Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar (Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)

Proposal to Introduce New Academic Programme

in

M. Sc. Wine, Brewing and Alcohol Technology

(M. Sc. WBAT)

Implemented from

Academic Year 2022 - 23

Programme Structure and Course Titles: (All academic years)

Sr. No.	Class	Semester	Course Code	Course Title	Credits
Semester I					
1.	**M. Sc.**	**I**	**MSCWBAT 111T**	Microbiology of Alcohol, Beer and Wine	**4**
2.	**M. Sc.**	**I**	**MSCWBAT 112T**	Biochemistry of Alcohol, Beer and Wine	**4**
3.	**M. Sc.**	**I**	**MSCWBAT 113T**	Viticulture	**2**
4.	**M. Sc.**	**I**	**MSCWBAT 114P**	Practical Course –I based on microbiology	**2**
5.	**M. Sc.**	**I**	**MSCWBAT 115P**	Practical Course –II based on biochemistry	**2**
6.	**M. Sc.**	**I**	**MSCWBAT 116P**	Practical Course –III based on viticulture	**2**
7.	**M. Sc.**	**I**	**MSCWBAT 117T (A)** **MSCWBAT 117T (B)**	Fermentation technology **OR** Environmental Science	**2**
8.	**M. Sc.**	**I**	**MSCWBAT 118P (A)** **MSCWBAT 118P (B)**	Practical Course based on: Fermentation technology **OR** Environmental Science	**2**
9.	**M. Sc.**	**I**	**MSCWBAT 119T**	Alcoholic beverages and Health	**2**
	M. Sc.	**I**	**Total**		**22**
Semester II					
10.	**M. Sc.**	**II**	**MSCWBAT 211T**	Alcohol Technology-I	**4**
11.	**M. Sc.**	**II**	**MSCWBAT 212T**	Brewing Technology-I	**4**
12.	**M. Sc.**	**II**	**MSCWBAT 213T**	Oenology-I	**2**
13.	**M. Sc.**	**II**	**MSCWBAT 214P**	Practical Course - I based on Alcohol Technology I	**2**
14.	**M. Sc.**	**II**	**MSCWBAT 215P**	Practical Course - II based on Brewing Technology I	**2**
15.	**M. Sc.**		**MSCWBAT 216P**	Practical Course - III Practical based on Enology I	**2**
16.	**M. Sc.**	**II**	**MSCWBAT 217T (A)** **MSCWBAT 217T (B)**	Chemical Engineering and Plant Management –I **OR** Laboratory Management	**2**
17.	**M. Sc.**	**II**	**MSCWBAT 218P(A)** **MSCWBAT 218P (B)**	Practical Course based on: Chemical Engineering and Plant Management-I **OR** Laboratory management	**2**
18.	**M. Sc.**	**II**	**MSCWBAT 219T**	Regulatory policies for alcoholic beverages	**2**
	M. Sc.	**II**	**Total**		**22**

Semester III					
19.	**M. Sc.**	**III**	**MSCWBAT 311T**	Alcohol Technology-II	**4**
20.	**M. Sc.**	**III**	**MSCWBAT 312T**	Brewing Technology II	**4**
21.	**M. Sc.**	**III**	**MSCWBAT 313T**	Oenology- II	**2**
22.	**M. Sc.**	**III**	**MSCWBAT 314P**	Practical Course - I Practical based on alcohol technology II	**2**
23.	**M. Sc.**	**III**	**MSCWBAT 315P**	Practical Course - II Practical based on brewing technology II	**2**
24.		**III**	**MSCWBAT 316P**	Practical Course - III based on Oenology II	**2**
25.	**M. Sc.**	**III**	**MSCWBAT 317T (A)** **MSCWBAT 317T (B)**	Chemical Engineering and Plant Management-II **OR** Biostatistics	**2**
26.	**M. Sc.**	**III**	**MSCWBAT 318P (A)** **MSCWBAT 318P (B)**	Practical Course based on: Chemical Engineering and Plant Management-II **OR** Biostatistics	**2**
27.	**M. Sc.**	**III**	**MSCWBAT 319T**	Business Management and Marketing	**2**
	M. Sc.	**III**	**Total**		**22**
Semester IV					
28.	**M. Sc.**	**IV**	**MSCWBAT 411T**	Industrial waste treatment & Environmental management	**4**
29.	**M. Sc.**	**IV**	**MSCWBAT 412T**	Bioanalytical Techniques	**4**
30.	**M. Sc.**	**IV**	**MSCWBAT 413T**	Research Methodology	**2**
31.	**M. Sc.**	**IV**	**MSCWBAT 414P**	Practical Course on Bioanalytical Techniques	**2**
32.	**M. Sc.**	**IV**	**MSCWBAT 415P**	Review and research article writing	**2**
33.	**M. Sc.**	**IV**	**MSCWBAT 416T*** **MSCWBAT 417T***	A) Alcohol Technology- III B) Brewing Technology- III C) Oenology- III	**2+2**
34.	**M. Sc.**	**IV**	**MSCWBAT 418 P**	Project/In-plant training	**4**
	M. Sc.	**IV**	**Total**		**22**

MSCWBAT 406T and 407T* are course specific optional subjects select any two courses from the options.

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(Affiliated to Savitribai Phule Pune University, Pune)

Choice Based Credit System (CBCS)

Syllabus of

M. Sc. Wine, Brewing and Alcohol Technology

(M. Sc. WBAT)

Implemented from

Academic Year 2022 - 23

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 Rameshrao Deshmukh	Member
4.	Mr. Ashish Sudhakar 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)

Preamble:

Wine Brewing and Alcohol Technology, being one of the youngest branch 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, alcoholic beverages have traditionally been consumed throughout history with evidence dating back to Harappa civilization.

Beer: It is believed that Chinese brewed alcoholic beverage similar to beer. Sumerian peoples brewed alcoholic beverage similar to beer which became most popular. In the 13th century AD, beer finally started being produced commercially in Germany, England, and Austria. In the nineteenth century, beer was widely famous as the world's number one alcoholic beverage. In India breweries and microbreweries are emerging one after another in India. India will become beer industry hub in near future.

Wine: Although, wine has traditionally been consumed throughout history with evidence dating back to Harappa 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. commercial 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 arena 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, Indians wines are considerably cheaper than their Western counterparts; thus, enabling it to achieve a particular target audience of it sown.

Back home, statistics reveal that India's rich and prosperous are finally warming up to this delicious drink; India has alcoholic beverage 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.

Introduction:

The syllabi till today had been sufficient to cater to the needs of students for building up their careers in industry and research. However, with the changing scenario at local and global level, we feel that the syllabus orientation should be altered to keep pace with developments in the education and industrial sector. The need of the hour is to design appropriate syllabi that emphasize on teaching of technological as well as the economic aspects of Wine, Alcohol and Brewing industry. Theory supplemented with 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. Thus, the university / college itself will be developing the trained and skilled manpower.

Objectives to be achieved:

To introduce the concepts in various allied subjects

To enrich students' knowledge

To help the students to build interdisciplinary approach

To inculcate sense of scientific responsibilities and social and environmental awareness

To help students build-up a progressive and successful career.

Programme Outcomes (POs)

After successfully completing this course, the student should be able to:

- Understand the basic knowledge and concepts of Wine/Beer/Alcohol and other related areas.
- Understand the ability to apply their knowledge for practical which they can conduct independently.
- Apply their knowledge in other advanced subject area like Energy Production Energy Conservation and Sustainable Development
- Learn the theoretical and practical exposure to the basic and the advanced fields of Wine/Beer/Alcohol technology.

SPECIAL FEATURES

1. More stress will be given to this process development and scale-upsystem along with marketing.
2. Evaluation of waste for production of valuable products will be given prime importance
3. Energy Production and Conservation will be considered during the tenure of the courses.
4. Industry attached Educational system, is more feasible concept

Career Opportunities:

1. Government sector in India

- Agriculture departments
- Agriculture Institute
- Excise Department
- Bureau of Indian Standards
- Import Export Departments

2. International and national wine making plant

- Vineyard management and marketing services
- Research technician

- Technical assistant
- Winery/Brewery/Distillery laboratory technicians
- Wine/Beer/Alcohol marketing services
- Quality control in Wine/Beer/Alcohol industry

3. Self-employment

- Own winery/Microbrewery
- Winery/Microbrewery consultant
- Wine/Beer taster, Wine maker, Brewer

- **Eligibility:** Candidates applying for M.Sc. for wine technology should be B. Sc. in Wine Technology/ Post Graduate Diploma in Industrial Fermentation and Alcohol Technology/ B.Sc. in Bio-Technology Microbiology/ Chemistry/ Agriculture/ Botany/ Zoology/Agricultural Bio- Technology and B.E. /B. Tech. (Chemical Engineering/ Biotechnology/food).

4. Credit system:

a. Definitions and Keywords:

1. **Credit Based Semester System**: The degree programme and total credits of the same are divided into semesters. To complete the degree the students, need to complete the prescribed options of credits during all the semesters of an academic programme.
2. **Choice-Based Credit System**: The choice-based credit system provides choices for students to select courses from the range of available programmes.
3. **Academic Programmes**: A range of learning experiences offered to students formally for one to four years leading to a certificate, diploma, or degree. All the specified degrees were notified by the University Grants Commission (UGC) in the Gazette of India on 05 July 2014.
4. **Semester**: Semester consists of 15 to 18 weeks of academic work equivalent to 90 actual teaching days. The odd semester of the academic programme is usually scheduled from June to December and even semesters from January to May.
5. **Academic Year**: The consecutive (One odd and One even) semesters constitute one academic year.
6. **Course:** A course (Paper) is a unit of credits in a formal degree programme.
7. **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching or two hours of practical work/fieldwork per week.
8. **Credit Point:** It is a product of grade points and the number of credits of a course.
9. **Grade Point:** It is a numerical weight prescribed to each letter grade on a 10-point scale.
10. **Letter Grade:** Letter grade is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P, and F.
11. **Semester Grade Point Average (SGPA)**: It measures the performance of work done in a semester. It is a ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
12. **Cumulative Grade Point Average (CGPA):** It measures the overall cumulative performance of overall semesters. The CGPA is the ratio of total credit points secured

by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

13. **Certificate (Marksheet**): Based on the grades earned, a Marksheet will be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) and SGPA of that semester and CGPA earned till that semester.
14. **Transcript**: The degree transcript will be issued as per the demand of students.

b. Types of Courses:

1. **Discipline-Specific Core Courses (DSCC):** These are the courses compulsorily studied by a student as a core requirement to complete a programme in a said discipline.
2. **Elective Course (DSEC):** Elective course is a course that can be chosen from a group of papers.

   It may be:

   - Supportive to the discipline of study
   - Provides an expanded scope
   - Enables exposure to some other discipline/domain
   - Nurtures student's proficiency/skill.

   Elective Courses may be Discipline Specific Elective Courses (DSEC), Skill Enhancement Courses (SEC) and Generic Elective (GE), or Open Elective.

   a. **Discipline-Specific Elective Course (DSEC):** Elective courses offered by the main discipline/subject of study are referred to as Discipline Specific Elective Courses. The institute may offer discipline-related elective courses of interdisciplinary nature (to be offered by the main discipline/subject of study).

   b. **Generic Elective (GE) Courses:** An elective course chosen from an unrelated discipline/subject, to seek exposure is called a Generic Elective.

   c. **Ability Enhancement Core Courses (AECC):** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to knowledge enhancement; i. Environmental Awareness and ii. English/MIL Communication. SEC courses are value-based and/or skill-based aim to provide hands-on training, competencies, skills, etc.

c. Letter Grades and Grade Points

Letter Grade	Meaning	Percentage of Marks	Grade Points
O	Outstanding	90 and Above	10
A+	Excellent	75-89	9
A	Very Good	60-74	8
B+	Good	55-59	7
B	Above Average	50-54	6
C	Average	45-49	5
D	Pass	40-44	4
F	Fail	Less than 40	0
Ab	Absent	Absent	0
-	-	Fx (Detained, Repeat the course)	0
-	-	IC (Incomplete Course - Absent for examination but continue for the course)	0

d. CGPA and Grade

Sr. No.	CGPA	Grade
1.	9.50 and above	O (Outstanding)
2.	8.25 to 9.49	A+ (Excellent)
3.	6.75 to 8.24	A (Very Good)
4.	5.75 to 6.74	B+ (Good)
5.	5.25 to 5.74	B (Above Avarage)

6.	4.75 to 5.24	C (Avarage)
7.	4.00 to 4.74	D (Pass)
8.	Less than 4.00	F (Fail)

* The statutory requirement for eligibility to enter as an assistant professor in colleges and universities in the disciplines of arts, science, commerce, etc., is a minimum average mark of 50% and 55% in relevant postgraduate degrees respectively for reserved and general categories. Hence, the cut-off marks for grade B shall not be less than 50% and for grade B+, it should not be less than 55% in CBCS System.

- A student obtaining Grade F shall be considered a fail and will be required to reappear in the examination.
- For non-credit courses 'Satisfactory' or "Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA. The students with unsatisfactory

e. Computation of SGPA and CGPA

As per the UGC recommendations the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

1. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student,

i.e SGPA (Si) = $\Sigma(C_i \times G_i) / \Sigma C_i$

where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

2. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme,

i.e. CGPA = $\Sigma(C_i \times S_i) / \Sigma C_i$

where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

f. Illustration of Computation of SGPA and CGPA (M. Sc.)

Method for Computation of SGPA and CGPA

Class	Subject	Course	Credit	Letter Grade	Grade Point	Credit Point (Grade points X Credits)
M. Sc. WBAT Semester I	M. Sc. WBAT	ABC	04	A	8	8 X 4 =32
	M. Sc. WBAT	BCS	04	A	8	8 X 4 =32
	M. Sc. WBAT	CDE	04	A	8	8 x 4 = 32
	M. Sc. WBAT	DEF	04	B+	7	7 X 4 =28
	M. Sc. WBAT	EFG	02	B+	7	7 X 2 =14
Total		5	18	-	-	138

Thus, SGPA =138/18= 7.66

Illustration for CGPA

Class	Semester	Total Credits	SGPA
M. Sc. WBAT	I	18	7.5
M. Sc. WBAT	II	18	8.5
M. Sc. WBAT	III	18	6.9
M. Sc. WBAT	IV	18	9.0
Total	04	132	32.06

Thus CGPA = 18 x 7.5 + 18 X 8.5 + 18 x 6.9 + 18 X 9.0 / 72 = 7.93 (A=Very Good)

M. Sc. Wine, Brewing and Alcohol Technology

Rules and regulations

1. The M. Sc. Programme is for 2 academic years and 4 semesters. The minimum total number of credits requirements for each programme is 88 credits and 12 additional credits for grades.
2. The M.Sc. degree will be awarded to the students who complete a total of 88 credits in a minimum of two years by completing an average of 22 credits per semester and 12 additional grade-based credits.
3. Each theory credit is equivalent to 15 clock hours of teaching and each practical credit is equivalent to 30 clock hours of teaching in a semester.
4. Semester Grade Point Average (SGPA) will be calculated based on 22 credits and the final Cumulative Grade Point Average (CGPA) will be calculated based on 88 credits of all four semesters.
5. The duration of each theory semester is 15-18 weeks in which at least 12-week classroom teaching and 03 weeks of continuous internal assessment is a must.
6. The duration of each practical semester is 15 to 18 weeks in which at least a 14-week laboratory session and one week of internal evaluation including viva and journal certification is a must.
7. The student can complete the two-year degree programme in a maximum of four years by completing fewer credits in each semester. This rule does not apply to practical courses, as the student needs to complete practical courses in the two years of a degree programme.
8. Discipline-Specific Core Courses (DSCC) are compulsory.
9. Students are allowed to opt for the Generic Elective (GE) and project credits from a department other than the one where he/ she is registered or from the parent department.

Distribution of credits

Type of Courses	Total Credits	Credits/ semester
Discipline Specific Core Courses (DSCC)	64	16
Discipline Specific Elective Courses (DSEC)	16	04
Generic Elective (GE)	06	02 (only I, II and III)
Project Work/ Internship (DSCC)	02	02 (IV Semester)
Industrial Training/ Internship	22*	22*
Total	88	22

Master of Science (M.Sc.) Course Distribution

Class	Semester	Subjects	Courses	DSCC		DSEC		GE **	Project **	Total Credits
				T	P	T	P	T or P		
M.Sc. I	I	01	09	03	03	01	01	01		22
M.Sc. I	II	01	09	03	03	01	01	01		22
M.Sc. II	III	01	09	03	03	01	01	01	00	22
M.Sc. II	IV	01	09	03	03	01	01	00	01	22
M.Sc. II	IV*	01	Internship/ Industrial Project							22

*** Industrial Project. Internship**: Only for professional degrees. The board of studies of the respective department shall decide the guidelines for an internship or industrial project.

** **GE and Project**: students are allowed to opt from any department of the college or the same department. The examination cell shall design and implement the mechanism of credit transfer.

Master of Science (M.Sc.) Credit Distribution

Class	Semester	Subjects	Courses	DSCC		DSEC		GE		Project	Total Credits
				T	P	T	P	T	P		
M.Sc. I	I	01	09	10	06	02	02	02	*	00	22
M.Sc. I	I	01	09	10	06	02	02	02	*	00	22
M.Sc. II	III	01	09	10	06	02	02	02	*	00	22
M.Sc. II	IV	01	09	10	06	02	02	00	00	02	22
M.Sc. II	IV*	01	Internship/ Industrial Project								22

Distribution of Credits

Class	Semester	Course and their credits in the bracket			
		DSCC	DSEC	GE	Project
M.Sc. I	I	DSCC-01 (04)	DSEC -01 (02)	GE-01(02)	NA
M.Sc. I	I	DSCC-02 (04)	DSEC-02 (02) P		
M.Sc. I	I	DSCC-03 (02)			

M.Sc. I	I	DSCC-04 (02) P			
M.Sc. I	I	DSCC-05 (02) P			
M.Sc. I	I	DSCC-06 (02) P			
M.Sc. I	II	DSCC-07 (04)	DSEC -03 (02)	GE-02(02)	NA
M.Sc. I	II	DSCC-08 (04)	DSEC-04 (02) P		
M.Sc. I	II	DSCC-09 (02)			
M.Sc. I	II	DSCC-10 (02) P			
M.Sc. I	II	DSCC-11 (02) P			
M.Sc. I	II	DSCC-12 (02) P			
M.Sc. II	III	DSCC-13 (04)	DSEC -05 (02)	GE-03(02)	NA
M.Sc. II	III	DSCC-14 (04)	DSEC-06 (02) P		
M.Sc. II	III	DSCC-15 (02)			
M.Sc. II	III	DSCC-16 (02) P			
M.Sc. II	III	DSCC-17 (02) P			
M.Sc. II	III	DSCC-18 (02) P			
M.Sc. II	IV	DSCC-19 (04)	DSEC -07 (02)	NA	Project (02)
M.Sc. II	IV	DSCC-20 (04)	DSEC-08 (02) P		
M.Sc. II	IV	DSCC-21 (02)			
M.Sc. II	IV	DSCC-22 (02) P			
M.Sc. II	IV	DSCC-23 (02) P			
M.Sc. II	IV	DSCC-24 (02) P			
M.Sc. II	IV*	Internship or Industrial Training (22)			

The students need to complete the DSCC and DSEC credit from the parent department and Generic Elective and Projects/ Internship credits can be earned from any department of the college or industry.

Structure of CGPA and Marking Scheme of CBCS for Postgraduate Science Programmes

M. Sc. Semester - I

Semester	Course Code	Type of Course	Course Name	Credits	Maximum Internal Marks	Maximum External Marks	Total
I	DSCC-01 (04)	Theory	X	04	30	70	100
I	DSCC-02 (04)	Theory	X	04	30	70	100
I	DSCC-03 (02)	Theory	X	02	15	35	50
I	DSCC-04 (02) P	Practical	X	02	15	35	50
I	DSCC-05 (02) P	Practical	X	02	15	35	50
I	DSCC-06 (02) P	Practical	X	02	15	35	50
I	DSEC-01	Theory	X	02	15	35	50
I	DSEC-02	Practical	X	02	15	35	50
I	GE-01	T/P	X	02	15	35	50
	Semester Total			22	165	385	550

M. Sc. Semester - II

Semester	Course Code	Type of Course	Course Name	Credits	Maximum Internal Marks	Maximum External Marks	Total

II	DSCC-07 (04)	Theory	X	04	30	70	100
II	DSCC-08 (04)	Theory	X	04	30	70	100
II	DSCC-09 (02)	Theory	X	02	15	35	50
II	DSCC-10 (02) P	Practical	X	02	15	35	50
II	DSCC-11 (02) P	Practical	X	02	15	35	50
II	DSCC-12 (02) P	Practical	X	02	15	35	50
II	DSEC-03	Theory	X	02	15	35	50
II	DSEC-04	Practical	X	02	15	35	50
II	GE-02	T/P	X	02	15	35	50
Semester Total				22	165	385	550

M. Sc. Semester - III

Semester	Course Code	Type of Course	Course Name	Credits	Maximum Internal Marks	Maximum External Marks	Total
III	DSCC-13 (04)	Theory	X	04	30	70	100
III	DSCC-14 (04)	Theory	X	04	30	70	100
III	DSCC-15 (02)	Theory	X	02	15	35	50
III	DSCC-16 (02) P	Practical	X	02	15	35	50
III	DSCC-17 (02) P	Practical	X	02	15	35	50
III	DSCC-18 (02) P	Practical	X	02	15	35	50
III	DSEC-05	T/P	X	02	15	35	50
III	DSEC-06	Practical	X	02	15	35	50
III	GE-03	Theory	X	02	15	35	50
	Semester Total			22	165	385	550

The BoS will decide the number of theory, practical, and project credits for the VI Semester.

M. Sc. Semester - IV

Semester	Course Code	Type of Course	Course Name	Credits	Maximum Internal Marks	Maximum External Marks	Total
IV	DSCC-19 (04)	Theory	X	04	30	70	100
IV	DSCC-20 (04)	Theory	X	04	30	70	100
IV	DSCC-21 (02)	Theory	X	02	15	35	50
IV	DSCC-22 (02) P	Practical	X	02	15	35	50
IV	DSCC-23 (02) P	Practical	X	02	15	35	50
IV	DSCC-24 (02) P	Practical	X	02	15	35	50
IV	DSEC-07	Theory	X	02	15	35	50
IV	DSEC-08	Practical	X	02	15	35	50
IV	Project / GE	T/P	X	02	15	35	50
Semester Total				22	165	385	550
Or							
IV*				Internship or Industrial Training			(22)
Total				88	660	1540	2200

A mechanism for workload computation:

01 credit is equivalent to a 01-hour theory lecture per week

01 credit is equivalent to a 02-hour practical session per week

Additional Credits for All PG Programmes

Sr. No.	Title	Credits	Remark
1.	Constitution of India / Ethics and Values: Semester -I	02	Compulsory
2.	Human Rights; Semester II	02	Compulsory
3.	Cyber Security: Semester III	02	Compulsory
4.	Intellectual Property Rights: Semester IV	02	Compulsory
5.	Completion of SWAYAM/MOOC course	02	Optional
6.	Completion of skill-based certificate course at the college level	02	Optional
7.	State/ National / International Level Medal/Award for curricular /Extracurricular/ Cultural/ Sports and Games activities	02	Optional
8.	Prize in curricular/ extracurricular/ cultural activities at college level/University level	01	Optional
9.	Any other curricular/ Co-curricular activity equavant to 30 contact hours decided by BoS and approved by the Academic Coucil	02	Optional
10.	Book Review on book suggested by Academic Council	02	Optional

Programme Structure and Course Titles: (All academic years)

Sr. No.	Class	Semester	Course Code	Course Title	Credits
Semester I					
1.	**M. Sc.**	**I**	**MSCWBAT 111T**	Microbiology of Alcohol, Beer and Wine	**4**
2.	**M. Sc.**	**I**	**MSCWBAT 112T**	Biochemistry of Alcohol, Beer and Wine	**4**
3.	**M. Sc.**	**I**	**MSCWBAT 113T**	Viticulture	**2**
4.	**M. Sc.**	**I**	**MSCWBAT 114P**	Practical Course –I based on microbiology	**2**
5.	**M. Sc.**	**I**	**MSCWBAT 115P**	Practical Course –II based on biochemistry	**2**
6.	**M. Sc.**	**I**	**MSCWBAT 116P**	Practical Course –III based on viticulture	**2**
7.	**M. Sc.**	**I**	**MSCWBAT 117T (A)** **MSCWBAT 117T (B)**	Fermentation technology **OR** Environmental Science	**2**
8.	**M. Sc.**	**I**	**MSCWBAT 118P (A)** **MSCWBAT 118P (B)**	Practical Course based on: Fermentation technology **OR** Environmental Science	**2**
9.	**M. Sc.**	**I**	**MSCWBAT 119T**	Alcoholic beverages and Health	**2**
	M. Sc.	**I**	**Total**		**22**
Semester II					
10.	**M. Sc.**	**II**	**MSCWBAT 211T**	Alcohol Technology-I	**4**
11.	**M. Sc.**	**II**	**MSCWBAT 212T**	Brewing Technology-I	**4**
12.	**M. Sc.**	**II**	**MSCWBAT 213T**	Oenology-I	**2**
13.	**M. Sc.**	**II**	**MSCWBAT 214P**	Practical Course - I based on Alcohol Technology I	**2**
14.	**M. Sc.**	**II**	**MSCWBAT 215P**	Practical Course - II based on Brewing Technology I	**2**
15.	**M. Sc.**		**MSCWBAT 216P**	Practical Course - III Practical based on Enology I	**2**
16.	**M. Sc.**	**II**	**MSCWBAT 217T (A)**	Chemical Engineering and Plant Management –I **OR**	**2**

			MSCWBAT 217T (B)	Laboratory Management	
17.	**M. Sc.**	**II**	**MSCWBAT 218P(A)** **MSCWBAT 218P (B)**	Practical Course based on: Chemical Engineering and Plant Management-I **OR** Laboratory management	**2**
18.	**M. Sc.**	**II**	**MSCWBAT 219T**	Regulatory policies for alcoholic beverages	**2**
	M. Sc.	**II**	**Total**		**22**
Semester III					
19.	**M. Sc.**	**III**	**MSCWBAT 311T**	Alcohol Technology-II	**4**
20.	**M. Sc.**	**III**	**MSCWBAT 312T**	Brewing Technology II	**4**
21.	**M. Sc.**	**III**	**MSCWBAT 313T**	Oenology- II	**2**
22.	**M. Sc.**	**III**	**MSCWBAT 314P**	Practical Course - I Practical based on alcohol technology II	**2**
23.	**M. Sc.**	**III**	**MSCWBAT 315P**	Practical Course - II Practical based on brewing technology II	**2**
24.		**III**	**MSCWBAT 316P**	Practical Course - III based on Oenology II	**2**
25.	**M. Sc.**	**III**	**MSCWBAT 317T (A)** **MSCWBAT 317T (B)**	Chemical Engineering and Plant Management-II **OR** Biostatistics	**2**
26.	**M. Sc.**	**III**	**MSCWBAT 318P (A)** **MSCWBAT 318P (B)**	Practical Course based on: Chemical Engineering and Plant Management-II **OR** Biostatistics	**2**
27.	**M. Sc.**	**III**	**MSCWBAT 319T**	Business Management and Marketing	**2**
	M. Sc.	**III**	**Total**		**22**
Semester IV					
28.	**M. Sc.**	**IV**	**MSCWBAT 411T**	Industrial waste treatment & Environmental management	**4**
29.	**M. Sc.**	**IV**	**MSCWBAT 412T**	Bioanalytical Techniques	**4**

30.	**M. Sc.**	**IV**	**MSCWBAT 413T**	Research Methodology	**2**
31.	**M. Sc.**	**IV**	**MSCWBAT 414P**	Practical Course on Bioanalytical Techniques	**2**
32.	**M. Sc.**	**IV**	**MSCWBAT 415P**	Review and research article writing	**2**
33.	**M. Sc.**	**IV**	**MSCWBAT 416T*** **MSCWBAT 417T***	A) Alcohol Technology- III B) Brewing Technology- III C) Oenology- III	**2+2**
34.	**M. Sc.**	**IV**	**MSCWBAT 418 P**	Project/In-plant training	**4**
	M. Sc.	**IV**	**Total**		**22**

MSCWBAT 406T and 407T* are course specific optional subjects select any two courses from the options

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Under

Faculty of Science

Semester – I	**Paper – I**
Course Code: MSCWBAT 111T	**Title of the Course: Microbiology of Alcohol, Beer and Wine**
Credits: 04	**Total Lectures: 60 Hrs.**

Course Outcomes (COs):

a. Students will learn the classification of microorganisms based on different criteria.

b. Students will study the structure of bacterial cell.

c. Students will learn the basic technique for isolation of bacteria and fungi.

d. Students will study the control of microorganisms through various technique.

e. Students will study about the morphology and characterization of yeast.

f. Students will learn the role and mechanism of antimicrobial agents.

g. Students will know industrially important microorganism and their culture collecting centres

Detailed Syllabus:

Unit.1. Classification of microorganisms and cell biology: 13

Occurrence, types of microorganisms. Classification of microorganisms: Difference between prokaryotic and eukaryotic cells, types of bacteria, fungi, viruses, protozoa and algae. Classification of bacteria and fungi.

Detailed study of bacterial cell structures, cell wall, cell membrane, capsule, endospore, flagella, types of flagella, mechanism of flagellar movement

Nutrition: autotrophic, heterotrophic

Pure culture techniques- enrichment culture technique, design & preparation of media nutritional requirements ingredients of media, types of media.

Preservation of pure culture and their techniques, slant culture preservation, lyophilization.

Unit.2. Basic techniques in microbiology Sterilization & Disinfections: 15

Definition of sterilization, disinfections and other concept

Methods of Sterilization-Physical – Heat and Radiation, Mechanical- Filtration

Chemical- characteristics of ideal disinfectant, selection of chemical antimicrobial agents-phenol & phenolic compounds, alcohol, halogens, heavy metals & their compounds, detergents, aldehydes, gaseous & chemo sterilizers.

Unit.3. Microbiology of yeast 12

Definition, comparison with other microorganisms, yeast morphology and taxonomy, yeast cell structure and functions of various cellular components. Nutritional requirements of yeast, Aerobic and anaerobic metabolic pathways in yeast for sugar dissimilation, Isolation and maintenance of yeast, stoichiometry of alcohol production.

Unit.4. Growth and Contamination control in alcoholic fermentations 15

Growth: Definition of growth, factor affecting the growth curve, measurement of growth, continuous culture, chemostat, turbidostat, synchronous growth.

Introduction to antibiotics, mechanism of various antibiotics, effect of microbial contaminants on alcoholic fermentations. Role of antimicrobial substances controlling contamination in alcoholic fermentation.

Unit.5. Industrially important Microorganisms and culture collection centres 05

Role of fungi and bacteria in various fermentations, Examples of various fermentations using Yeast with special reference to Glycerol, baker's yeast, etc.

Suggested Readings:

1. Stanier, Roger Y.; Doudoroff, Michael; and Adelberg, Edward A., Lloyd E. M., 1957, The Microbial World, USA**,** J. Chem. Educ**.**, American Chemical Society and Division of Chemical Education, Inc.

2. Dr. C.B.Powar, Dr.H.F. Daginawala, 2010, General Microbiology**,** Vol. I, New Delhi Himalaya Publishing House

3. Pelcza M.J. Chan E.C.S. , 1982, Elements of Microbiology , International Edition, New York, McGraw-Hill Education

4. Casida L. E., 1968, Industrial microbiology, Wiley, the University of Michigan**,** United States.

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Faculty of Science

Semester – I	**Paper – II**
Course Code: MSCWBAT 112T	**Title of the Course:** Biochemistry of Alcohol, Beer and Wine
Credits: 04	**Total Lectures:** 60 Hrs.

Course Outcomes (COs):

1. Students will learn different biomolecules with their structure and function.
2. Students will understand concept of biochemistry of alcoholic fermentation & maloalcoholic Fermentation
3. Students gain knowledge of different concepts like pH, pKa, buffer, enzyme activity etc.

Detailed Syllabus:

Unit 1: Basic Biochemistry of living cells: 15

Introduction to Biochemistry, Concept & scope of Biochemistry and its application.

Water: Types of bond, Covalent and non-covalent interactions in biomolecules with suitable example, functional groups and modification of functional group relevant to biomolecules. Properties of water, Hydrogen bonding, ionization of water, interaction of biological molecules in water, osmosis pH, pKa, Titration curve, HH equation, Concept of Buffers: Biological buffers, types and their importance.

Unit 2: Primary metabolites and their metabolism: 15

Photosynthesis: Definition, importance and mechanism, light reaction, dark reactions and factors affecting the photosynthesis rate.

Classification and metabolism carbohydrates- Examples and structures of various carbohydrates, important carbohydrates for production of alcohol, beer and wine, glycolysis, fates of pyruvate, TCA cycle and glyoxylate cycle.

Amino Acids: Classification, properties and metabolism, structure and classification of proteins, amino acids and proteins in sugarcane juice and molasses.

Classification of lipids- simple, complex, derived lipids - structure & example.

Unit 3: **07**

DNA as the genetic material, DNA structure, Chemical Properties: Hydrolysis (acid, alkali), enzymatic hydrolysis of DNA, concept of central dogma, mutation and its importance in strain development**.**

Unit 4: Enzyme: **08**

Concept of active site, binding sites, Enzyme Activity, Stereospecificity of enzyme and enzyme substrate complex formation

Factors influencing enzyme activity, Enzyme inhibition

Enzyme regulation- allosteric enzyme, Isoenzymes,

Applications of enzymes in winery and brewery.

Unit 5: Biochemistry of alcoholic fermentation & Maloalcoholic Fermentation: **15**

Pathways involved in alcoholic fermentation, Transport of carbohydrates in yeast. Inter relationship between sugar uptake during alcoholic fermentation (Pasteur and Crabtree Effect).

Concept of Maloalcoholic fermentation and its effect on harmonious balance taste, various strains used in Malolactic fermentation (MLF), beneficial and deleterious aspects of malic acid biodegradation.

Production of biogenic amines & ethyl carbamate, usage & formation of Sulphur compound. Microbial formation & modification of flavor & off-flavor compounds in alcoholic beverages. Exoenzymes of alcoholic beverages microorganisms.

Suggested Readings:

1. Keith W. 2005, **Practical Biochemistry Biology Principles &Techniques,**USA,
2. Nelson D.L.,2013**, Lehninger principles of Biochemistry**, 6th edition,USA, Macmillan publication
3. Sadasivam S. & Manickam A.,2010, **Biochemical Methods,** 3rd edition,New age international publication,New Delhi
4. Voet D.& Voet J.G.,1999,**Fundamentals of Biochemistry,** John Wiley & Sons,Unites states
5. Nelson D.L.& Cox MM ,2008 **, Lehninger principles of Biochemistry**, 5th edition,USA, W.H.Freeman and Compony

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Semester – I	**Paper – III**
Course Code: MSCWBAT- 113 T	**Title of the Course: Viticulture**
Credits: 02	**Total Lectures: 30 Hrs.**

Course outcomes (CO's)

a. Students will learn history and origin of grape vines and understand the physicochemical factors of the edaphic and aerial environment impacting vine growth and development
b. Students will learn the technique of grape vine propagation
c. Students will learn significance of grape vine training and pruning
d. Students will learn significance of biology and symptomatology of the most common pests and diseases of grapevines
e. Students will learn morphological, physiological and biochemical changes in berry during maturation

Detailed Syllabus:

Unit 1: History and origin of grapes, Soil and climate for viticulture: 8

Concept of centres of diversity,

History and origin of grape vines in India and world

Role of Relationship of grapevine and climatic factors

Introduction to soil and its importance, Pedogenesis, Soil profile, Major types of soil, Properties of Soil: Physical Chemical and Biological properties of soil

Introduction to climatic factors and its effect on different growth stages (dormant period, bud burst period, flowering, post setting and harvest period).

Unit 2: Vineyard establishment: 8

Site selection and its importance w.r.t. irrigation, climate, soil etc., Planting materials and propagation techniques used- Seed, Vegetative/Asexual- Cutting, layering, grafting,

budding, micropropagation

Vineyard design: Initial planning, roads, blocks, rows, spacing,

Planting and care of young grape vine: Planting methods, timing of planting, irrigation, fertigation, weed, pest, disease management and training of young vines,

Pruning: Significance of pruning, types and pruning procedure in different geographical areas.

Unit 3: Weed, pest and disease management **10**

Weeds: Concept, types and its management

Pest: Mealybug, Moths, Phylloxera, Fruit flies, Thrips.

Fungal diseases: Downey mildew, Powdery mildew, Anthracnose, Botrytis rot.

Bacterial diseases: Pierce's disease, Crown gall

Viral diseases: Leaf-roll, Fanleaf degeneration

Unit 4: Berry development, pre and post-harvest management **4**

Muscadine and Euvitis species, Developmental stages of the grape, Berry structure, flavour and aroma compounds of the mature grape, phenolic compound in grape.

Harvesting: Maturity standards, harvesting periods, packing, Postharvest handling, processing, transportation and marketing

Suggested readings

1. R.G. Somkuvar (2009) Training and Pruning in grapes. Technical Bulletin No. 9, NRCG Pune.
2. How to start a Vineyard In 2020: The Step by Step Guide To Starting A Vineyard In 2020 Kindle Edition by Alex Johnson
3. Phil, Nicholas, Peter, Magarey & Malcom, Wachtel (2003). Diseases and pests Grape production series. Winetitiles.
4. Dry, P.R. & Coombe, B.G. (2005). Viticulture Vol.1 Resources. Winetitiles.
5. Dry, P.R. & Coombe, B.G. (2006). Viticulture vol. 2 practices. Winetitiles.
6. John, Kent & Richard, Early (2003). Pesticide applications inVineyards. Charles stuart university.
7. White, Robert E. (2003). Soil for fine wines. Oxford university press.
8. Andrew, Markides & Richard, Gibson. Australian Society of Viticulture & Enology.
9. Larry J. Bettiga (2013) Grape pest management 3rd edition ISBN-10 : 1601078005.
10. Kunkee, Ralph E. (2001) Introduction to wine making : viticulture and enology-3.

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Semester – I	**Paper – IV**
Course Code: MSCWBAT 114P	**Title of the Course: Practical Course –I based on Microbiology**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students will study to prepare and sterilize media.

b. Students will perform the isolation of microorganisms.

c. Students will learn the to prepare slide culture technique for yeast

d. Students will learn the immobilization.

e. Students will study bacteria by performing different staining technique.

f. Students will check practically the effect of antibiotic on microbial growth.

Detailed Syllabus:

1. Preparation of culture media and sterilization.	**1**
2. Preparation of MGYP medium for growth and Identification of yeast.	**2**
3. Preparation of MGYP and molasses medium slants.	**1**
4. Enumeration of microorganisms by four-quadrant method.	**1**
5. Enumeration of microorganisms by using spread plate technique.	**1**
6. Counting of microorganisms by pour plate method.	**1**
7. Preparation of slide culture of yeast.	**1**
8. Immobilization of yeast cell and check its activity.	**2**
9. To study types and composition of stain and preparation of stains and reagents.	**1**
10. To study bacteria by monochrome staining technique.	**1**
11. To study bacteria by Gram's staining technique.	**1**
12. Effect of antibiotic on microbial growth.	**2**

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Semester – I	**Paper – V**
Course Code: MSCWBAT 115P	**Title of the Course:** Practical Course –II based on biochemistry
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students will learn different qualitative and quantitative tests for biomolecules.
b. Students will understand concept of chromatography, spectroscopy etc.
c. Students gain knowledge of enzyme activity, specific activity and effect of different parameters on enzyme activity.

Detailed Syllabus:

1. Safety Measurement and good Lab Practices. 01
2. Preparation of buffers and desired pH, Molarity, Normality- Acetate buffer and Phosphate buffer. 01
3. Detection of sugar (Benedicts/Felhings), detection of starch, difference between reducing and non-reducing sugars. 01
4. Detection of amino acids and proteins by spot test. 01
5. Paper chromatography of amino acid. 01
6. Determination of reducing sugar by DNSA/ Lane-Eynon titration method. 01
7. Estimation of protein by Biuret method. 01
8. Estimation of protein by Lowry method. 01
9. Estimation of activity and specific activity of amylase. 02
10. Effect of salt concentration, temperature, pH on enzyme activity. 02
11. Determination of proteolytic activity of yeast strain. 01
12. Identification of wine spoilage by biochemical methods. 02

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Semester – I	**Paper – VI**
Course Code: MSCWBAT 116P	**Title of the Course:** Practical Course –III based on viticulture
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students will learn basic techniques of soil analysis

b. Students will practice the techniques of grape vine propagation

c. Students will study the morphology of grape vine and nutritional requirement of grapevine

d. Students will practically learn grape vine training and pruning

e. Students will learn significance in biology and symptomatology of the most common pests and diseases of grapevines

f. Students will practically study morphological, physiological and biochemical changes during berry maturation

Detailed syllabus:

1. To study collection and preservation of soil sample and analysis of physical parameters of soil: colour, particle size and water holding capacity of soil sample **2**
2. To determine soil pH, conductivity and total alkalinity of the soil sample **1**
3. To determine chlorides and sulphates of the soil sample **1**
4. To determine organic matter content of the soil sample **1**
5. To determine Nitrogen in the given soil/petiole (plant) sample **1**
6. To study of morphology of grapevine and anatomical features of stem **1**
7. To study grapevine propagation techniques (cutting, grafting and budding) **1**
8. To study methods of plantation, irrigation and fertigation of grapevines **1**
9. To study training and pruning technique of grapevine **1**

10. To study major pests of grapevine	**1**
11. To study fungal disease of grapevine	**1**
12. To study viral disease of grapevine	**1**
13. To study Stages of grape berry development	**1**
14. Visit to vineyard and submission of a report	**1**

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Semester – I	**Paper – VII**
Course Code: MSC WBAT 117T (A)	**Title of the Course: Fermentation technology**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs):

1. Students shall become aware of fermentation.
2. Students should be able to gain in-depth understanding of fermenter, types of fermenter and its parts.
3. Students should be able to known about the media preparation, inoculum development and media optimization.

Detailed Syllabus:

Unit 1: Fermenter and its sterilization **15**

Scope and importance of fermentation, configuration of fermenter, types of fermenter: batch fermenter, continuous, stirred tank, tubular fermenter, fluidized bed fermenter, bed fermenter, solid state fermenter, hollow fiber fermenter

Parts of fermenters: Body construction and temperature control, aeration and agitation: aerator (sparger), agitator (impellers, baffles)

Sterilization: introduction, media sterilization, design of batch sterilization processes, sterilization of fermenter, filter sterilization

Unit 2: Inoculum development and media preparation **15**

Development of inoculum for industrial fermentation, criteria for transfer of inoculums, development of inoculums for yeast, bacterial processes, and mycelial processes

Production of media, characteristics of ideal production media.

Raw materials: saccharine material, starchy material, cellulosic hydrocarbon and vegetable oils, nitrogenous material.

Composition of grape juice as fermentation on medium with respect to source ‘C’, ‘N’, amino acid, vitamins, minerals, pH, water, buffering capacity, additives used in wine fermentation. Media optimization.

Suggested reading:

1. Stanbury, P. F., Whittaker, A. and Hall, S., (2016) Principles of Fermentation technology, Springer, Third edition

2. Atkinson, (2014) Handbook of Bioreactors,Harvey W. Blanch, Douglas S. Clark, Biochemical Engineering, Marcel Decker Inc.

3. Casida, L. E., (2019), Industrial Microbiology, New age International, New Delhi, Second Edition.

4. A.H. Patel. (2011), Industrial Microbiology, Macmillan India Ltd., Second Edition.

5. Crueger, W. and Crueger, A. (2005) A Text Book of Industrial Biotechnology.

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Faculty of Science

Semester – I	**Paper – VIII**
Course Code: MSC WBAT 117T (B)	**Title of the Course: Environmental Science**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (CO's)

a. The student will understand threats to the environment, its causes and consequences.

b. The student will be able to evaluate the potential of biodegradation of organic pollutants by microorganisms, taking microbial, physical/chemical environments, as well as the chemical structure of the compound itself into consideration.

c. Students will understand the phenomenon of bioremediation, phytoremediation for the decontamination of soil and water, wetlands as treatment processes.

d. Students will learn about national/international environmental laws and policies.

Detailed Syllabus:

Unit 1: Threats to Environment **10**

Global and regional threats to the environment

Composition of Air, chemical composition of atmosphere, air pollution-causes, greenhouse gases, greenhouse effect, global warming and its effect on agriculture

Water Pollution-sources and its effect on environment

Soil pollution causes and its effect

Carbon foot prints and carbon sequestration

Unit 2: Biotechnology in Remediation **10**

Introduction to bioremediation, advantages, limitations and applications, Types of bioremediation and factors affecting, bio-stimulation, bio-augmentation, *Ex-situ* and *In-situ* methods of bioremediation, phytoremediation

Waste water treatment plant- physical, chemical and biological unit operations/processes-overview, activated sludge process, trickling filters, oxidation ponds

Unit 3: Environmental Laws and Policies **10**

International: In the view of global concerns, objectives of laws/regulations and its importance, Stockholm conference, the Montreal protocol, Rio conference, United Nations Framework Convention on Climate Change (UNFCC) and Kyoto protocol

National: Environmental policy and overview of laws, anti-pollution Acts: Their important objectives, Environmental Impact Assessment (EIA)-Introduction, Objectives, Classification, Guidelines.

Suggested readings:

1. Environmental Science (2011) S C Santra, New Central Book Agency
2. Ecology and Environment (2011) P D Sharma,
3. Agenda 21: Guidelines for Stakeholders Patwardhan & Gunale, Pune.
4. Air Pollution (2004) HVN Rao and M N Rao Tata McGraw-Hill, , New Delhi
5. Air Pollution Engineering Manual (2000) Wayne T Davis (editor), Air and Waste Management Association, Wiley Interscience,, New Jersey
6. Bioremediation (1994) Baker, K.H and Herson, D.S.Mc Graw Hill, Inc. New York
7. Biotreatment of Industrial & Hazardous Waste (1993) M.V.Levin and Gealt, M.A McGraw Hill. Inc, New York
8. Ecology and environmental biology (2011) Saha T K Books & Allied (p) Ltd, Delhi
9. Environment Problems & Solutions (2001) Asthana & Asthana S. Chand Limited, New Delhi

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Syllabus of M.Sc. I. Wine, Brewing and Alcohol Technology

Under

Faculty of Science

Semester – I	**Paper – IX**
Course Code: WBAT MSC WBAT 118P(A)	**Title of the Course: Practical course based on fermentation technology**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students shall become aware of fermenter and its parts.
b. Students will practically learn about the media preparation, inoculum development and media optimization.
c. Students will practically understand how to screen and isolate the yeast or enzyme producer organism from the natural sources.

Detailed Syllabus:

1. Preparation and sterilization of growth medium – nutrient agar and broth, PDA and PDB, YEPD, etc. **1**
2. Study of various parts and working of lab bench fermenter **1**
3. Screening and isolation of different yeast species from natural sources **2**
4. Screening and isolation of enzyme producer organism from the natural sources. **2**
5. Development of inoculums for bacteria, yeast and mycelial fungi **3**
6. Medium optimization for laboratory scale production. **2**
7. Lab scale production, recovery of any product by fermentation method. **2**
8. Solid state fermentation: lab scale production of a product. **1**
9. Visit to a fermentation based unit **1**

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Faculty of Science

Semester – I	**Paper –X**
Course Code: WBAT MSC WBAT 118P(B)	**Title of the Course: Practical course based on environmental science**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students will practically validate toxic effects of pollutants on biological system
b. Students will isolate the pollutant degrading microorganism from polluted environments.
c. Students will analyze/practically validate water quality parameters like TSS, DO, BOD and COD.
d. Students will practically execute biodegradation of pollutants using plant or microbes.

Detailed Syllabus:

1. Genotoxicity assay on polluted water- onion root tip and pollen germination assay. **2**
2. Isolation of microorganisms from different habitats/niches and enumeration of its bioremediation potential **2**
3. Isolation of microorganisms from different habitats/niches and enumeration of its bioremediation potential **2**
4. Qualitative estimation of biodegradation of pesticide/insecticide/fungicide. **2**
5. Estimation of total suspended solids (TSS) of waste water **1**
6. Determination of dissolved oxygen (DO) concentration of water sample **1**
7. Determination of chemical oxygen demand (COD) of sewage sample. **1**
8. Determination of biological oxygen demand (BOD) of sewage sample **1**
9. Review on EIA case study. **2**
10. Visit to waste water treatment plant **1**

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Semester – I	**Paper – XI**
Course Code: MSCWBAT 119T	**Title of the Course:** Alcoholic beverages and Health
Credits: 02	**Total Lectures:** 30 Hrs.

Course Outcomes (COs):

1. Students will understand concept of free radicals and antioxidants.
2. Students gain knowledge about nutritional value of alcoholic beverages.
3. Students will understand health benefits of alcoholic beverages in various disease prevention.
4. Students will understand harmful effects of alcohol on human health.

Detailed Syllabus:

Unit 1: Antioxidant: **10**

Basic concept of anti-oxidant and free radical

Types of free radicals- reactive oxygen species (ROS) and reactive nitrogen species (RNS)

Wine antioxidant – formation of reactive oxygen species and cell damage

Wine polyphenols as anti-oxidant and free radical scavengers

French paradox and protective effect of moderate alcohol consumption

Synergism of alcohol and antioxidant in wine.

Unit 2: Nutritional value of alcoholic beverages: **05**

Outline of nutrient content of various alcoholic beverages – Wine and Cider,

nutritional aspects of beer

Unit 3: Moderate alcohol consumption and associated health benefits: **08**

To liver, lungs, heart, anti-aging effect, ulcers, kidney stone,

Role of antioxidant in preventing – cardiovascular disease, cancer, gouts, anti-degenerative disease – Parkinson's disease, Alzheimer's disease, rheumatoid arthritis

Unit 4: Harmful effects of excessive alcohol intake **07**

Cardiovascular complication, gastro-intestinal disorder, liver problem, methanol & higher alcohol toxicity, nervous system and psychological disorder. allergies and hypersensitivity, headaches and dental erosion.

Suggested Readings:

1. Andrea and Schaffer -Red wine for your health 2001, ISBN : 1553560019, Key Porter Books Ltd
2. Zoecklein B., Fugelsang K. and Gump B. 1995, Wine analysis and production, 1st edition, Hardcover ISBN 978-0-412-98241-5, Zoecklein, Springer, Boston, M
3. Buglass J. Alan J. 2010, Handbook of alcoholic beverages technical, analytical and nutritional aspects vol.1 and Vol .2, ISBN:9780470512029, John Wiley & Sons, Ltd
4. C. A. Crampton 1887, Fermented Alcoholic Beverages, Malt Liquors, Wine and Cider, Washington: Government Printing Office
5. Catherine, Cheze, V.ercauteren J. and R. Verpoorte, Polyphenols, wine and health 2001, ISBN: 978-94-015-9644-2, Proceedings of the Phytochemical Society of Europe, Bordeaux, France
6. Jackson R. S. 2008,Wine science-Principles and applications, 3rd edition, ISBN 978-0-12-373646-8, Elsevier Inc.

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Syllabus of M.Sc. I. Wine, Brewing and Alcohol Technology

Under

Faculty of Science

Semester – II	**Paper – I**
Course Code: MSC-WBAT211 T	**Title of the Course: Alcohol technology -I**
Credits: 04	**Total Lectures: 60 Hrs.**

Course Outcomes (COs):

a. Learn the propagation practice for yeast in distillery process.

b. To study the alcoholic fermentation concept and check their efficiency.

c. To understand the chemistry of alcohol.

d. To study types of substrates for alcohol yield.

e. To understand the manufacturing process of alcohol-based chemicals.

Detailed Syllabus:

Unit 1: Yeast maintenance and propagation in distillery **15**

Design of yeast vessels, material of construction and its maintenance. Propagation practices of yeast adopted under plant conditions. Measurement of number of yeast Cells/yeast viability count etc. Use of Baker's yeast. Active dry yeast and yeast acidification/pre-treatment practices. Pre-fermentation practices adopted for yeast propagation. Prior to inoculation to main fermenter.

Unit 2: Raw material for alcoholic fermentation and its manufacturing: **15**

Introduction to first and second generation of ethanol. Introduction to various feedstock for alcohol fermentation-grain, sweet sorghum, sugar beet, rice, maize, bajara, wheat, dates, cashew, apple. Overview of molasses composition, grades, storage and cost. Details of molasses weighing system. Molasses dilution practices adopted and design of diluter, quality of dilution water used, quality of water and molasses dilution practices. Pre clarification of molasses advantages and drawback, molasses sterilization/pasteurization.

Unit 3: Details of alcoholic fermentation **15**

Process of batch fermentation, factor influencing efficiency of fermentation, theoretical yield of alcohol, characteristics of batch fermentation process, control over fermentation operation, contamination control, design and material of construction of fermenters, maintenance of fermenter and operational conditions on plant scale, flow sheet of batch fermentation process, efficiency of fermentation and attenuation data calculations – related examples and solutions. Alcoholometry – proof spirit (British and USA) over proof, under proof, specific gravity of alcohol strength of alcohol in terms of concentration – related examples and solution. Prevention of losses of alcohol during fermentation, post – fermentation practices/scrubbing etc.

Unit 4: Chemistry of alcohol and alcohol based chemicals/products **15**

What is alcohol? physical and chemical properties of alcohol, classification of alcohols, important chemical reactions of alcohol, production of alcohol by synthetic method. Uses of alcohol.

Introduction to alcohol based chemicals/products, detail study of reactions involved, manufacturing process, uses, and list of manufacturing products-Acetaldehyde, Acetic acid, Acetic-Anhydride, Butanol, Ethyl Acetate, Butyl Acetate, Acetone, Ethyl Ether, Diethyl Oxalate.

Suggested Readings:

1. Patel, A.H. (2013). Industrial Microbiology. MaCmillan Publication, New Delhi.

2. Stanbuzy, Peter & Whitaker, A. (2012). Principal of Fermentation Technology. Butterworth Heinemann.

3. Srivastava, M.L. (2012) Fermentation Technology.

4. John, J Palmer & Colin. Kaminski. (2013). Water: a comprehensive guide for brewers. Brewers Publications.

5. Jacques T. P. Lyons & D. R. Kelsall (1999), The Alcohol Textbook, Nottingham University Press.

6. Reddy. S.M (2017) Basic Fermentation Technology 1St Edition, New Age International (P) Ltd Publishers

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Under

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Semester – II	**Paper – II**
Course Code: MSCWBAT- 212 T	**Title of the Course: Brewing technology -I**
Credits: 04	**Total Lectures: 60 Hrs.**

Course Outcomes (COs):

1. Students should be known the history and origin of beer.
2. Give an account of important concept regarding to beer and its terminologies
3. Students should be able to known about the materials, equipment's and methods used in beer industries.
4. Student should be known the detailed information about the four magic ingredients in beer.

Detailed Syllabus:

Unit No. 1 History and overview of industrial brewing 08

Introduction, brewing in an agrarian world, the eighteenth century, porter, the first industrial beer: mechanization and measurement. The nineteenth century: porter vs ale, the rush to bottom fermentation, science and practice. The twentieth century: beer and society, temperature and prohibition. Consumer choice fewer & bigger: the path to globalization, science applied & technology transformed.

An overview of brewing: introduction, outline of the brewing steps, malting, milling and adjunct use, mashing, wort separation, wort boiling, trub removal, wort cooling/aeration, yeast handling, yeast pitching, fermentation, yeast removal, aging, clarification, packaging and warehouse practices.

Unit No. 2 Beer origin, classification and beer styles 07

Beer origin, classification and beer styles, their origins and classification-introduction: creation of different styles of beer and factors involved- ingredients: water, fermentable carbohydrates, hops, yeast, processing: equipment configuration, milling, mashing, lautering,

boiling time, fermentation temperature, maturation time, filtration, packaging, marketing, cultural origins of style, analytical and sensor variables, beer style guidelines, analysis, tasting &, brewing beer. The beer styles-ales: British origin, Irish origin, German origin, Belgian and French origin, lager beer: European- Germanic origin, North American origin, other origin.

Unit No. 3 Basic raw materials of brewing – Water **15**

Basic raw materials of brewing-water: brewery water consumption, brewery water categories, water hardness, water alkalinity and pH, effect of ions in water, inorganic constituents and organic constituents of water, water quality reports parameter – primary standards, secondary standards & aesthetic standards, chemical characterization of water types, summary of the influences of various ions during beer production

Unit No. 4 Basic raw materials of brewing – Barley and malt **15**

Barley and Malt: -barley–structure and function: husk, pericarp, testa, aleurone layer, starchy endosperm, the embryo.

Malt production: drying, storage, and handling, steeping, germination, kilning and malt quality, malt varieties

Unit No. 5 Basic raw materials of brewing – Hops **15**

Hops-classification, hop variety, cultivation and harvesting, chemistry, whole hops, hop resins-soft and hard resins, hop oils, hop storage, bittering value, bitter flavor and foam – role of α-acids, typical chemical profile in presence and absence of hops. Factors affecting on hop addition in brewing process. Hops usage – choice of hop product, hop utilization, calculation of hop additions.

Adjuncts- concept, role of adjuncts in brewing, various examples of adjuncts.

Suggested readings -

1. American Society of Brewing Chemists, U.S.A.: Methods of analysis of American society of brewing chemists. (8th rev.) U.S.A. American society of brewing chemists, 1996.

2. Arntzen,C.J.,ed.: Encyclopedia of agricultural science, Vol. 1: - A - D. N. York, Academic Press, 1994. 3. Birch,G.G.: Alcoholic beverages. London, Elsevier Applied Science Pub.1985.

4. Government of India. Technical Excise Manual. --(663.16GOV)

5. Hardwick,W.A.,ed.: Handbook of brewing. N. York, Marcel Dekker,Inc.,1995.(663.3 HARHAR)

6. Hough,J.S.,Briggs,D.E.,Stevens,R.,Young,T.W.: Malting & brewing science, vol. 2 : hopped wort & water. London, Champman & Hall, 1982.

7. Pollock, J.R.A., and ed.: Brewing science vol. 1.London, Academic Press, 1979,

8. Pollock, J.R.A., and ed.: Brewing science, vol. 2. London, Academic Press, 1981.

9. Prescott, S.C. & Dunn, C.G.: Industrial microbiology. Jodhpur. Agrobios (India), 2002. 81-7754-149-10.

Priest, F.G.: Brewing microbiology, 2nd ed.. (1996) U.K. Chapman & Hall, 1996.

11. Priest, Fergus G.; & Stewart, Graham G.: Handbook of brewing. (2nd) U.S.A. CRC Press, Taylor & Francis Group, 2006.

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Syllabus of M.Sc. I. Wine, Brewing and Alcohol Technology

Under

Faculty of Science

Semester – II	**Paper – III**
Course Code: MSC-WBAT 213 T	**Title of the Course: Oenology-I**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs):

a. Students will know the history and status of oenology.
b. Students will learn the scope of oenology.
c. Students will study the classification and therapeutic values of wine.
d. Students will study the different red and white grape varieties along with its composition used in oenology.
e. Students will study the pre fermentation processes.
f. Students will learn the monitoring and controlling of wine fermentation parameters.

Detailed Syllabus:

Unit. 1 Introduction, History and classification of wine **08**

Introduction to Oenology

History of wine making, Major wine producing countries in the world.

Present international and national status of wine production, commercial aspect of wine production.

Overview of world and Indian wine scenario

The current and future wine prospectus in India

New concept of wine production: organic, biodynamic wine, Ice wine, etc.

Classification of wine- table wines, sparkling wine, dessert wines, aperitif wine, pop wine.

Nutritional and health aspects of wine

Unit. 2 Grape varieties, composition and Pre-fermentation treatments **08**

White wine grapes varieties, Red wine grape varieties

Principal constituents of grape juice and Wine: Water, carbohydrates (Sugar), acid, Nitrogen containing compounds, mineral salts, phenolic compounds and related phenol-tannins, Anthocyanin's, some important functional and chemical groups in grapes.

Must preparation, must adjustments, Clarification of grape juice and commercial enzymes and yeast used in wine making.

Unit. 3 Wine Production: 08

Detailed Red wine production and its styles - harvesting to bottling

Detailed White wine production and its styles -harvesting to bottling

Sparkling wine production stages -traditional method, transfer process method, Tank method and Carbonation

Unit. 4 Monitoring and controlling of wine fermentation parameters (06)

Monitoring cell number and viability of yeasts during wine fermentation, controlling microbial growth during wine production, effect of pH, temperature, CO_2, amount of sugar on fermentation rate.

Role of sulphur-di-oxide in vinification

Preservation of wine- sulphur dioxide, dimethyl dicarbonate, sorbic acid & benzoic acid

Suggested Readings

1. Pascal Ribereau , (2000) Hand book of enology volume–I
2. Ron s. Jockson (2000) Wine science principles practices &perception
3. Brue W. Zoecklein, Kenneth Fugelsang, Barry H. Gump Fred S. Nury (1999) Wine Analysis and production
4. C. S. Ough (1992) Wine makingBasics
5. Roger B.Boulton (1996) Principles and practices of winemaking
6. Emile Peynalld (1984) Knowing & makingwine
7. Patrice Iland& Peter Gago (1997) Australian wine from the grasp vine to theglass
8. Brue W. Zoecklein (1999) Wine Analysis andproduction
9. Handbook of Enology, Vol. I. The Microbiology of Wine and Vinification- P. Ribereau- Gayon, D. Dubourdieu, B. Doneche, A. Lonvaud.
10. American Society for Enology and Viticulture- Seattle.
11. Australian Society of Viticulture and Enology - Andrew Markides, Richard Gibson.
12. Introduction to winemaking, Viticulture and Enology 3- Prof. Ralph E. Kunkee.

13. Understanding wine- Course notes- Patrick IIand, Peter Gago.
14. Wine science- Ron S. Jackson.
15. Handbook of Enology, Vol 2- The chemistry of wine stabilization and treatments P. Ribereau – Gayon, D. Dubourdieu, A. Maujean, Y. Glories.
16. Concepts on wine chemistry- the wine appreciation guide- Yair Margalit, James Crum.
17. Wine making from grape growing to marketplace- Richard P. Vine, Ellen M.Harkness, Salley J. Linton.
18. Monitoring the wine making process from grapes to win techniques and Concepts- Patrick Iland, Nick Bruer, Andrew Ewart, Andrew Markides, John Sitters.
19. Wine appreciation- Richard P. Vine.

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Semester – II	**Paper – IV**
Course Code: MSC WBAT 214 P	**Title of the Course: Practical's course I based on Alcohol technology I**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Learn the types of substrate for alcohol production.

b. Understand the viability and measurement technique to detect yeast count.

c. To study the dilution practices of molasses.

d. Learn the alcoholic fermentation technique.

Detailed Syllabus:

1. To study types of raw materials and substrate for alcohol production. **2**
2. Preparation of diluted molasses for alcohol production. **1**
3. To perform starch processing for alcoholic fermentation. **2**
4. Determination of fermentation efficiency of yeast (in molasses medium) **1**
5. Production of alcohol based chemical. **2**
6. Determination of alcohol content in given product. **2**
7. To study the types of alcoholic fermentation. **1**
8. Determination of viable count of yeast from fermentation sample. **2**
9. Growth measurement of yeast cells in alcoholic fermentation broth **1**
10. To study the effect of alcohol concentration on yeast growth. **1**

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Semester – II	**Paper – V**
Course Code: MSCWBAT- 215 P	**Title of the Course: Practical course II based on brewing technology –I**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students should be known the structure of barley/cereal grains.
b. Students will practically understand how to prepare malt.
c. Students will practically learn about the chemical analysis of barley/cereal grains/malt.
d. Students will practically understand the chemical analysis of wort.

Detailed Syllabus:

1.	Study of different types of cereal grains used in preparation of beer	**1**
2.	Sampling & grading of barley/ other cereal grains	**1**
3.	Determination of moisture content of barley/ cereal grains	**1**
4.	Study of structure of barley/ cereal grains	**1**
5.	Chemical analysis of barley/ cereal grains	**2**
6.	Study of germination of barley and its analysis	**2**
7.	Preparation of malt and chemical analysis of prepared malt	**2**
8.	Extraction of wort and determination of its specific gravity	**1**
9.	Determination of reducing sugar content of wort.	**1**
10.	Determination of fermentable saccharides of wort.	**2**
11.	Determination of pH & acidity of wort.	**1**

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Semester – II	**Paper – VI**
Course Code: MSCWBAT 216P	**Title of the Course: Practical Course - III based on oenology**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Students will study the instruments used in Oenology laboratory.
b. Students will learn the types of wine.
c. Students will learn to estimate sugar from grape juice.
d. Students will learn to determine different components from wine.
e. Students will study the wine preparation technique.

Detailed Syllabus:

1. Study of instruments used in oenology laboratory. **1**
2. To study of types of wine. **1**
3. Estimation of sugar from grape juice. **1**
4. Must preparation and juice clarification. **1**
5. Determination of total antioxidant content of wine. **1**
6. Determination of total tannin content of wine. **1**
7. Preparation of red wine. **2**
8. Preparation of white wine. **2**
9. Determination of alcohol content of wine by Ebulliometer. **1**
10. Determination of pH and total acidity of wine. **1**
11. Determination of volatile acidity of wine. **1**
12. Determination of free and total sulphur dioxide of wine. **1**
13. Visit to a wine industry and report submission along with photo documentation. **1**

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Faculty of Science

Semester – II	**Paper – VII**
Course Code: MSCWBAT 217T (A)	**Course Name: Chemical Engineering and Plant Management –I**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs):

a. An ability to accomplish basic design and optimization of process components and systems.
b. Understanding of the processes of measurement, the concept of a unit, and a familiarity with the tools and common units of measurement
c. Use of different fluid flow measuring devices.
d. Apply appropriate equations and principles to analyze pipe flow problems

Detailed Syllabus:

Unit 1: Fundamentals of distilleries **06**

Fundamentals of distilleries, principles of distillation, vapour liquid equilibrium, boiling point curve/diagram.

Heat transfer fundamentals, types of heat exchanger, design of heat exchange equipments and their application to distillery industry

Unit 2: Pressure measurement **06**

Introduction pressure measurement to instrumentation, important terms associated with instruments such as range, span, accuracy, error, resolution, reproducibility, repeatability, and sensitivity

Various pressure units and their conversion

Pressure transducers such as barometer, manometers, bourdon tube, diaphragm, bellows, capsule, strain gauges for pressure measurement.

Unit 3: Flow measurement **08**

Basic terms such as total flow, volumetric flow, Mass flow, types of flow

Flow transducers such as orifice plate, pitot tube, venturi meter, variable area flow meter, magnetic flowmeter, vortex flowmeter, ultrasonic flowmeter, turbine flowmeter, displacement flowmeter.

Unit 4: Temperature measurement **05**

Various scales and conversion

Expansion thermometers, thermocouples, Resistance temperature detector, Thermistors and pyrometers.

Unit 5: Level measurement **05**

Direct methods such as gauge glass method, float method, magnetic level indicator, magnetic level switches, indirect methods such as hydrostatic method, radiation method, ultrasonic method and capacitance method.

Suggested Readings:

1. Chaiwal, Gurdeep P.& Anand, Sham- Industrial Methods of chemical Analysis, Analytical instruments
2. Gurdeep & Anand, Sham (2007)- Industrial methods of chemical Analysis .
3. Mccabe, Warren L. , Smith, Julian C. & Harriott, Peter- Unit operations of chemical engineering.
4. Richardson, J. F. & Peacock, D. G. Coulson & richardson's - Chemical engineering, vol. 3.
5. L. Victor, Streeter and E. Benjamin Wylie, (1985), Fluid Mechanics, Tata McGraw Hill.
6. M. Franck White, (2017), Fluid Mechanics, Tata McGraw Hill.
7. K. Subramanya, (2001), Theory and Applications of Fluid Mechanics, Tata McGraw Hill.
8. R. K. Rajput, A text book of Fluid Mechanics and Hydraulic Machines, S. chand Technical

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Semester – II	**Paper –VIII**
Course Code: MSCWBAT 217 T (B)	**Title of the Course:** Laboratory Management
Credits: 2	**Total Lectures:** 30 Hrs..

Course Outcomes (COs):

a. Students will study the Laboratory design and management

b. Students will able to understand basic design consideration, control measures

c. Students will understand Framework of laboratory project

d. Students will learn the operation and maintenance of laboratory

Detailed Syllabus:

Unit 1: Introduction to Laboratory Design and Management **02**

Unit 2: Design Considerations - Facility space, Storage, Surfaces and finishes, Furniture, Facilities and systems, Laboratory equipments **06**

Unit 3: Heightened Control Measures - Controlled access systems, Additional design features, Directional airflow and inward airflow, HEPA filters, Waste disposal, Laboratory emergency response **07**

Unit 4: Framework of a Laboratory Project – Planning team, Costs, Time Scale, Quality **05**

Unit 5: Design- User requirement specification, Workflow diagrams, Typical project design stages, Budget, Procurement. **05**

Unit 6: Operation and maintenance- Safety of maintenance personnel, Design for maintenance, Operating and maintenance manuals, Maintenance contracts, Planned maintenance, Breakdown maintenance, Maintenance records and inspections **04**

Unit 7: Decommissioning Laboratory Facilities **01**

Suggested Readings:

1. Janet S. Baum, Louis J. DiBerardinis, Melvin W. First, Gari T. Gatwood (2013). Guidelines for Laboratory Design: Health, Safety, and Environmental Considerations. Wiley Global Education.

2. Leonard Mayer, (1995). Design and Planning of Research and Clinical Laboratory Facilities. Wiley Global Education.

3. Griffin Brian (1998). Laboratory Design Guide. Taylor & Francis Ltd

4. Laboratory biosafety manual, fourth edition. Geneva: World Health Organization; 2020 (Laboratory biosafety manual, fourth edition and associated monographs).

5. Risk assessment. Geneva: World Health Organization; 2020 (Laboratory biosafety manual, fourth edition and associated monographs).

6. Biological safety cabinets and other primary containment devices. Geneva: World Health Organization; 2020 (Laboratory biosafety manual, fourth edition and associated monographs).

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Semester – II	**Paper – IX**
Course Code: MSCWBAT 218P (A)	**Title of the Course: Practical Course based on: Chemical Engineering and Plant Management-I**
Credits: 02	**Total Hours: 60**

Course Outcomes (COs):

a. Use of different fluid flow measuring devices.
b. Apply appropriate equations and principles to analyze pipe flow problems.
c. Determine the fluid pressure and use various devices for measuring fluid pressure.
d. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Detailed Syllabus:

1. Measurement of specific gravity (must, molasses, sugar syrups, wort, beer, wine etc.) using specific gravity bottle **1**
2. Measurement of viscosity of liquids using Oswald's viscometer **1**
3. To study CIP process in winery /brewery /distillery **2**
4. Calibration of Bimetallic Thermometer **1**
5. Estimation of thermal death coefficient k for normal wine contaminants **2**
6. Determine the coefficient discharge using Orifice meter and pitot tube **2**
7. Determine the coefficient discharge using Venturi meter and magnetic flowmeter **2**
8. Determination of the heat transfer coefficient for plate type heat exchanger **1**
9. Determination of the heat transfer coefficient for Shell and Tube heat exchanger **2**
10. To study Rayleigh equation and study simple distillation. **1**

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Semester – II	**Paper –X**
Course Code: MSCWBAT 218P (B)	**Title of the Course:** Practicals in Laboratory Management
Credits: 2	**Total Hours: 60**

Course Outcomes (COs):

a. Students will study different types of laboratories and their components

b. Students will able to understand working principle of laboratory equipment, their handling and maintenance

c. Students will learn the laboratory safety, design layout and preparation of SOPs

Detailed Syllabus:

1.Study of different type of laboratories	**02**
2.To study laboratory spaces, facilities, storage and furniture	**01**
3.To study the working principle of laboratory equipments	**02**
4. Handling of Laboratory equipments	**02**
5.To prepare the laboratory layout for establishing new laboratory	**02**
6. Hands on training of laboratory safety and biosafety management	**02**
7. Study of preparation of SOP for laboratory instruments	**02**
8. Maintenance of some basic laboratory equipments	**02**

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Semester – II	Paper – XI
Course Code: MSC WBAT 219T	Course Name: Regulatory policies for Alcoholic Beverages
Credits: 02	Total Lectures: 30 Hrs.

Course Outcomes (COs):

a. Students can understand the regulation of beverages on both state and federal levels.
b. Students will specifically understand TTB regulations.
c. Students will understand procedure of licensing.
d. Students will learn taxation and public hearing requirements with regard to Alcoholic Beverages.

Detailed Syllabus:

Unit 1: Introduction and historical background **05**

Introduction to alcohol laws

History of alcohol laws and regulation

Alcohol and tobacco tax and trade bureau (TTB)

Unit 2: Federal alcohol laws **04**

Definition

Federal laws for alcohol in India

Unit 3: State alcohol laws **07**

Laws that govern: distribution of alcohol,

Selling of alcohol,

State taxation of alcohol,

Shipping of alcohol by producers and consumers.

Unit 4: State distribution laws **08**

Laws applicable for: Suppliers (wineries, microbreweries), brokers, companies, and individuals that represent the alcohol industry.

Distributors, storage, retailers (restaurants and bars or alcohol shops and grocery stores), consumers.

Unit 5: State laws governing alcohol sales **06**

Excise norms and policies- State laws governing taxation of alcohol

State laws governing shipping of alcohol

Suggested Readings:

1. Alcohol marketing and regulatory policy; by Arora M.
2. Compendium Alcoholic Beverages Regulation by FSSAI.
3. Developing principles for regulation of alcoholic beverages sector in India by Arpita Mukherjee.
4. Alcoholic Beverages by John Piggot.

Course Structure: M. Sc. in Wine, Brewing and Alcohol Technology programme is 02 academic years and 04 semesters. The minimum total number of credits requirement for this programme is 88 credits and 12 additional credits

- CGPA will be calculated based on core 88 credits only
- Each theory credit is equivalent to 15 clock hours of teaching and each practical credit is equivalent to 30 clock hours of laboratory teaching in a semester.
- The duration of each theory semester is 15-18 weeks in which at least 12-week classroom teaching and 03 weeks of continuous internal assessment is must.
- The duration of each practical semester is 15-18 weeks in which at least 14-weeklaboratory sessions and one week of internal evaluation including viva and journal certification is must.
- For the purpose of computation of workload, the following mechanism may be adopted as per UGC guidelines:
- 1 Credit = 1 Theory period of one-hour duration per week, 1 Credit = 1 Tutorial period of one-hour duration per week, 1 Credit = 1 Practical period of two-hour duration per week
- **Each theory Lecture time for MSc is of 1 hour = 60 min**
- **Each practical session time for 4 credit course is of 8 hour = 480 min per week**
- **Each practical session time for 2 credit course is of 4 hour = 240 min per week**

Award of Credits:

- Each course having 4 credits shall be evaluated out of 100 marks and student should secure at least 40 marks to earn full credits of that course.
- Each course having 2 credits shall be evaluated out of 50 marks and student should secure at least 20 marks to earn full credits of that course.
- GPA shall be calculated based on the marks obtained in the respective subject provided that student should have obtained credits for that course.

Examination Pattern:

Four Credits:

Theory paper: Autonomous College/University Examination-70 marks (at the end of semester)

Internal Examination-30 marks

Practical course: Autonomous College/University Examination-70 marks (at the end of semester), Internal Examination-30 marks

Two Credits:

Theory paper: Autonomous College/University Examination-35 marks (at the end of semester)

Internal Examination-15 marks

Practical course: Autonomous College/University Examination-35 marks (at the end of semester) Internal Examination-15 marks

Theory examination for 4 Credits:

Theory examination will be of 3 hours' duration for each theory course of 4 credits. There shall be 5 questions and all are compulsory. Question 1 carries 10 marks and question 2 is short answer question for 20 marks, question 3 and 4 are long answer questions each question carries 10 marks and question 5 is short notes or short answer for 20 marks. The pattern of question papers shall be:

Question 1: Solve any 10 out of 12 sub-questions, each of 1 marks; answerable in 3-4 line and based on entire syllabus.

Question 2: Short answer type question 20 marks, solve any 4 out of 5/6 sub-question; answerable in 15-20 lines, 5 marks.

Question 3: Long answer type question 10 marks, solve any 1 out of 2 sub-question; answerable in 25-30 lines.

Question 4: Long answer type question, solve any 1 out of 2 sub-question; answerable in 25- 30 lines, 10 marks.

Question 5: Short notes/Short answer type question 20 marks, solve any 4 out of 5/6 sub-question; answerable in 15-20 lines, 5 marks.

Theory examination for 2 Credits:

Theory examination will be of 2 hours' duration for each theory course. There shall be 5 questions and all questions are compulsory. Question 1 carries 5 marks and from question 2 and 3 carries 12 marks and question 4 carries 6 marks. The pattern of question papers shall be:

Question 1: Solve any 5 out of 7 sub-questions, each of 1 marks; answerable in 2-4 line and based onentire syllabus.

Question 2: Short answer type questions 12 marks, Solve any three out of 5 sub-questions:; each of 4 marks; answerable in 12-15 lines and based onentire syllabus.

Question 3: Short note/Short answer type questions 12 marks, Solve any three out of 5 sub-questions; each of 4 marks; answerable in 12-15 lines and based on entire syllabus

Question 4: Solve any 1 out of 2 sub-questions: long answer type questions; each of 6 marks; answerable in 20-25 lines and based on entire syllabus.

Internal examination: Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test, 10/20 marks each term. The written test shall comprise of subjective type questions or objective type questions-Multiple Types Questions, True/False, Definitions, Tricky computational problems with minimum calculations.

Practical Examination: Practical examination shall be conducted at the end of the semester. Practical examination will be of minimum 4 hours' duration. There shall be minimum two experiments for the examination. Certified journal is compulsory to appear for practical examination. There shall be two experts and two examiners per batch for the practical examination.

Evaluation Pattern:

- Each course carrying 100 marks shall be evaluated with Continuous Assessment (CA) and Autonomous College Evaluation (ACE)/University Evaluation (UE) mechanism.

- Continuous assessment shall be of 30 marks while Autonomous College Evaluation/ University Evaluation (UE) shall be of 70 marks. To pass in a course, a student has to secure minimum 40 marks provided that he should secure minimum 28 marks in Autonomous College Evaluation (ACE).
- Each course carrying 50 marks shall be evaluated with Continuous Assessment (CA) and Autonomous College Evaluation (ACE)/University Evaluation (UE) mechanism.
- Continuous assessment shall be of 15 marks while Autonomous College Evaluation (ACE)/University Evaluation (UE) shall be of 35 marks. To pass in a course, a student has to secure minimum 20 marks provided that he/she should Secure minimum14 marks in Autonomous College Evaluation (ACE).
- For Internal examination minimum two tests per paper of which one has to be written test 10 marks
- Methods of assessment for Internal exams: Subjective/Objective written tests (comprehension/open book), Seminars, Viva-voce, Projects, Surveys, Field visits, Tutorials, Assignment, Group Discussion, etc. (on approval of the head of the centre)