learn the effect of plant growth regulators on plants.
- Students will preparation and importance of herbarium.

Detailed Syllabus:

1. Study of typical plant and plant parts (1)
2. Study of osmosis and turgor pressure (1)
3. Determination of Diffusion Pressure Deficit using potato tubers. (1)
4. Study of transpiration and translocation in plants. (1)
5. Testing presence of phenols in the plant tissue by ferric chloride test. (1)
6. Separation of leaf pigments by paper strip chromatography (1)
7. Extraction and Spectrophotometric estimation of leaf pigments (1)
8. Observation of parts of flower (1)
9. Study of different types of fruits (1)
10. Study of embryological evidences in plants & Observation of embryo in monocot and dicot seeds (1)
11. Determination of rate of respiration in germinating seeds (1)

12. To study effect of plant growth regulators on leaf (1)

Suggested Readings:

1. Roy Piyush (2012). Plant Anatomy. New Central Book Agency (P.) Ltd. Pune
2. Vasishta, P.C. (1981). Plant Anatomy to embryology. Pradeep Publications
3. Gokhale, S. B. and Kokate, C.K. (1987). Pharmacognosy
4. Wallis, T. E. (1985). A Text book of Pharmacognosy, CBS Publishers & Distributors, New

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Syllabus
B.Sc. Wine, Brewing and Alcohol Technology (Major)

Title of the Course: Practicals in Wine Technology								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
VSC-1	BS-WT124P	00	02	02	60	15	35	50

Learning Objectives:

1. To learn the sensory evaluation of alcoholic beverages
2. To understand the concept of scoring wines using tasting sheets
3. To understand the scorecards used for determination of quality of alcoholic beverages.
4. To learn the interaction of different tastes in alcoholic beverages.

Course Outcomes (Cos)

1. Students will learn the sensory evaluation of alcoholic beverages
2. Students will understand the concept of scoring wines using tasting sheets
3. Students will understand the scorecards used for determination of quality of alcoholic beverages.
4. Students will learn the interaction of different tastes in alcoholic beverages.

Detailed Syllabus:

1. Introduction to Wine, brewing and alcohol technology laboratory and study of common instruments e.g. Refractometer, Hydrometer, Colorimeter, pH Meter, Distillation Unit, Balance etc. (1)
2. Determination of sugar in brix and pH of grapes/fruits juice and alcoholic beverages (1)
3. To study threshold detection of acid taste. (1)
4. To study threshold detection of sweet taste. (1)
5. To study threshold detection of bitter taste. (1)
6. To study threshold detection of salt taste. (1)

7. Interaction of sweet, bitter and acid taste. (1)
8. Detection of different aromas in wine/beer using aroma wheel. (1)
9. Types of glasses and bottles (1)
10. Scoring of wine using different tasting sheet. (1)
11. Sensory evaluation of white wine and red wine. (1)
12. Study of a 50 KL winery and report writing (1)