Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/ Sci./College/NEP-2020/104/2024

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and rccommcnded by the Dean, Faculty of Science & Technolgy, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	Physics	Ist and IInd semester
2	Instrumentation Practice	Ist and IInd semester
3	Electronics	Ist and IInd semester
4	Mathematics	Ist and IInd semester
5	Industrial Chemistry	Ist and IInd semester
6	Agrochemical Fertilizer	Ist and IInd semester
7	Horticulture	Ist and IInd semester
8	Biochemistry	Ist and IInd semester
9	Botany	Ist and IInd semester
10	Zoology	Ist and IInd semester
11	Biotechnology	Ist and IInd semester
12	bioinformatics	Ist and IInd semester
13	Microbiology	Ist and IInd semester
14	Dairy Science & TEchnology	Ist and IInd semester
15	Statistics	Ist and IInd semester
16	computer Science	Ist and IInd semester
17	Geology	Ist and IInd semester
18	Chemistry	Ist and IInd semester
19	Analytical Chemistry	Ist and IInd semester
20.	Polymer Chemistry	Ist and IInd semester
21.	Environmental Science	Ist and IInd semester
22.	Fishery Science	Ist and IInd semester

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This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
REF.NO. SU/SCI./2024/27128-35
Date:-27.05.2024.

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Deputy Registrar,
Academic Section.

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

B.Sc. Degree Programme

(Three Year / Four Years (Hons) /Four Years (Hons with Research)

Course Structure and Syllabus for B.Sc. Ist Year

(Revised)

(AS PER NEP-2020)

Subject (Major): Agrochemicals and Fertilizers

Effective from 2024-25

Dr. M. A. Sakhare
Chairman
Ad-hoc Board in Agrochemicals
& Fertilizers and Horticulture
Dr.Babasaheb Ambedkar Marathwada
University, Chha.Sambhajinagar

PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

Subject (Major): Agrochemicals and Fertilizers

BSc First Year: 1st Semester

Course Type	Course Code	Course Name	Teaching Scheme Hrs./week		Credit Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	ACF/DSC-1	Organic Chemistry	2	-	2	-	2+2 = 04
	ACF/DSC- 2	Lab Course-1	-	4	-	2	
Major (Core) M2 Mandatory	DSC-1		2		2		2+2 = 04
	DSC-2	Practical based on DSC-1		4		2	
Major (Core) M3 Mandatory	DSC-1		2		2		2+2 = 04
	DSC-2	Practical based on DSC-1		4		2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	ACFGE/OE-1	To be chosen from other faculty	2	-	2	-	02
SEC (Skill Enhancement Courses) (Choose any one from pool of courses)	ACF/SEC-1	1. Water Analysis 2. Beverages Technology	1		1		02
	ACF/SEC-2	1. Practical on Water analysis 2. Practicals on Beverages Technology		2		1	
AEC,VEC,IKS Ability Enhancement Course	AEC-1	English	2	-	2	-	2+2=04
	IKS-1		2	-	2	-	
OJT,FP,CEP, CC,RP	CC-1	Health and wellness	-	4	-	2	02
			13	**18**	**13**	**09**	**22 Credits**

ACF/GE/OE-1 : **Introduction to Fertilizers**
(This course will be available for the students of other faculty)

BSc First Year: 2nd Semester

Course Type	Course Code	Course Name	Teaching Scheme Hrs./week		Credit Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	ACF/DSC-3	Soil Science	2	-	2	-	2+2 = 04
	ACF/DSC-4	Lab Course-2	-	4	-	2	
Major (Core) M2 Mandatory	DSC-3	----------	2		2		2+2 = 04
	DSC-4	Practical based on DSC-3		4		2	
Major (Core) M3 Mandatory	DSC-3	----------	2		2		2+2 = 04
	DSC-4	Practical based on DSC-3		4		2	
Generic / Open Elective (GE/OE) (Choose any two from pool of courses) **It should be chosen compulsorily from the faculty other than that of Major**	ACF/GE/OE-2	To be chosen from other faculty	2	-	2	-	02
VSC (Vocational Skill Courses) (Choose any one from pool of courses)	ACF/VSC-1	1.Soil analysis 2. Processing of milk and milk products	1		1		1+1 = 02
	ACF/VSC-2	1. Practicals on Soil Analysis 2. Practicals on Processing of milk and milk products		2		1	
AEC,VEC,IKS Ability Enhancement Course	AEC-2	English	2	-	2	-	2+2 = 04
	VEC-1	Constitution of India	2	-	2	-	
OJT,FP,CEP, CC,RP	CC-2	Yoga education/sports and fitness	-	4	-	2	02
			13	**18**	**13**	**09**	**22 Credits**
Exit Option : Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course / Internship OR continue with Major and Minor							

ACF/GE/OE-2 : **Pest and Pesticides**
(This course will be available for the students of other faculty)

Students will have to choose any three subjects as a **Major 1, Major 2, Major 3,** from Basket 1 under the Faculty of Science and Technology.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject **as a major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year).**

Detailed Illustration of Courses included in 1st and 2nd semester:

1) **Major** (Core) subject are mandatory.

DSC-1 : This is a 2 credit theory course corresponding to Major (core) subject
DSC-2 : This is a 2 credit practical course based on DSC-1
DSC-3 : This is a 2 credit theory course corresponding to Major (core) subject
DSC-4 : This is a 2 credit practical course based on DSC-3

2) **Generic / Open Elective (GE/OE)**: (Needs to be chosen (any one) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

GE/OE -1 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.
GE/OE -2 : This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

3) **SEC** (Skill Enhancement Courses) : Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

SEC-1 : This is a 1 credit theory course to enhance the technical skills of the students in specific area.
SEC-2 : This is a 1 credit practical course based on SEC-1.

4) VSC (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

VSC-1 : This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
VSC-2 : This is a 1 credit practical course based on VSC-1

5) **AEC** (Ability Enhancement courses): The focus of these courses should be based on linguistic and communication skills.

AEC-1 : English
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

AEC-2 : English
This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

6) **IKS** (Indian Knowledge System) : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

IKS-1 : To be chosen from the pool of courses designed by the University
This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty

7) **VEC** (Value Education Courses): The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

VEC-1 : Constitution of India
This is a 2 credit theory course based on value education. It will be common for all the faculty

8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Preforming Arts.

CC-1 : Health and Wellness
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

CC-2 : Yoga education / Sports and Fitness
This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty

General Guidelines for Course Selection

1) The Major subject is the discipline or course of main focus, bachelors degree shall be awarded in that discipline / subject.
2) Students will have to choose any three subjects as a Major 1, Major 2, Major 3, from **Basket 1** under the Faculty of Science and Technology (based on the available options in the respective college).
3) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
4) In the beginning of second year, students will have to select / declare choice of **one major subject** and **one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year)**
5) Once the students finalize their **Major Subject** and **Minor Subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
6) Students are required to select **Minor subject** from **other discipline of the same faculty**
7) Students are required to select **Generic /Open Elective** (vertical 3 in the credit framework) **compulsorily from the faculty different than that of their Major / Minor subjects**.
8) Vocational Skill Courses and Skill Enhancement Courses (VSC and SEC) shall be related to the Major subject
9) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

Programme Educational Objectives (PEOs) :

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge**: Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.

2. **Interdisciplinary Proficiency**: Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.

3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.

4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.

5. **Global Citizenship and Cultural Sensitivity**: Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

Programme Outcomes (POs) :

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.

- **PO2. Environment and sustainability**: Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.

- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.

- **PO4. Individual and team work:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.

- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **PO6. Project management and finance**: Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.

- **PO7. Life-long learning**: Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

Programme Specific Outcomes (PSOs):

On completion of the 03/04 years degree in Agrochemicals and Fertilizers students will be able to

POS 1: Develops a strong foundation in the fundamental concepts of agriculture.

POS 2: Work skilfully in agriculture industry and agro product business.

POS 3: Employ the different methods in crop cultivation.

POS 4: Students can have enough knowledge to pursue further study.

POS 5: Get exposed to strong theoretical and practical background in fundamental concepts of agrochemistry.

POS 6: Express ideas persuasively in written and oral form to develop their business abilities.

POS 7: Gained the theoretical as well as practical knowledge of formulations of agrochemicals

POS 8: Work as a farm advisor/ consultant in the field of soil science, pest management, agricultural technologies, crop cultivation, fertilizers etc.

B.Sc. First Year (Semester I)

ACF/DSE-1: Organic chemistry

Total Credits : 02 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To know the chemical reactivity of organometallic compound.
- To detect the elements present in unknown organic compounds.
- To provide the knowledge about preparation and properties of some heterocyclic compounds.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand some terms of organic chemistry.

CO 2 : Perform qualitative analysis of organic compounds.

CO 3 : Understand the synthesis and properties of organometallic compounds.

CO 4 : Understand synthesis and properties of some heterocyclic compounds.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Analysis of Organic compounds**	10
	1. Detection of elements: Carbon, Hydrogen, Nitrogen, Halogen & Sulphur. 2. Estimation of elements: I. Halogen by Carius method. II. Nitrogen by Kjeldahl method III. Sulphur by Carius methods 3. Determination of Empirical and molecular formula	
II	**Organo metallic compounds**	10
	Organometallic compounds: Introduction, Simple organo-metallics, Complex organometallics. Grignard reagent: preparation, reaction with water, aldehydes, ketones, carbon dioxide etc. Organolithium reagent: preparation, reaction with water, aldehydes, ketones etc. Organozinc reagent: preparation, reaction with water, acid chlorides etc.	
III	**Heterocyclic Compounds:**	10
	Introduction, classification of heterocyclic compounds containing one hetero atom. 1. Five membered heterocyclic compounds: Synthesis and chemical properties of Pyrrole, Furan & Thiophene 2. Six membered heterocyclic compounds: Synthesis and chemical properties of Pyridine, Quinoline & Isoquinoline.	

Books Recommended:

1. Advanced Practical Organic Chemistry by Jagdamba Singh
2. Advanced Organic Chemistry by B.S. Bahl and Arun Bahl
3. Organic chemistry by Jonathon clyden, Nick Greeves, Stuart Warren
4. Advanced Practical Organic Chemistry by N.K. Vishnoi
5. Comprehensive Practical Organic chemistry: Qualitative Analysis by V. K. Ahluwaliya, Sunita Dhingra
6. Advanced Practical Organic Chemistry by N.K. Vishnoi
7. Organometallic and Reagent Chemistry by Dr. Srijit, Dr. Subhra mishra

B.Sc. First Year (Semester I)

ACF/DSE-2: Laboratory course-I

Total Credits : 02 (4 Hours per week)

Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge and practical skills of organic qualitative analysis.
- To provide skill of determination of pH of soil and water sample and its importance.
- To develop practical skills and techniques for measuring the viscosity of liquids, surface tension of liquid, conductance of soil and water sample.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the fundamental and experimental concept of organic qualitative analysis.

CO 2 : Measure the pH of soil and water sample.

CO 3 : Identify the name and properties of unknown organic compound.

CO 4 : Synthesis of various derivatives of organic compounds.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	1. Identification of Organic compounds (any five) that includes, i. Preliminary tests. ii. Nature of organic compounds iii. Element Detection iv. Functional groups v. Physical constant 2. Estimation of available chlorine in the given sample of bleaching powder. 3. Determination of molecular weight of organic acid. 4. Determination of acid value of soil sample 6. Determination of pH of given soil sample. 7. Determination of pH of given water sample. 8. To prepare acetanilide from aniline by acetylation method. 9. To prepare benzanilide from aniline by benzoylation. 10. To prepare m-dinitrobenzene from nitrobenzene.	60

Books Recommended:

1. Practical physical chemistry by Chondekar and Rajbhoj
2. Practical organic chemistry by A.I. Vogel
3. Advanced practical inorganic chemistry by Gurdeepraj
4. A Handbook on soil Analysis by Rishikesh Thakur, Atul kumar Shrivastava, G.D. Sharma, B.S. Dwivedi
5. Soil Science: P. S. Varma and V. K. Agarwal.

B.Sc. First Year (Semester I)

ACF/SEC- 1 A: Water Analysis

Total Credits : 01
(1 Hours per week)

Total Contact Hours : 15 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge of importance of water analysis.
- To know the important water quality parameters and its determination methods.
- To inculcate the skill of water analysis.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Aware about water constituent parameters and its adverse effect on human body.

CO 2 : Understand the methods of determination of hardness of water.

CO 3 : Learn the determination of various components of water.

CO 4 : Aware the peoples about water analysis and its benefits.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Water Testing**	15
	1. Chemistry of water, physical and chemical properties, water resources. water pollutions, important water quality parameters and methods for their determination- turbidity, colour, odour, taste, pH, electrical conductance, acidity, alkalinity, 2. Chemical water quality parameters, hardness, BOD, COD, bacteria test, mineral etc. Significance of Water testing, factors affecting water quality, constituent's parameters and its effects. 3. Standards for drinking water as per BIS specification, Household water treatment and safe storage, Exchangeable sodium percentage.	

Books Recommended:

1) Experimental methods for Water analysis - G. S. Wagh.
2) Hand book of water and wastewater analysis – Kanwaljit Kaur.
3) Handbook of Water Analysis by Leo M.L. Nollet, Leen S. P. De Gelder.
4) Water Quality Analysis And Treatment by Dr. Saima Khan, Dr. Abdul Rehman Khan.
5) Water-Analysis: A Handbook for Water-Drinkers by G. L. Austin.
6) Methods of Soil & Water Analysis by Shashi S. Yadav, P.A. Khamalkar,S.K. Varma, Akhilesh Singh.
7) Water Quality Concepts, Sampling, and Analyses (1st Edition) by Yuncong Li, Kati Migliaccio

B.Sc. First Year (Semester I)

ACF/SEC- 1 B: Beverages Technology

Total Credits : 01 (1 Hours per week)

Total Contact Hours : 15 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge of beverage technology.
- To provide a technical view of beverages.
- To provide a discussion of manufacturing processes of beverages.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Able to produce various types of beverage.

CO 2 : Understand the formation methods of juice based and alcoholic beverage.

CO 3 : Learn the process of various beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy-based beverages.

CO 4 : Starts juice centre /cafe and to do job in beverage industry.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Beverages Technology**	15
	1. Types of beverages and their importance; status of beverage industry in India; Manufacturing technology for juice-based beverages; dry beverages; role of various ingredients of soft drinks, carbonation of soft drinks. 2. Specialty beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy-based beverages. 3. Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, technology of brewing process, equipment's used for brewing and distillation, wine and related beverages, distilled spirits.	

Books Recommended:

1) Beverages: Processing and Technology by Deepak Mudgil & Sheweta Mudgil
2) Innovative Technologies in Beverage Processing by
3) Chemistry and Technology of Soft Drinks and Fruit Juices, 3rd Edition by Philip R. Ashurst
4) Beverages Technology by Umesh Kumar
5) Food and Beverage Service by John Cousins & Suzanne Weekes
6) Fermented Foods And Beverages Technology by Ravindra A., Srinivas Maloo, Fr. Dr. S. Emmanuel S. J.
7) The Complete Technology Book on Alcoholic and Non- Alcoholic Beverages(Fruit Juices, Whisky, Beer, Rum and Wine) by NPCS Board of Consultants & Engineers.

B.Sc. First Year (Semester I)

ACF/SEC-2 A : Practicals on Water Analysis

Total Credits : 01 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide practical knowledge of water analysis.
- To know the quality parameters and its determination methods.
- To inculcate the skill of water analysis techniques.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Able to do job as water analyst.

CO 2 : Understand the methods of determination of TDS, BOD, COD of water.

CO 3 : Learn the determination of various components of water.

CO 4 : Starts self-business in water testing services.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Practicals**	30
	1. Collect the different types of water samples. 2. Determination of pH of collected water samples by pH metrically. 3. Determination of Conductance of collected water samples by conductometrically. 4. To estimate Total hardness of water sample by EDTA solution. 5. Determine TDS of water sample by TDS meter. 6. Estimation of soluble Chlorine in water sample. 7. Estimation of dissolved oxygen in a water sample. 8. Estimation of soluble sulphates in a water sample. 9. Estimation of soluble Nitrates in a water sample. 10. Determination of BOD and COD of a polluted water sample. 11. Identification of pesticides in pesticide residues.	

Books Recommended:

1) Hand book of water and wastewater analysis – Kanwaljit Kaur.
2) Experimental methods for Water analysis - G. S. Wagh.
3) Water Quality Analysis And Treatment by Dr. Saima Khan, Dr. Abdul Rehman Khan.
4) Handbook of Water Analysis by Leo M.L. Nollet, Leen S. P. De Gelder.
5) Water-Analysis: A Handbook for Water-Drinkers by G. L. Austin.
6) Water Quality Concepts, Sampling, and Analyses (1st Edition) by Yuncong Li, Kati Migliaccio
7) Methods of Soil & Water Analysis by Shashi S. Yadav, P.A. Khamalkar,S.K. Varma, Akhilesh Singh.

B.Sc. First Year (Semester I)

ACF/ SEC-2 B : Practicals on Beverages Technology

Total Credits : 01 (2 Hours per week) | Total Contact Hours : 30 Hrs | Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge of beverage technology.
- To provide a technical view of beverages.
- To provide a discussion of manufacturing processes of beverages.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Able to produce various types of beverage and do job in beverage industry.

CO 2 : Understand the formation methods of juice based and alcoholic beverage.

CO 3 : Learn the process of various beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy-based beverages.

CO 4 : Starts juice centre /cafe and to do job in beverage industry.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Practicals**	30
	1. Moisture Content- Lab Oven Method. 2. Chemical and microbiological analysis of raw water quality; 3. Preparation of regional fruit juices; 4. Preparation of whey-based beverages; 5. preparation of iced and flavoured tea beverage; 6. Preparation of carbonated and noncarbonated soft drinks; 7. Preparation of soy milk, fruit milkshakes, herbal beverages. 8. Detection of adulterants in different food products 9. Visit to dairy processing units. 10. Visit to fruit juice processing units. 11. Visit to alcoholic processing units.	

Books Recommended:

1) Food and Beverage: A Practical Guide Paperback by Edgar D'Souza
2) Beverages Technology by Umesh Kumar
3) Beverages: Processing and Technology by Deepak Mudgil & Sheweta Mudgil
4) Innovative Technologies in Beverage Processing by
5) Chemistry and Technology of Soft Drinks and Fruit Juices, 3rd Edition by Philip R. Ashurst
6) Food and Beverage Service by John Cousins & Suzanne Weekes
7) Fermented Foods And Beverages Technology by Ravindra A., Srinivas Maloo, Fr. Dr. S. Emmanuel S. J.
8) The Complete Technology Book on Alcoholic and Non- Alcoholic Beverages(Fruit Juices, Whisky, Beer, Rum and Wine) by NPCS Board of Consultants & Engineers.

B.Sc. First Year (Semester I)

ACF/GE/OE- 1 : Introduction to Fertilizers

(This course will be available for the students from other faculty)

Total Credits : 02 (2 Hours per week)

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Learning objectives of the course:

- To provide the information of fertilizers and its role on plant growth.
- To know about advantages and disadvantages of inorganic and organic fertilizers.
- To aware about advantages and disadvantages of types of biofertilizers.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : know the advantages and disadvantages of different types of fertilisers.

CO 2 : Understand types of fertilizers and its role on plant growth.

CO 3 : learn fertilizers requirements based on soil test reports.

CO 4 : Apply the fertilizers as per crop requirement.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction of Fertilizers**	10
	Introduction, classification, composition of fertilizers, advantages and disadvantages of fertilizers, application of fertilizers, Essential elements and their role in plant growth, calculating fertilizers requirements based on soil test reports, soil amendments. micronutrient fertilizers, complex fertilizers, nano fertilizers	
II	**Inorganic and Organic Fertilizers**	10
	Inorganic Fertilizers: Classification- Straight, Complex and Mixed fertilizers, chemical composition, timing and methods of application, Characteristics of Nitrogen fertilizers, Phosphorous fertilizers and Potassium fertilizers. Mixed Fertilizers: Properties, advantages and disadvantages. Organic Fertilizer- definition, Source, importance	
III	**Bio fertilizers**	10
	Definition, Application, Classification, Bacterial Biofertilizers: Rhizobium, Phosphobacteria Azobacteria, Azospirillium. Fungal biofertilizers: Mycorrhiza, Algal bio fertilizers: Blue green algae, Azolla. advantages and disadvantages of biofertlizers,	

Books Recommended:

1. Manures and fertilizers Das P. C., Rept. 2015, Kalyani Publishers Pvt. Ltd., New Delhi
2. Practical manual for Agril. Chemistry Gupta A. K. and Varshney M. L., Kalyani Publishers Pvt. Ltd., New Delhi
3. Soil Fertility Management Nagornny V. D. and Raghav J. S. Rept. 2015, Kalyani Publishers Pvt. Ltd., New Delhi.
4. Fertilizers: Properties, Application and Effect, R. Langdon, Elsworth, Paley, W.O. Nova Science Pub 2008.

B.Sc. First Year (Semester II)

ACF/DSC-3 : Soil Science

Total Credits : 02 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To describes the importance of soil and properties of soil.
- To learn the fertility of soil and their effect on productivity
- To know the soil physical properties and their importance in soil fertility

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Get the knowledge of soil and its importance.

CO 2 : Understand the soil science, soil fertility management.

CO 3 : Aware about soil productivity and soil conservation.

CO 4 : Provide counselling regarding importance of soil testing to the farmers.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction of Soil:**	10
	Definition of soil, classification, Properties and composition of soil. Rock, Minerals & weathering: Definition of rocks & minerals, Classification and properties of rocks & minerals. Definition of weathering, types of weathering, factors responsible for weathering.	
II	**Soil profile and Physico-Chemical properties of soil**	10
	Definition, Soil Horizon and typical diagram of soil profile, types of soil horizon, Soil Components. **Physical properties** : Soil texture and mechanical analysis of soil, Soil colour, Soil density and porosity, Soil structure, Soil temperature, Soil aeration, Soil Consistency **Chemical properties**: pH (soil reaction), Cation exchange Capacity, Humus content, Clay mineral present. Organic matter in Soil	
III	**Soil fertility, productivity and Soil Conservation**:	10
	Definition, Comparison between fertility and productivity and factors affecting them, Management of soil productivity. Soil Conservation: Definition, importance, methods of soil conservation in agriculture	

Books Recommended:

1. Fundamental of Soil Science: Forth and Turk.
2. Principles of Soil Science: M. M. Rai.
3. Nature and properties of Soil: Bookmann and Brady
4. A text book of soil science: Dr. J. A. Daji.
5. Soil fertility and fertilizer: Tisdle and Nelson
6. Soil Science: P. S. Varma and V. K. Agarwal.
7. Soil fertility: Theory and Practice by J. S. Kanwar
8. Dictionary of Soil and water management by J. R. Kadam, B. P. Ghildyal

B.Sc. First Year (Semester II)

ACF/DSC- 4 : Lab Course-2

Total Credits : 02
(4 Hours per week)

Total Contact Hours : 60 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To know the methods of collection of soil sample from field.
- To identify the pH, pOH of soil.
- To develop the practical skill of soil analysis in students.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Learn the practical skill of soil analysis

CO 2 : Helps in understanding the soil profile.

CO 3 : Determine the available organic matter in soil.

CO 4 : Starts their self-employment in water testing services

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Practical's**	60
	1. Method of collection of soil sample. 2. Preparation and preservation of soil sample in laboratory. 3. Study of soil Augers and collection of soil sample with the help of the Augers. 4. To determination of water holding capacity of soil. 5. To determine the moisture and pH of soil by using soil pH and moisture tester. 6. Identify the texture of the soil. 7. Determine the bulk density of the soil. 8. Visit to soil testing laboratory and write report on visit 9. Determination of organic carbon from organic manure (Compost / FYM / Oil cake) by ignition method. 10. Determination of exchangeable Ca & Mg in soil by EDTA method. 11. Estimation of available sulphur by turbidity method. 12. To determine percentage expansion of soil collides. 13. Determination of percentage organic matter content in a soil sample.	

Books Recommended:

1. Soil Testing and Analysis by S.R. Vinodkumar, G.Murugan, R. Rex Immanuel, K. Krishnaprabhu
2. A Handbook on soil Analysis by Rishikesh Thakur, Atul kumar Shrivastava, G.D. Sharma, B.S. Dwivedi
3. Soil Science: P. S. Varma and V. K. Agarwal.
4. Nature and properties of Soil: Bookmann and Brady
5. A text book of soil science: Dr. J. A. Daji.

B.Sc. First Year (Semester II)

ACF/VSC-1 A : Soil Analysis

Total Credits : 01 (01 Hours per week)

Total Contact Hours : 15 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge about significance of soil testing.
- To inculcate the knowledge of soil health card.
- To develop technical report writing skills.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the importance of soil testing.

CO 2 : Select the appropriate fertiliser on the basis of soil testing report.

CO 3 : Understand importance soil health card.

CO 4 : Starts self-employment in soil testing services to the farmers.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Soil Testing**	**10**
	Introduction: Types of Soil and Nutrients, Soil test, Significance of soil testing. **Physical and chemical analysis:** Soil sampling and its procedure. Soil testing kits and its applications, soil physical analysis, Soil pH and EC determination. Determination of Micro and Macro nutrients in soil, Cation exchange capacity, Reclamation of soil.	
II	**Soil Health Card.**	**05**
	Essential nutrients and their analysis. Management of fertilisers and Micronutrients. Soil amendment and integrated nutrients management. Soil health card portal management	

Books Recommended:

1. Soil Testing and Analysis by S.R. Vinodkumar, G.Murugan, R. Rex Immanuel, K. Krishnaprabhu
2. Practical manual for Soil, Plant, Water and Seed Testing by P. Gurumurthy, B. Santosh, C. Yasmeen, Dr. Sudhakarrao
3. Soil testing, Soil Stability and ground improvement by Wissem Frikha, Serge Varaksin,
4. Soil Science: P. S. Varma and V. K. Agarwal.
5. A Handbook on soil Analysis by Rishikesh Thakur, Atul kumar Shrivastava, G.D. Sharma, B.S. Dwivedi

B.Sc. First Year (Semester II)

ACF/VSC-1 B : Processing of Milk and Milk Products

Total Credits : 01 (1 Hours per week)

Total Contact Hours : 15 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge about milk processing.
- To inculcate the knowledge about importance of milk processing unit.
- To provide knowledge about technical skills of milk product processing.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the importance of milk product processing.

CO 2 : Understand technical skill of different milk product processing.

CO 3 : Dairy plant sanitation and waste disposal.

CO 4 : Produce different types of quality milk products.

CO 5: Stat self-business in milk products and to do jobs in milk processing units.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Processing of Milk and Milk Products**	15
	1. Milk and milk products in India; Importance of milk processing plant in the country 2. Handling and maintenance of dairy plant equipment. Dairy plant operations viz. receiving, separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk 3. Technology of fermented milks (starter culture, dahi, yoghurt, shrikhand); Milk products processing viz. cream, butter, ghee, cheese, condensed milk, evaporated milk, whole and skimmed milk powder 4. Ice-cream, butter oil, khoa, channa, paneer and similar products 5. Judging and grading of milk products 6. Cheese spreads by spray and roller drying techniques 7. Insanitization viz. selection and use of dairy cleaner and sanitizer 8. Scope and functioning of milk supply schemes and various national and international organizations 9. Specifications and standards in milk processing industry 10. Dairy plant sanitation and waste disposal	

Books Recommended:

1. Dairy Chemistry and Animal Nutrition – M.M. Roy.
2. Text book of Practical Dairy Chemistry – N.K. Roy.
3. Fundamentals of Dairy Chemistry – Webb Johnson and Alfred.
4. A text book of Dairy Chemistry – Ling, E.R.
5. Dairy processing handbook – Gosta Bylund.
6. Outlines of Dairy Technology – Sukumar De.
7. Milk products preparation and quality control – C.P. Ananthakrishnan.
8. The technology of milk processing – C.P. Ananthakrishnan.
9. Modern Dairy products – Lincoln M. Lamp

B.Sc. First Year (Semester II)

ACF/VSC-2 A : Practicals on Soil Analysis

Total Credits : 01 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide practical knowledge of nutrient present in soil.
- To inculcate the skill of soil testing.
- To develop technical report writing skills.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the importance of soil testing.

CO 2 : Select the appropriate fertiliser on the basis of soil testing report.

CO 3 : Understand importance of micro and macro nutrients in soil.

CO 4 : Analyse the soil by using soil testing kit.

CO 5 : Start their self-business in soil testing for farmers.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Practical's**	30
	1. Collect the different types of soil and their nutrient enrichments. 2. Determine the N, P, K, Zn, S, B, Fe, Mn, pH, lime, Gypsum present in soil by soil testing kit. 3. Identify the texture of the soil and determine the bulk density of the soil. 4. Determine the moisture content by gravimetric method. 5. Estimate the pH and EC of the soil. 6. Determination of total available nitrogen in a soil sample. 7. Determination of available sulphur in a soil sample. 8. Determination of available phosphorus in a soil sample. 9. Determination of percentage organic matter content in a soil sample.	

Books Recommended:

1. Soil Testing and Analysis by S.R. Vinodkumar, G.Murugan, R. Rex Immanuel, K. Krishnaprabhu
2. Practical manual for Soil, Plant, Water and Seed Testing by P. Gurumurthy, B. Santosh, C. Yasmeen, Dr. Sudhakarrao
3. Soil testing, Soil Stability and ground improvement by Wissem Frikha, Serge Varaksin,
4. Soil Science: P. S. Varma and V. K. Agarwal.
5. A Handbook on soil Analysis by Rishikesh Thakur, Atul kumar Shrivastava, G.D. Sharma, B.S. Dwivedi

B.Sc. First Year (Semester II)

ACF/VSC-2 B : Practicals on Processing of Milk and Milk Products

Total Credits : 01 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide skills of sampling of milk and milk production.
- To determine fat contents in milk and adulterants in milk and milk products.
- To visit modern milk processing and milk manufacturing plants for getting the knowledge about industry.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the skills of milk processing.

CO 2 : Understand technical skill of different milk product processing.

CO 3 : Detect the fat content in milk, adulterants in milk and milk products and standardization of milk

CO 4 : Open own milk processing business or unit and to do jobs in milk processing unit.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Practical's**	30
	1. Sampling of milk and milk production. 2. Platform tests cream separation. 3. Determination of fat content of milk. 4. Detection of adulterants in milk and milk products. 5. Standardization of milk. 6. Heat processing of milk – Pasteurization. 7. Preparation of milk products like curd, paneer/channa, khoa, ice-cream, milk beverages. 8. Preparation of butter. 9. Preparation of ghee. 10. Microbiological quality evaluation of milk and milk products. 11. Visit to modern milk processing and milk manufacturing plants.	

Books Recommended:

1. Dairy Chemistry and Animal Nutrition – M.M. Roy.
2. Text book of Practical Dairy Chemistry – N.K. Roy.
3. Fundamentals of Dairy Chemistry – Webb Johnson and Alfred.
4. Dairy Chemistry and Physics – Pieter Walstra and Robert Jenner.
5. Dairy processing handbook – Gosta Bylund.
6. Outlines of Dairy Technology – Sukumar De.
7. Milk products preparation and quality control – C.P. Ananthakrishnan.
8. The technology of milk processing – C.P. Ananthakrishnan.
9. Modern Dairy products – Lincoln M. Lamp

B.Sc. First Year (Semester II)

ACF/GE/OE-02 : Pest and Pesticides

(This course will be available for the students from other faculty)

Total Credits : 02 (2 Hours per week)

Total Contact Hours : 30 Hrs
Maximum Marks : 50

Learning objectives of the course:

- To provide knowledge about different types of pest.
- To provide knowledge of the pesticides and bio pesticides and its effects.
- To understand the damages caused by pests and their control measures.

Course Outcome (COs): After completion of the course, students will be able to -

CO 1 : Understand the concept of pesticides and their classification based on chemical nature.

CO 2 : Get knowledge about negative effects of chemical pesticides on environments and safety with pesticides, first aids and antidotes.

CO 3 : Analyse the prevention and control measures of pests using pesticides.

CO 4 : Aware about pesticides and its adverse effects.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Pests:**	10
	Definition, introduction, classification of pest, concept of insect pest-definition, life cycle, Non insect pests- introduction, weeds, bacteria, birds, mites, nematodes, arthropods, plant pathogens, bacteria, viruses, fungi.	
II	**Introduction of pesticides**	10
	Chemical and biological pesticides, classification of pesticides based on nature and type of target, Systematic and Nonsystematic pesticides, Effect of pesticides: pesticide residue, Toxicity, warning symbols, safety with pesticides, first aids and antidotes.	
III	**Bio pesticides**:	10
	botanical and bio-organism: azadirachtin and its role in pest management, use of predators (lady bird beetle crysopa) and parasite (trichogramma) in pest management, pathogens in disease insect pest management (bacillus thuringiensis, NPV)	

Books Recommended:

1. Chemistry of Pesticides (English) Springer by N.N. Melnikov
2. Chemical for crop Improvement and Pest Management by M.B. Green, G.S. Hartley, T.F. West
3. Principles of Pesticides Chemistry by S.K. Handa
4. Chemistry of Pesticides by K.H. Buchel
5. Management insects Pest of Horticultural crop by H.C. L. Gupta, O.P. Ameta