

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 Framework
B. Sc. - I ()

Wine Brewing and Alcohol Technology

Implemented from
Academic Year 2024-25

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)

Board of Studies in 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.	Mr. Rajendra G. Chaurse	Academic Council Nominee
6.	Prof. Sanjay V. Patil	Academic Council Nominee
7.	Prof. Syed S. Dastager	Vice-Chancellor Nominee
8.	Mr. Prasad Vinod Rajale	Alumni
9.	Mr. Manoj Madhukarrao Mukkirwar	Industry Expert
10.	Ms. Dipali D. Giramkar	Member (co-opt)
11.	Ms. Supriya P Salve	Member (co-opt)

1. Prologue/ Introduction of the programme: At least one page

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
1. 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.

B. Sc. Programme Framework: Credit Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	02		02				02	02	02	02	-	02		02	02	02	02	22
	II	02		02				02	02	02	02	02	-	02	--	02	02	02	22
		Credits Related to Major						Selected as Minor											
		Core		Elective		VSC	FP / OJT/ CEP/RP												
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	
Diploma 5.0 / 200	III	04	02	--		02	02	02	02	-	02	02		-	02	-	02	22	
	IV	04	02	--		02	02	02	02	-	02		02	--	02	-	02	22	
Degree 5.5 / 300	V	06	04	02	02	2	2	02	-	-	-	-	-	02	-	-	-	22	
	VI	06	04	02	02	2	4	02	-	-	-	-	-	-	-	-	-	22	
Total		24	16	04	04	08	10	10	08	04	04	06	08	04	08	04	08	132	
6.0/400 Honours	VII	08	06	02	02	-	RM-04											22	
	VIII	08	06	02	02		OJT-04											22	
6.0/400 Honours with Research	VII	06	04	02	02		RM-04 RM-04											22	
	VIII	06	04	02	02		RM-08											22	
Total		40/36	28/24	08	08	08	18/26	10	08	04	04	06	04	04	04	08	04	08	176

B.Sc. Programme Framework: Course Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	01		01				01	01	01	01	-	01		01	01	01	01	11
	II	01		01				01	01	01	01	01	-	01	--	01	01	01	11
		Credits Related to Major																	
		Core		Elective		VSC	FP / OJT/ CEP/RP	Selected as Minor											
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	
Diploma 5.0 / 200	III	02	01	--		01	FP-01	01	01	-	01	01		-	01	-	01	11	
	IV	02	01	--		01	CEP-01	01	01	-	01		01	--	01	-	01	11	
Degree 5.5 / 300	V	03	02	01	01	01	FP-01	01	-	-	-	-	-	01	-	-	-	11	
	VI	03	02	01	01	01	OJT-01	01	-	-	-	-	-	-	-	-	-	10	
Total		12	08	02	02	04	04			02	02	03	04	02	04	02	04	65	
6.0/400 Honours	VII	03	03	01	01	-	RM-01											09	
	VIII	03	03	01	01		OJT-01											09	
6.0/400 Honours with Research	VII	02	02	01	01		RM-01 RM-01											08	
	VIII	02	02	01	01		RM-01											07	
Total		18/16	14/12	04	04	04	06/07	06	04	02	02	03	04	02	04	02	04	83/80	

B. Sc. -Wine Brewing and Alcohol Technology: Credit and Course Distribution in Brackets

Level / Difficulty	Sem	Subject-1							Total
		T		P					
4.5	I	02 (01)		02 (01)				04(02)	
	II	02 (01)		02 (01)				04(02)	
		Credits Related to Major						IKS	
		Core		Elective		VSC	FP / OJT/ CEP		
		T	P	T	P	P	P	T	
5.0	III	04(02)	02(01)	--		02(01)	FP-02(01)		10(05)
	IV	04(02)	02(01)	--		02(01)	CEP-02(01)		10(05)
5.5	V	06(03)	04(02)	02(01)	02(01)	02(01)	FP-02(01)	02(01)	20 (10)
	VI	06(03)	04(02)	02(01)	02(01)	02(01)	OJT-04(01)		20(09)
Total		12	08	(02)	(02)	04	04	(01)	33
6.0	VII	03	03	(01)	(01)	-	RM-04(01)		22(09)
	VIII	03	03	(01)	(01)		OJT-04(01)		22(09)
6.0	VII	(02)	(02)	(01)	(01)		RM-04(01) RP-04(01)		22(08)
	VIII	(02)	(02)	(01)	(01)		RM-08(01)		22(07)
		18/16	14/12	04	04	04	06/07	(01)	51/48

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

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-01	BS-WT 111T	Biochemistry	02
2.	I	I	4.5	DSC-02	BS-WT 112P	Practicals in Biochemistry	02
3.	I	II	4.5	DSC-03	BS-WT 121T	Metabolic Pathway	02
4.	I	II	4.5	DSC-04	BS-WT 122T	Practicals in Metabolic Pathway	02
5.	II	III	5.0	DSC-05	BS-WT 231T	Introduction to Sensory Evaluation	02
6.	II	III	5.0	DSC-06	BS-WT 231T	Vineyard Management	02
7.	II	III	5.0	DSC-07	BS-WT 231P	Practicals in Sensory Evaluation	02
8.	II	III	5.0	VSC-01	BS-WT 234P	Introduction to Alcoholic Beverages and Health Effect	02
9.	II	III	5.0	FP-01	BS-WT 235T	Field Project (Vineyard Management)	02
10.	II	IV	5.0	DSC-08	BS-WT 241T	Fermentation Technology	02
11.	II	IV	5.0	DSC-09	BS-WT 242T	Yeast Technology	02
12.	II	IV	5.0	DSC-10	BS-WT 243P	Practicals in Fermentation Technology	02
13.	II	IV	5.0	VSC-02	BS-WT 243T	Practicals in Yeast Technology	02
14.	II	IV	5.0	CEP-01	BS-WT 245P	Community Engagement Project	02
15.	III	V	5.5	DSC-11	BS-WT 351T	Basic of Brewing Technology	02
16.	III	V	5.5	DSC-12	BS-WT 352T	Basic of Alcohol Technology	02
17.	III	V	5.5	DSC-13	BS-WT 353T	Microbial Spoilage of Alcoholic Beverages	02
18.	III	V	5.5	DSC-14	BS-WT 354P	Practicals in Brewing and Alcohol Technology	02
19.	III	V	5.5	DSC-15	BS-WT 355P	Practicals in Microbial Spoilage of Alcoholic Beverages	02
20.	III	V	5.5	DSE-01	BS-WT 356T	Chemical Engineering OR Enterprisership	02
21.	III	V	5.5	DSE-02	BS-WT 357P	Practicals in Chemical Engineering OR Practical in Enterprisership	02
22.	III	V	5.5	VSC-03	BS-WT 358P	Scientific Communication	02
23.	III	V	5.5	FP-02	BS-WT 359P	Marketing and Regulation of Alcoholic Beverages	02

24.	III	V	5.5	IKS-02	BS-WT 360T	IKS (Major Specific)	02
25.	III	VI	5.5	DSC-16	BS-WT 361T	Red and White Wine Making	02
26.	III	VI	5.5	DSC-17	BS-WT 362T	Fruit and Fortified Wine	02
27.	III	VI	5.5	DSC-18	BS-WT 363T	Waste Management	02
28.	III	VI	5.5	DSC-19	BS-WT 364P	Practicals in Wine Making	02
29.	III	VI	5.5	DSC-20	BS-WT 365P	Practicals in Waste Management	02
30.	III	VI	5.5	DSE-03	BS-WT 366T	Equipments and Utilities OR Laboratory Management	02
31.	III	VI	5.5	DSE-04	BS-WT 367P	Practicals in Equipments and Utilities OR Practicals in Laboratory Management	02
32.	III	VI	5.5	VSC-04	BS-WT 368T	Maturation and Ageing of Alcoholic Beverages	02
33.	III	VI	5.5	OJT-01	BS-WT 369T	On Job Training	04

B. Sc. Wine Brewing and Alcohol Technology (Honours)

34.	IV	VII	6.0	DSC-21	BS-WT 471T	Microbiology of Wine, Beer and Alcohol	03
35.	IV	VII	6.0	DSC-22	BS-WT 472T	Biochemistry of Wine, Beer and Alcohol	03
36.	IV	VII	6.0	DSC-23	BS-WT 473T	Viticulture	02
37.	IV	VII	6.0	DSC-24	BS-WT 474P	Practical's In Microbiology of Wine, Beer and Alcohol	02
38.	IV	VII	6.0	DSC-25	BS-WT 475P	Practical's In Biochemistry of Wine, Beer and Alcohol	02
39.	IV	VII	6.0	DSC-26	BS-WT 476TP	Practical's In Viticulture	02
40.	IV	VII	6.0	DSE-05	BS-WT 477T	Bioprocess Engineering Or Environmental Science	02
41.	IV	VII	6.0	DSE-06	BS-WT 478T	Practical's In Bioprocess Engineering Or Practical's In Environmental Science	02
42.	IV	VII	6.0	RM-01	BS-WT 479T	Research Methodology (Instrumentation)	04
43.	IV	VIII	6.0	DSC-27	BS-WT 481T	Applied Alcohol Technology	03
44.	IV	VIII	6.0	DSC-28	BS-WT 482T	Applied Brewing Technology	03
45.	IV	VIII	6.0	DSC-29	BS-WT 483T	Applied Oenology	02

46.	IV	VIII	6.0	DSC-30	BS-WT 484T	Practical's In Applied Alcohol Technology	02
47.	IV	VIII	6.0	DSC-31	BS-WT 483T	Practical's In Applied Brewing Technology	02
48.	IV	VIII	6.0	DSC-32	BS-WT 484T	Practical's In Applied Oenology	02
49.	IV	VIII	6.0	DSE-07	BS-WT 485T	Chemical Engineering and Plant Management OR Biostatistics	02
50.	IV	VIII	6.0	DSE-08	BS-WT 485T	Practical's In Chemical Engineering and Plant Management OR Practical's In Biostatistics	02
51.	IV	VIII	6.0	OJT-02	BS-WT 486T	--	04

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

34.	IV	VII	6.0	DSC-21	BS-WT 471T	KLM	03
35.	IV	VII	6.0	DSC-22	BS-WT 472T	NOP	03
36.	IV	VII	6.0	DSC-23	BS-WT 473P	TUV	02
37.	IV	VII	6.0	DSC-24	BS-WT 474P	WXY	02
38.	IV	VII	6.0	DSE-05	BS-WT 473T	TUV	02
39.	IV	VII	6.0	DSE-06	BS-WT 474P	WXY	02
40.	IV	VII	6.0	RM-01	BS-WT 476T	ZAB	04
41.	IV	VII	6.0	RP-01	BS-WT 477T	ABC	04
42.	IV	VIII	6.0	DSC-19	BS-WT 481T	CDE	03
43.	IV	VIII	6.0	DSC-20	BS-WT 482T	FGH	03
44.	IV	VIII	6.0	DSC-21	BS-WT 483T	IJK	02
45.	IV	VIII	6.0	DSE-04	BS-WT 485T	OPQ	02
46.	IV	VIII	6.0	DSE-07	BS-WT 473T	TUV	02
47.	IV	VIII	6.0	DSE-08	BS-WT 474P	WXY	02
48.	IV	VIII	6.0	PR-02	BS-WT 486T	RST	08

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Syllabus

B. Sc. -I (Wine Brewing and Alcohol Technology)

Title of the Course: Biochemistry								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-01	BS-WT 111T	02	00	02	30	15	35	50

Learning Objectives:

- 1.To understand types of biomolecules
- 2.To learn biological functions of biomolecules
- 3.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:	04
	<ul style="list-style-type: none"> • Structure of water, ionization of water, osmosis, pH, titration curves, buffer • Types of bond- Covalent and noncovalent bonds 	
Unit II	Carbohydrates:	07
	<ul style="list-style-type: none"> • Definition of carbohydrates • Monosaccharides: ketoses and aldoses, D and L configuration, epimers, anomers • Oligosaccharides: glycosidic bond eg. maltose • Polysaccharides: classification based on function Storage polysaccharide: eg starch Structural polysaccharides: eg. cellulose • Biological functions of carbohydrate 	

Unit III	Lipid:	07
	<ul style="list-style-type: none"> • 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	07
	<ul style="list-style-type: none"> • Classification of amino acids, zwitterion, titration of amino acid, Isoelectric pH. • Protein structure: Primary structure and peptide bond formation, Secondary structure (alpha helix and beta sheet), Tertiary structure (eg. Myoglobin) and Quarternary structure (eg.Haemoglobin) • Biological Functions of proteins 	
Unit V	Nucleic acids	05
	<ul style="list-style-type: none"> • 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), Jeffery 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. -I (Wine Brewing and Alcohol Technology)**

Title of the Course: Practicals in Biochemistry								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-02	BS-WT 112P	00	02	02	60	15	35	50

Learning Objectives:

1. To learn safety measures in chemical laboratory
2. To study the concept of Molarity, molality, normality, pH measurement
3. To study the qualitative analysis of biomolecules

Course Outcomes (Cos)

1. Isolation of starch and its confirmation by confirmatory tests
2. Understand the concept of estimation of sugars by DNSA method, Benedicts method and phenol sulfuric/anthrone method
3. Understand the concept of estimation of DNA and RNA

Detailed Syllabus: Example

Sr.No.	Title of experiment	No. of practicals
1.	Safety measures and practices in chemistry laboratory	01
2.	Biochemical calculations (Preparation of molar, normal, percent solutions)	01
3.	Preparation of solutions and buffers	01
4.	Measurement of pH of various solutions using pH indicator and pH meter.	01
5.	Isolation and identification of starch from plant source and to perform its confirmatory test.	01
6.	Spot tests for sugars	01
7.	To estimate concentration of reducing sugar by DNSA method	01

- | | | |
|-----|---|-----------|
| 8. | To estimate concentration of reducing sugar by Benedicts/Eyon and Lane method | 01 |
| 9. | To estimate concentration of total carbohydrate by phenol sulfuric/anthrone method. | 01 |
| 10. | Determination of specific rotation of sugar solution by using a polarimeter. | 01 |
| 11. | Estimation of DNA by diphenylamine method. | 01 |
| 12. | Estimation of RNA by orcinol method. | 01 |

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. David Plummer (2017) An introduction to practical biochemistry, 3rd Edition, ISBN13 978-0070841659
4. Introductory practical biochemistry edited by S. K. Sawhney and Randhir Singh (2007) New Delhi: Narosa, ISBN: 9788173193026

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Syllabus
B. Sc. -I (Wine Brewing and Alcohol Technology)**

Title of the Course: Metabolic Pathway								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-03	BS-WT121T	02	00	02	30	15	35	50

Learning objectives:

- 1.To learn concept of bioenergetics and metabolism.
- 2.To understand mechanism of nitrogen fixation and nitrogen cycle
- 3.To learn importance of enzyme in metabolism

Course Outcomes (COs):

- 1.Students can correlate between synthesis and degradation of biomolecules.
- 2.Students will learn biomolecules and their metabolism.
- 3.Students will understand regulation of various metabolic pathways.

Detailed Syllabus: Example

Unit I	Introduction to Metabolism: ATP energy cycle, concept of bioenergetics, ATP and phosphoanhydride bond.	02
Unit II	Carbohydrate Metabolism: Glycolysis, gluconeogenesis, fates of pyruvate, Kreb's cycle, glyoxylate cycle, cori cycle, glycogenesis, glycogenolysis, and pentose-phosphate pathway (oxidative and non-oxidative phase) with regulation.	10
Unit III	Amino acid Metabolism: Overview of nitrogen metabolism- the nitrogen cycle and nitrogen fixation, essential and non-essential amino acids, biosynthetic families of amino acids, transamination, transdeamination and oxidative deamination, metabolic breakdown of amino acids – glucogenic and ketogenic amino acids and urea cycle.	07

- Unit IV Lipid Metabolism:** Digestion, mobilization and transport of fats, fatty acid synthesis, catabolism of fatty acid: beta oxidation, oxidation of unsaturated fatty acids, oxidation of odd chain fatty acids and ketone bodies. **08**
- Unit V Nucleotide Metabolism:** Overview of purine & pyrimidine biosynthesis (de novo and salvage pathway) and its degradation. **03**

Suggested Readings/Material:

1. Nelson D. and Cox M. 2008, Lehninger-Principles of Biochemistry, 5th Edition, W.H. Freeman and company, NY.
2. Voet D. and Voet J. 2008, Fundamentals of Biochemistry, 4th Edition, John Wiley and Sons, Inc. USA
3. Berg J. and Stryer L. 2012, Biochemistry, 7th Edition, W.H. Freeman and company, NY
4. Conn E. and Stumpf P. 2009, Outlines of Biochemistry, 5th Edition, John Wiley and Sons, USA
5. Murray R.K. et.al., Harper's Biochemistry, 23rd Edition, Prentice Hall International.
6. Stryer, L. 2000, Biochemistry, 4th Edition, W.H. Freeman & Co., NY

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Syllabus
B. Sc. -I (Wine Brewing and Alcohol Technology)**

Title of the Course: Practicals in Metabolic Pathway								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-04	BS-WT 122P	00	02	02	60	15	35	50

Learning Objectives:

1. To learn phenomenon of osmosis
2. To study the extraction of lipids and proteins.
3. To study the qualitative analysis of amino acids, proteins and lipids

Course Outcomes (Cos)

1. Understand the methods for estimation of cholesterol and amino acids.
2. Learn to determine amylase activity
3. Understand the concept of estimation of protein by Biuret method and Lowry methods.

Detailed Syllabus:

Sr. No.	Title of experiment	No. of practicals
1.	Study of osmosis	01
2.	Oil extraction from plant source and determination of concentration of free fatty acids	01
3.	Spot tests for lipids	01
4.	To estimate concentration of cholesterol by Zak's method.	01
5.	Determination of acid value/peroxide value of oil/fat	01
6.	Isolation of casein from milk	01
7.	Spot tests for amino acids and proteins	01
8.	To estimate concentration of amino acid by ninhydrin	01
9.	Estimation of concentration of protein by Biuret method.	01
10.	Extraction and estimation of Lycopene	01

11. Determination of Ascorbic acid	01
12. Determination of amylase activity	01

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. David Plummer (2017) An introduction to practical biochemistry, 3rd Edition, ISBN13 978-0070841659
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