SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Hons) Chemistry

DETAILED CURRICULUM

(W.E.F. 2024-25)

Credit Framework for Four Years Undergraduate Program (As per KCG SOP)

Faculty of Science, Sarvajanik University

Semester	Major						Minor		Skill Enhancement		Ability Enhancement		Multidiscipl.		Value Added		Total Credits
	Major No. of Papers	Theory		Lab		Total Major Credits											
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits		No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	
1	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
2	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
3	3	3+3+3	3+3+3	2+2+2	1+1+1	12	0	0	1	2	1	2	1	4	1	2	22
4	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	1	2	1	2			1	2	22
5	3	3+3+3	3+3+3	2+2+2	1+1+1	12	2	8	1	2							22
6	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	Intrnsp	4	1	2					22
Total after 3y	**16**					**64**	**6**	**24**	**5+I**	**10+4**	**5**	**10**	**3**	**12**	**4**	**8**	**132**
7 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
8 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
7 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
8 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
Total after 4y	**24/22**					**96/88**	**8**	**32**	**7+I**	**18/26**	**5**	**10**	**3**	**12**	**4**	**8**	**176**

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

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Faculty of Science

B. Sc. (Honors) Programmes

(Teaching and Evaluation Schemes)

(W.E.F. 2024-25)

Teaching Scheme for B.Sc. (Hons) Semester 1, 2, 3 and 4 (Applied Sciences)						
Semester	**Course Category**	**Credits**	**Theory (Hrs/Week)**	**Theory (Total)**	**Laboratory (Hrs/Week)**	**Laboratory (Total)**
1	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	**22**	**19**	**285**	**6**	**90**
2	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	**22**	**19**	**285**	**6**	**90**
3	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	**22**	**19**	**285**	**6**	**90**
4	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Total	**22**	**18**	**270**	**8**	**120**

Evaluation Scheme for B.Sc. (Hons) Semester 1, 2, 3 and 4							
Semester	**Course Category**	**Continuous and Comprehensive Evaluation (CCE)**			**Total CCE**	**Semester End Examination (SEE)**	**Grand Total**
		CCE	**Assignments**	**Attendance**			
1	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
2	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
3	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
4	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Honors) Programmes

(W.E.F. 2024-25)

Majors

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Introduction:

These programmes are an exploration into the science that directly affects us all on a daily basis, and that will enhance its significance to the overall environment. Students will be introduced to the scientific study of our environment, as well as the technological, social, political and economic challenges required for the understanding and critical examination of related issues.

Some important features of the programmes are as below:

1. B. Sc. Honors Programmes will run on a Choice Based Credit System as per NEP 2020.
2. These programmes will run on the Semester system and each Semester will be of fifteen (15) weeks.
3. Whole programme will be of four years (Eight Semesters).
4. There will be two options for the students for the fourth year, (a) with Honors (b) with Honors (Research).
5. Overall credit structure for these programmes will be Annexure-I.
6. Proposed Teaching and Examination Scheme will be as per Annexure-II.
7. Syllabus of B. Sc. Honors program will be as per Annexure-III.
8. Examination system and passing standards will be as per Sarvajanik University and UGC-NEP norms **(W.E.F. 2024-25)**.

Objectives of programmes:

1. To make students aware about how science and the scientific method address current issues.
2. To empower students through skill development and progressive learning for entrepreneurship development.
3. To provide knowledge and skills on sustainability, interactions between humans and Earth's natural systems i.e. energy generation and usage, resource consumption and economics, food production, agriculture, health and clinical sciences, industrial and pharmaceutical research and manufacturing.

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Evaluation Scheme for B.Sc. (Hons) Semester 1, 2, 3 and 4 (WEF 2024)							
Semester	**Course Category**	**Continuous and Comprehensive Evaluation (CCE)**			**Total CCE**	**Semester End Examination (SEE)**	**Grand Total**
		CCE	**Assignments**	**Attendance**			
1	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
2	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
3	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
4	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Paper No	Semester	Titles of Major Courses			
		Biotechnology	**Environmental Science**	**Microbiology**	**Chemistry**
1	1	*Foundation Major in Applied Sciences 1*			
2		*Foundation Major in Applied Sciences 2*			
3	2	*Foundation Major in Applied Sciences 3*			
4		*Foundation Major in Applied Sciences 4*			
5	3	Prokaryotic and Eukaryotic Cell Structure	Prokaryotic and Eukaryotic Cell Structure	Prokaryotic and Eukaryotic Cell Structure	Organic Chemistry-1
6		Growth and Control of Microorganisms	Ecology and Ecosystem Services	Nutrition and Growth of Bacteria	Inorganic Chemistry-1
7		Biochemistry and Enzymology	Biochemistry and Enzymology	Biochemistry and Enzymology	Biochemistry and Enzymology
8	4	Taxonomy of Microbes, Plants and Animals	Taxonomy of Microbes, Plants and Animals	Control of Microorganisms	Physical Chemistry-1
9		Plant Anatomy and Physiology	Industrial Chemicals and Environment	Microbial Diversity	Industrial Chemicals and Environment
10		Applied Environmental Microbiology	Applied Environmental Microbiology	Applied Environmental Microbiology	Organic Chemistry-2
11	5	Animal Physiology and Immunology	Green Chemistry	Basics of Immunology	Green Chemistry
12		Environmental Biotechnology	Environmental Biotechnology	Industrial Microbiology	Inorganic chemistry-2
13		Molecular Biology	Atmosphere and Climate	Molecular Biology	Physical chemistry-2
14	6	Microbial Physiology and Metabolism	Ecoinformatics	Microbial Physiology and Metabolism	Organic chemistry-3
15		Animal and Plant Biotechnology	Pollution Chemistry and Management	Medical Microbiology	Pollution Chemistry and Management
16		rDNA Technology	Ecotourism and Entrepreneurship	rDNA Technology	Petrochemistry
17	7	Biotechnology Research: DNA Sequencing and Omics	Ecotoxicology	Microbial Technology	Chemistry of drugs & dyes
18		Biotechnology Business: Vaccine Manufacturing	Environmental Law	Advances In Virology	Inorganic chemistry-3
19		Biotechnology Business: IVF and ART	Disaster Management	Molecular Immunology	Polymer chemistry
20		Dairy Technology	Formulation and Synthesis of Chemicals	Enzyme Technology and Protein Engineering	Formulation and Synthesis of Chemicals

21	8	Biotechnology Business: CRO and CMDO	Environmental Statistics	Microbial Pathogenicity	Physical chemistry-3
22		Biotechnology Business: Aquaculture and Livestock Biotechnology	Sustainable Development	Pharmaceutical Microbiology	Organic chemistry-4
23		Biotechnology Business: Cancer Diagnosis and Therapy	Waste Management	Microbial Ecology & Agriculture Microbiology	Food & Dairy chemistry
24		Food Technology	Food Technology	Genomics & Proteomics	Agricultural chemistry

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Credit Framework for Four Years Undergraduate Program (As per KCG SOP) (W.E.F. 2024)																	
Faculty of Science, Sarvajanik University																	
Semester	Major						Minor		Skill Enhancement		Ability Enhancement		Multidiscipl		Value Added		Total Credits
	Major No. of Papers	Theory		Lab		Total Major Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers		No. of Papers	Credits	
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits												
1	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
2	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
3	3	3+3+3	3+3+3	2+2+2	1+1+1	12	0	0	1	2	1	2	1	4	1	2	22
4	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	1	2	1	2			1	2	22
5	3	3+3+3	3+3+3	2+2+2	1+1+1	12	2	8	1	2							22
6	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	Intrnsp	4	1	2					22
Total after 3y	**16**					**64**	**6**	**24**	**5+I**	**10+4**	**5**	**10**	**3**	**12**	**4**	**8**	**132**
7 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
8 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
7 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
8 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
Total after 4y	**24/22**					**96/88**	**8**	**32**	**7+I**	**18/26**	**5**	**10**	**3**	**12**	**4**	**8**	**176**

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Honors) Programmes

(PACK OF MINORS OFFERED WITH MAJOR COURSES)

(W.E.F. 2024-25)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Introduction:

Minor courses are designed in such a way that students will get the opportunity to study in depth specialization along with their chosen Major Courses with an interdisciplinary approach that will enhance their vocational skills and will lead to the overall development of students. Minor packs are designed to reflect upon some of the needs of the society and satisfies the willingness of the students to learn new and advanced applications in addition to their Major course.

Some important features of the Minor packs are as below:

1. Minor courses are offered from the first year onwards to all 4 years (8 semesters).
2. First two semesters are introductory in nature and common paper for all students.
3. From the third semester onwards, students have to select one of the packs of the minor courses.
4. Overall credit structure and titles of minor packs will be as per Annexure-I and II.
5. Syllabus of minors pack will be as per Annexure-III.
6. Examination system and passing standards will be as per Sarvajanik University and UGC-NEP norms **(W.E.F. 2024-25)**.

Objectives of Minor packs:

1. To make students aware about the interdisciplinary approaches in sciences.
2. To empower students with vocational skills related to new horizons for entrepreneurship development.
3. To nurture the culture of innovative ideas as per the needs of society and overall upliftment of a student's career.

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Sem.	Paper No	Minor Pack 1	Minor Pack 2	Minor Pack 3	Difficulty Level
		Agriculture and Forestry	**Analytical Chemistry and Instrumentation**	**Forensic Science**	
1	1	**Foundation Minor in Applied Sciences 1**			Foundation
2	2	**Foundation Minor in Applied Sciences 2**			Foundation
4	3	Fundamentals of Agroforestry	Analytical chemistry-I	Criminalistics-1	Intermediate
5	4	Fundamentals of Horticulture	Analytical chemistry-II	Criminalistics-2	Intermediate
	5	Ethnobotany	Applied Analytical Techniques	Forensic Chemistry	Higher
6	6	Forest and Agriculture Pathology	Instrumentation Techniques of Analysis	Forensic Biology and Environmental Forensics	Higher
7	7	Agriculture Management	Advanced Analytical Chemistry	DNA Typing	Advanced
8	8	Forest and Wildlife Management	Modern Instrumentation for Analysis	Forensic Toxicology	Advanced

Sem.	Paper No	Minor Pack 4	Minor Pack 5	Minor Pack 6	Difficulty Level
		Industrial Fermentation Technology	**Industrial Safety and Occupational Health**	**Medical Laboratory Technology**	
1	1	**Foundation Minor in Applied Sciences 1**			Foundation
2	2	**Foundation Minor in Applied Sciences 2**			Foundation
4	3	Introduction to Industrial Fermentation Processes	Fundamentals of Industrial Safety	Introduction to Clinical Laboratories and GLP	Intermediate
5	4	Concept of Fermentation Technology	Safety in Industries	Introduction to Clinical Pathology and Histopathology	Intermediate
	5	Screening and Improvement of Microorganisms	Environment and Safety	Basics of Clinical Biochemistry	Higher
6	6	Fermenter Design and Downstream Processing	Occupational Health and safety	Diagnostic Microbiology and Serology	Higher
7	7	Bioprocess Engineering-I	Fire Safety and Audit	Molecular Diagnosis and Cytogenetics	Advanced
8	8	Bioprocess Engineering-II	Industrial Disaster and Safety Measures	Clinical Laboratory Management	Advanced

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Honors) Programmes

(SKILL ENHANCEMENT COURSES)

(W.E.F. 2024-25)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Sarvajanik University	
Faculty of Science	
AY 2024-25: List of Skill Enhancement Courses (Applied Sciences)	
Semester	**Title**
1	Arogya Mitra
1	Soap and Detergent Making
2	Dairy Farmer
2	Florist
3	Mushroom Cultivation Technology
3	Economical Arthropods
4	Forest Mensuration

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Honors) Programmes

(VALUE ADDED COURSES)

(W.E.F. 2024-25)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Sarvajanik University	
Faculty of Science	
AY 2024-25: List of Value Added Courses	
Semester	**Titles**
1	Indian Knowledge Systems (Foundation)
2	Indian Knowledge Systems (Chemistry)
	Indian Knowledge Systems (Health Science)
	Indian Knowledge Systems (Antiquity of Bharat)
3	Indian Knowledge Systems (Temple Architecture and Design)
	Indian Knowledge Systems (Gananshastra)
4	Indian Knowledge Systems (Parampara : Sustainable Practices of Bharat)
	Indian Knowledge Systems (Vedic Microbiology)
	Indian Knowledge Systems (Tark evam Krutrim Buddhimata)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty of Science

B. Sc. (Honors) Programmes

(ABILITY ENHANCEMENT COURSES)

(W.E.F. 2024-25)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Sarvajanik University	
Faculty of Science	
AY 2024-25: List of Ability Enhancement Courses	
Semester	**Title**
1	Time Management
1	IPDC-1
1	MIL Gujarati-1
2	IPDC-2
2	MIL Gujarati-2
3	Communication Skills
3	Mastering Google Drive
4	Environmental Studies

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FACULTY OF SCIENCE

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Faculty of Science

B. Sc. (Honors) Programmes

(MULTIDISCIPLINARY COURSES)

(W.E.F. 2024-25)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Sarvajanik University	
Faculty of Science	
AY 2024-25: List of Multidisciplinary Courses	
Semester	**Title**
1	Ornamental Fish Breeding and Culture
1	First Aid
1	Human Health and Nutritional Disorders
1	Exploring the Spectrum of Art
1	Social and Economic Geography
2	Energy Management and Audit in Green Schools
2	Mastering Your Money: An Entry-Level course to Financial Planning and Smart Investments
2	Nutrition & Fitness
2	Aapnu Gujarat/State of Gujarat
3	Entrepreneurship and Innovation- Indian Context
3	Green Schools
3	Personal Finance and Investment Planning
3	Pharmaceutical Product

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Semester 1

B.Sc. (Hons) Chemistry Semester 1

Sr. No.	Category	Course Title	Course Type
1	Major	Foundation Major in Applied Sciences 1	Compulsory
2		Foundation Major in Applied Sciences 2	Compulsory
3	Minor	Foundation Minor in Applied Sciences 1	Compulsory
4	SEC	Arogya Mitra	Elective
		Soap and Detergent Making	
5	VAC	Indian Knowledge Systems (Foundation)	Compulsory
6	AEC	Time Management	Elective
		IPDC-1	
		MIL Gujarati-1	
7	Multidisciplinary	Ornamental Fish Breeding and Culture	Elective
		First Aid	
		Human Health and Nutritional Disorders	
		Exploring the Spectrum of Art	
		Social and Economic Geography	

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department**: All
Program: B.Sc. (Hons)	**Type**: Major
Subject: Foundation Major in Applied Sciences-1	Credits: 4
Semester: 1	
Course description: The objectives of this course are to provide students with fundamental scientific knowledge of basic Biotechnological, Chemistry, Environmental Science and Microbiology concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Obtained ideas on various branches Biotechnology, Chemistry, Environmental Science and Microbiology. 2. Students will be acquainted with the historical account and development. 3. Able to learn scientific principles and scope of Biotechnology, Chemistry, Environmental Science and Microbiology. 4. Will be aware of general characteristics and able to gather knowledge about Biotechnology, Chemistry, Environmental Science and Microbiology.	

References and Textbooks:

Biotechnology:

1. John Smith., (2009). Biotechnology, Cambridge Press. ISBN 9780521711937
2. Ratledge, C., & Kristiansen, B., (2006). *Basic Biotechnology*, Cambridge University Press. ISBN 9780521549585
3. R.C. Dubey (2014) Advanced Biotechnology S.Chand ISBN 81-219-4290-X
4. Sobti and Pachauri (2009) Essential of Biotechnology, Ane Books Pvt. Ltd. ISBN-81-8052-160-5

Chemistry:

1. Foundations of Chemistry: An Introductory Course for Science Students By Philippa B. Cranwell ,lizabeth M. Page

Environmental Science:

1. P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN: 8171338143.
2. Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd ISBN-13: 978-0471906254.

Microbiology:

1. Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J. (2014). Brock biology of microorganisms.14th edi., Upper Saddle River (NJ): Prentice-Hall.

2. M. K.Cowan and H. Smith. (2018). Microbiology: Systems Approach, 5th edi., McGraw-Hill Publishing Company

Science:

1. Buckingham, L. (2014). Fundamental Laboratory Mathematics: Required Calculations for the Medical Laboratory Professional. United States: F. A. Davis Company.
2. Cheesbrough, M. (2005). District laboratory practice in tropical countries, part 1. Cambridge university press.
3. Moorthy, K. (2007). Fundamentals of Biochemical Calculations. United States: CRC Press.

Unit-1 Measurement and Units **(7 hrs)**

1.1 Metric system and prefixes
1.2 SI units
1.3 Significant digits
1.4 Exponents and scientific notations

Unit-2 Types of Solutions **(8 hrs)**

2.1 Solutions: Basic concepts
2.2 Part and Percentage solutions
2.3 Molarity, Molality and Normality
2.4 Osmolarity and Osmolality
2.5 Density

Unit-3 Basic Biotechnology: **(8 hrs)**

3.1 History and introduction to Biotechnology
3.2 Definition of Biotechnology, Traditional and New
3.3 The World of Biotechnology- Red, Green, White and Blue Biotechnology
3.4 Biotechnology-an Interdisciplinary Pursuit
3.5 Biotechnology- a three-component central core

Unit-4: Foundation of chemistry **(7 hrs)**

4.1Qualitative observation Vs quantitative observation
4.2 Theory vs law
4.3 Mass vs weight, Density: Solid, liquid, gas
4.4 Physical changes and chemical changes
4.5 Chemical bonds (Types, bond length, bond energy)

Unit-5 Natural Resources and Management **(8 hrs)**

5.1 Classification of natural resources; renewable and non-renewable resources
5.2 Resource degradation & resource conservation; resource availability and factors influencing its availability

5.3 Types of resources: Land resources; Water resources; Fisheries and other marine resources; Energy resources; Mineral resources
5.4 Impact on natural resources: Human impact; ecological, social and economic dimension of resource management

Unit-6 Introduction and major themes of Microbiology (7 hrs)

6.1Microbiology & it's important
6.2 Structure and Activities of Microbial cell
6.3 Evolution and Diversity of Microbial Cell
6.4 Microorganisms and Their Environment
6.5 The Impact of Microorganisms on Humans

List of Practicals:

1. Introduction to three Biotechnology laboratories and Instrumentation Room.
2. Qualitative analysis of unknown organic compounds containing monofunctional groups (carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) and simple bifunctional groups, for e.g. salicylic acid, cinnamic acid, nitrophenols etc. (Minimum Seven)
3. Determination of minimum quadrat size by species-area curve method.
4. Study of bright field microscope.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department**: All
Program: B.Sc. (Hons)	**Type**: Major
Subject: Foundation Major in Applied Sciences-2	**Credits**: 4
Semester: 1	
Course description: The objectives of this course are to provide students with fundamental scientific knowledge of basic Biotechnological, Chemistry, Environmental Science and Microbiology concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Obtained ideas on various branches Biotechnology, Chemistry, Environmental Science and Microbiology. 2. Students will be acquainted with the historical account and development. 3. Able to learn scientific principles and scope of Biotechnology, Chemistry, Environmental Science and Microbiology. 4. Will be aware of general characteristics and able to gather knowledge about Biotechnology, Chemistry, Environmental Science and Microbiology.	

References and Textbooks:

Biotechnology:

1. John Smith., (2009). Biotechnology, Cambridge Press. ISBN 9780521711937
2. Ratledge, C., & Kristiansen, B., (2006). *Basic Biotechnology*, Cambridge University Press. ISBN 9780521549585
3. R.C. Dubey (2014) Advanced Biotechnology S.Chand ISBN 81-219-4290-X
4. Sobti and Pachauri (2009) Essential of Biotechnology, Ane Books Pvt. Ltd. ISBN-81-8052-160-5

Chemistry:

1. Organic Chemistry, Volume-1,2, I.L.Finar, 6 th Edn., 2002, , Pearson
2. Organic Chemistry, Seventh Edition, By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson
3. Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand
4. Organic Chemistry, W.H. Perkin and F. S. Kipping, 2012, Nabu Press

Environmental Science:

1. P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN: 8171338143.
2. Keller E.A (2012): Introduction to Environmental Geology, Pearson Publication, USA.
3. Sagar Rajendra (2014): Geochemistry and Environmental Geology, Anmol Publications Pvt. Ltd., New Delhi.

4. Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd ISBN-13: 978-0471906254.

Microbiology:

1. Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J. (2014). Brock biology of microorganisms.14th edi., Upper Saddle River (NJ): Prentice-Hall.
2. M. K.Cowan and H. Smith. (2018). Microbiology: Systems Approach, 5th edi., McGraw-Hill Publishing Company

Science:

1. Buckingham, L. (2014). Fundamental Laboratory Mathematics: Required Calculations for the Medical Laboratory Professional. United States: F. A. Davis Company.
2. Cheesbrough, M. (2005). District laboratory practice in tropical countries, part 1. Cambridge university press.
3. Moorthy, K. (2007). Fundamentals of Biochemical Calculations. United States: CRC Press.

Unit-1 Solution preparation and Dilution **(7 hrs)**

1.1 Ration and Proportion
1.2 Calculations for the dilution of solutions
1.3 Preparation and Dilution of solution with Factor X
1.4 Preparation and dilution of Percent Solution
1.5 Stock solution and working solution

Unit-2 pH and Buffers, Calculation related to enzyme activity **(7 hrs)**

2.1 Concept of pH and pH scale
2.2 Buffer
2.3 Mathematical calculations to find pH
2.4 Calculation of Enzyme activity

Unit-3 Biotechnology in India **(7 hrs)**

3.1 Role of GSBTM, STBI and GBRC
3.2 Gujarat Biotechnology Policy 2022-27
3.3 Introduction to DBT, Its Mandate and Strategy
3.4 Autonomous and Public sector undertakings of DBT
3.5 BIRAC and ABLE

Unit-4 Recapitulation of basics of organic chemistry **(8 hrs)**

4.1 Introduction to natural and synthetic organic compounds
4.2 Hybridisation: Shapes of molecules, effect on resonance structure
4.3 Electronic displacements and their applications: Inductive, electromeric, resonance and mesomeric effects and hyperconjugation
4.4 Homolytic and Heterolytic fission with suitable examples
4.5 Electrophiles and Nucleophiles, Curly arrow rule

4.6 Types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes
4.7 Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

Unit- 5 Environment, Climate and Sustainability **(8 hrs)**

5.1 Classification, characteristics of Rocks and Mineral
5.2 Basics in Climatology, various impact of climate change
5.3 Principles of Environmental Sustainability
5.4 Sustainable Environmental Technologies and its application

Unit-6 Microbiology in historical context **(8 hrs)**

6.1 The Discovery of Microorganisms
6.2 Pasteur & Spontaneous Generation
6.3 Koch, Infectious Disease and Pure Cultures
6.4 The Rise of Microbial Diversity

List of Practicals:

1. Introduction to Biosafety and Biohazards.
2. Determination of porosity, bulk density, water holding capacity and field capacity of soil.
3. Examination of Hay infusion by wet mount technique

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Minor
Subject: Foundation Minor in Applied Sciences-1	Credits: 4
Semester: 1	
Course description: The objectives of this course are to provide students with fundamental scientific knowledge of basics of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Obtained ideas on various branches Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts. 2. Students will be acquainted with the historical account and development. 3. Able to learn scientific principles and scope of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health. 4. Will be aware of general characteristics and able to gather knowledge about Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health.	

References and Textbooks:

Agriculture & Forestry:

1. Dwivedi AP. 1992. *Agroforestry: Principles and Practices*. Oxford and IBH.
2. Dwivedi AP. 1993. *A Text Book of Silviculture*. International Book Distributors, Dehradun.
3. Khanna LS. 1996. *Principle and Practice of Silviculture*. International Book Distributors.
4. Smith DM, Larson BC, Ketty MJ & Ashton PMS. 1997. The Practices of Silviculture-Applied Forest Ecology. John Wiley & Sons.

Analytical Chemistry:

1. Douglas A. Skoog and Donald M..West: Fundamentals of Analytical Chemistry.
2. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
3. Gary D. Christian : Analytical Chemistry .
4. Freifelder and Kealy: Analytical Chemistry

Forensic Science:

1. Henry Lee's Crime Scene Handbook:Henry C Lee
2. Forensic Biology:Shrikant H. Lade
3. Crime Scene Processing and Laboratory Work Book : Patric Jones
4. Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. : Stuart H. James

Industrial Fermentation Technology:

1. Patel, A. H. (2016). Industrial Microbiology, 2nd Ed., Trinity press; An imprint of Laxmi publications PVT. Ltd.
2. Stanbury, P., Whitaker, A. and Hall, S. J. (2016). Principles of fermentation technology, 3rd Ed., Butterworth-Heinemann.

Medical Laboratory Technology:

1. P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, Vol I, 3rd ed.,¬ Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)
2. Mukharjee K.L. (1999), Medical Laboratory Technology, Vol I, 2nd ed., Tata MacGraw Hill. (ISBN: 9789352606818)

Occupational Health:

1. Mistry K.U (2012): Fundamentals of Industrial Safety & Health-I, Siddharth Prakashan, Ahmedabad.
2. Mistry K.U (2012): Fundamentals of Industrial Safety & Health-II, Siddharth Prakashan, Ahmedabad.
3. Benjamin O. Alli (2008): Fundamental principles of occupational health and safety, International Labour Office; 2nd edition, 978-9221204541.

Unit-1: Introduction forestry: **(10 hrs)**

1.1 Concept of forest ecosystem and dynamics of forest succession
1.2 Classification of world's forest vegetation
1.3 Productivity and vegetation forms of India and forest composition and classification
1.4 Natural regeneration of species and types of uneven-aged silviculture
1.5 Principles of silviculture and physical-ecological factors affecting it.

Unit-2: Scope and importance of analytical chemistry **(10 hrs)**

2.1 Introduction and role of analytical chemistry in sciences
2.2 Quantitative analysis; major, minor and trace constituents
2.3 SI Units: Basic units, Derived units, Conversion between units
2.4 Concept of concentration: Mole, Molar mass, Solutions and their concentrations

Unit-3 Forensic science and Forensic laboratories **(10 hrs)**

3.1 Introduction, definition and principles

3.2 Laws of forensic science
3.3 Historical aspects of forensic science in India
3.4 Need of forensic science in present scenario
3.5 Types and divisions
3.6 Forensic examination
3.7 Organizational set up of forensic science laboratories at central and state level.
3.8 Introduction of BPR& D, NICFS,CDFD,CCMB, IITR, CDTS, NCRB

Unit-4 History and Basic of Industrial Fermentation Processes (10 hrs)

4.1 Historical development of industrial processes
4.2 The range of fermentation processes
4.3 The component parts of fermentation process
4.4 Stages of fermentation process
4.5 Types of fermentation Process – Batch, Continuous & Fed batch

Unit-5 Organization of the Clinical laboratory and Laboratory Safety (10 hrs)

5.1 Clinical pathology laboratory definition & Laboratory Premises
5.2 Functional components of clinical laboratories
5.3 Various types of laboratories
5.4 Responsibilities of the laboratory worker
5.5 Precautions for prevention of transmission of pathogens
5.6 Precautions regarding fire and explosions
5.7 Important instructions to reduce infections in laboratory workers

Unit-6 Introduction of Occupational Health (10 hrs)

6.1 Basic concepts of Occupational Health and Safety (OHS).
6.2 Hazard identification and prevention techniques at the workplace.
6.3 Occupational Health and Safety Standards.
6.4 Workplace environment monitoring and measurements.
6.5 Occupational health hazards and preventive measures.

Practicals:

1. Study of Raunkiaer;s normal frequency distribution of vegetation.
2. Study of anatomical adaptations of hydrophytes (Roots and petiole), Xerophytes (Stem and Root), Mesophytes (monocot and dicot leaf, stem and root).
3. Use and calibration of volumetric equipment (volumetric flasks, pipette's and burette's)
4. Preparation of standard solutions of acids and bases
5. Preparation of standard solution of EDTA and estimation of magnesium using EDTA
6. Determination of specific gravity of petroleum products
7. To compare physical evidence (Cloth, Thread)
8. Introduction to laboratory batch fermenter.
9. Study of safety symbols and waste disposal in clinical laboratories.
10. Measurement of Illumination by Lux meter.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Skill Enhancement Course
Subject: Arogya Mitra	**Credits:** 2
Semester: 1	

Unit 1: Overview of ABPMJAY (08 hours)

Unit 2: Daily Operation Process (08 hours)

Unit 3: Software and Systems: BIS, TMS, Support (07 hours)

Unit 4: Hardware (07 hours)

Training:

45 Hours training as Arogya Mitra

Reference:

Participant's Handbook by Healthcare Sector Skill Council

Skill Enhancement Course: Soap and Detergent Making

Faculty: Science	**Title:** Soap and Detergent Making
Program: B.Sc. (Hons)	**Total Credit: 2**
Semester: 1	**Type:** Skill Enhancement Course

1. **Student Learning Outcomes (SLOs):**
   - Skill development for detergent cake and liquid soap, shampoo, handwash making.
   - Knowledge of basic concepts and techniques of soap and detergent industry.
   - Understanding of oil, fat and their sources in India.

2. **References and Textbooks:**
   - Ajay Kr. Gupta, Handbook on Soaps, Detergents & Acid Slurry , 3rd revised edition; NIIR Board publication. ISBN: 9789381039472
   - P. K. Chattopadhyay, Modern Technology of Soaps, Detergents & Toiletries (with Formulae & Project Profiles) 4th Revised Edition, NIIR Board publication; ISBN: 9789381039700
   - H. Panda, Herbal Soaps & Detergents Handbook, NIIR Board publication; ISBN: 9789381039007

Unit-1: Introduction to oil and fats: (6 hours)

1.1 Classification, structure and sources of oil and fats

1.2 Natural sources of oils and fats in India

Unit-2: Soaps: (7 hours)

2.1 introduction to soaps, synthetic detergents, raw materials and its selection

2.2 principles of soap making and chemistry of soap

2.3 Boiling, saponification process

Unit-3: Detergents: (7 hours)

3.1 Types of detergents, classification of detergents (anionic, cationic, nonionic, amphoterics), biodegradability.

3.2 Inorganic compounds of detergents (builder & other additives, phosphates, silicates, zeolites, etc)

Unit-4: Synthetic detergents: (10 hours)

4.1 Organic raw materials for manufacturing of fatty acids, olefins, alkylbenzene, methyl esters, fatty amines, ethylene oxide, propylene oxide sources and manufacture.

4.2 Inorganic raw material for sulphonation viz; sulphuric acid, sulphonic acid, oleum, sulphur trioxide, chlorosulphonic acid.

4.3 Sulphonation of organic raw materials like fatty acids, fatty acids ethoxylates plants and processes.

4.4 Sulphonation of alkylbenzene, olefins & vegetable oils, plants and processes.

Practicals:

1. Determination of physico-chemical characteristics of oil and fats
    1. Moisture content
    2. Acid value
    3. Iodine value
    4. Saponification reaction and Saponification value
2. Manufacture of liquid soap (shampoo) and laundry soap.
3. Project Work: Industrial training for one month duration.

Name of Faculty: Science	**Department:** Biotechnology
Program: B.Sc. (Hons)	
Subject: Time Management	**Semester:** 01
Credit: 02	**Total learning hours:** 30
Type: Ability Enhancement Course	

Course description: This syllabus aims to provide students with a comprehensive understanding of time management principles and equip them with practical skills for effective time management. Through a combination of lectures, workshops, exercises, and reflection activities, students will develop the knowledge and habits necessary to optimize their use of time and achieve greater productivity and work-life balance.

Student learning outcome:

1. Students will be able to learn concept of time management and its importance in personal and professional life
2. Students will be able to explore key principles and strategies for effective time management.
3. Students will be able to learn various tools and techniques to enhance time management skills.
4. Students will be able to develop action plans and strategies for implementing time management principles in daily life.

Reference book:

1. Getting Things Done: The Art of Stress-Free Productivity by David Allen (2001) Penguin Books

Unit-1 Understanding Time Management **(8 hrs)**

1.1 Definition and significance of time management
1.2 Benefits of effective time management
1.3 Common time management challenges ad obstacles

Unit-2 Time Management Principles **(8 hrs)**

2.1 Setting SMART goals and priorities
2.2 Prioritization techniques
2.2.1 Eisenhower Matrix
2.2.2 ABC method
2.3 Time blocking and scheduling techniques

Unit-3 Tools and techniques for Time Management **(8 hrs)**

3.1 Time management apps and software
3.2 Task delegation and outsourcing
3.3 Stress management and relaxation techniques

Unit-4 Implementing Time Management Strategies **(6 hrs)**

4.1 Creating personalize time management system
4.2 Overcoming procrastination and time-wasting habits
4.3 Continuous improvement and self-reflection

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Ability Enhancement Course
Subject: MIL Gujarati-1	**Credits:** 2
Semester: 1	

Unit 1: ગુજરાતી સાહિત્ય

- ગુજરાતી સાહિત્યનો ઇતિહાસ
- ગુજરાતી સાહિત્યના નોંધપાત્ર લેખકો અને કવિઓનો પરિચય

Unit 2: ગુજરાતી વ્યાકરણ

- રૂઢીપ્રયોગોના અર્થ અને તેનો વાક્યપ્રયોગ
- કહેવતોનો અર્થ
- સમાસનો વિગ્રહ કરી તેની ઓળખ
- છંદ ઓળખાવો
- અલંકાર ઓળખાવો

Unit 3: ગુજરાતી વ્યાકરણ

- શબ્દસમૂહ માટે એક શબ્દ
- જોડણી શુદ્ધિ
- લેખન શુદ્ધિ / ભાષા શુદ્ધિ
- સંધિ જોડો કે છોડો
- વાક્યરચનાના અંગો / વાક્યના પ્રકાર / વાક્ય પરિવર્તન

Unit 4: સંક્ષેપીકરણ અને સમીક્ષા

- ગદ્યખંડમાંથી આશરે ૧/૩ ભાગમાં સંક્ષેપ
- ગદ્યખંડના આધારે પૂછેલા પ્રશ્નોના જવાબ

Faculty: Science	**Department:** Env. Sc.
Program: B.Sc. (Hons)	**Type:** Multidisciplinary
Subject: Ornamental Fish Breeding and Culture	
Credit: 04	**Total learning hours:** 60
Semester: 1	

Course Objective:

This course is designed to provide knowledge on advanced ornamental fish production technologies and aquatic ornamental plant propagation. Ornamental fish breeding is one of the most promising frontier of entrepreneurship in Gujarat.

Student learning outcomes:

1. Students will have primary knowledge of ornamental fish breeding business.
2. Students will learn about major varieties of fish used for this purpose.
3. They will have an understanding of techniques used for fish breeding and tools needed for it.
4. Students will have the understanding of aquarium design, components, working and techniques used for the same.

References:

1. National Fisheries Development Board, Package of Practices for Breeding and Culture of Commercially Important Freshwater Fish Species
2. Venugopal, K. M. "Aquarium Making and Maintenance." (2015).

Unit 1 Introduction to the business of fish breeding (07 hrs)

1.1 Global status of ornamental fish trade

1.2 Present status and of ornamental fish farming and trade in India

1.3 Types of fishes commonly been farmed in India

Unit 2 Diversity of Commercial Fish Varieties (07 hrs)

2.1 Indian ornamental fish diversity and its status

2.2 Prospects of production of new strains / varieties

2.3 Ornamental fish breeding techniques towards strain development

Unit 3 Aquarium Design and Construction (07 hrs)

3.1 Self-maintained aquarium

3.2 Species compatibility and High value species

3.3 Aquarium maintenance and care

3.4 Common aquarium plants and their identification

Unit 4 Tools used in aquariums (08 hrs)

4.1 Common gadgets and tools used in freshwater and marine aquarium

4.2 Aerators

4.3 Filters (UV, trickling and biofiltration)

4.4 Protein skimmers

4.5 Ozonizer

4.6 Thermostatic heater and chiller

4.7 Lighting

4.8 Water conditioners

Unit 5 Captive Breeding techniques-1 (08 hrs)

5.1 Mass production of commercially important freshwater and marine ornamental fishes

5.2 Nursery and grow out culture of commercially important ornamental fish species in Raceways, RAS etc.

5.3 Hybrids development

Unit 6 Captive Breeding techniques-2 (08 hrs)

6.1 Feed and feeding

6.2 Color enhancement through pigmented feed

6.3 Novel feeds

6.4 Common diseases and control

6.5 Water quality management.

Unit 7 Transportation of Ornamental Fishes (08 hrs)

7.1 Medicines and chemicals used in the ornamental fish industry

7.2 Anaesthetics

7.3 Packing

7.4 Transportation

7.5 Marketing strategies

Unit 8 Entrepreneurship (08 hrs)

8.1 Culture unit for entrepreneurship development

8.2 Socio-economic upliftment through backyard ornamental fish farming

8.3 Micro-traders in ornamental fish marketing

Practicals:

1. Identification of common ornamental fishes
2. Introduction to plants and gadgets used in aquariums
3. Visit to ornamental fish units
4. Introduction to aquarium fabrication

Faculty: Science	**Department:** Microbiology
Program: B.Sc. (Hons)	**Type:** Multidisciplinary
Subject: First Aid	
Credit: 04	**Total learning hours:** 60

Course description:

This course will incline the student how to respond to an emergency and to help the victim. It trains the student to make appropriate decisions about first aid care in different situations and cases until professional medical help arrives. Students will understand the significance of first aid training as a low cost, but highly effective strategy to reduce morbidity and mortality.

Student learning outcome:

1. Students will be benefited by understanding the basic concepts of First Aid
2. Students will be conceptualized how to prevent medical emergencies from
3. Students will learn how to assess a victim during a medical emergency to determine what care is needed.
4. Students will acquire the understanding about how to provide the right and effective help before a trained health worker is available or the victim reaches a health facility,

Reference Book:

- Indian First Aid Manual 2016 (7th Edition) Authorized Manual – English Version

Further Reading:

- Emergency Safety and First Aid Handbook, Department of Disaster Management, Ministry of Home & Cultural Affairs

Unit-1: Introduction to First Aid (Duration: 6 Hrs)

1.1 What Is First Aid?
1.2 Aims Of First Aid
1.3 The First Aider
1.4 Dealing With An Emergency
1.4.1 How To Make The Area Safe
1.4.2 Evaluate The Condition Of The Sick Or Injured Person And Seek Help
1,4,3 Provide First Aid

Unit-2: Heart, Blood Circulation, Shock (Duration: 7 Hrs)

2.1 The Heart And The Blood Circulation
2.2 Chest Discomfort
2.3 Bleeding
2.4 First Aid For Bleeding (In General)

Unit-3: Nervous System And Unconsciousness (Duration: 9 Hrs)

3.1 The Nervous System
3.2 Unconsciousness
3.3 Head Injuries
3.4 Stroke
3.5 Fits – Convulsions - Seizures

Unit-4: Skin, Burns, Heat Exhaustion, Fever And Hypothermia (Duration: 10 Hrs)

4.1 The skin & its function
4.2 Burn wounds
4.3 Heat exhaustion
4.4 Heatstroke
4.5 Frostbites
4.6 Fever & Hypothermia

Unit-5: Resuscitation CPR: Chest Compressions (Duration: 10 Hrs)

5.1 Basic CPR (Cardio Pulmonary Resuscitation)
5.1.1 How To Observe Responsiveness And Consciousness - AVPU Scale
5.1.2 How To Observe The Breathing?
5.2 How To Observe The Pulse?
5.3 Resuscitation Of A Person Who Is Not Breathing Or Not Breathing Normally

Unit-6: Poisoning (Duration: 6 Hrs)

6.1 Types of Poisoning
6.2 First aid procedures in Poisoning

Unit-7: Bites And Stings (Duration: 8 Hrs)

7.1 Animal Bites
7.2 Snake Bite
7. Insect Stings And Bites

Unit-8: First Aid Techniques (Duration: 4 Hrs)

8.1 Dressings
8.2 Bandages
8.3 Fast evacuation techniques (single rescuer)
8.4 Transport techniques.

Experiments:

1. First Aid techniques for Dressing s and Bandages
2. Demonstration of CPR by Experts
3. Identification of venomous snakes and first aid procedure in cases of snake bites

Faculty: Science	**Department**: Microbiology
Subject: Human Health and Nutritional Disorders	**Type**: Multidisciplinary
Credits: 04	

Course description:

The following course id design to…

- To understand the functions and role of nutrients, their requirements and the effect of deficiency and excess (in brief)
- To understand the concept of an adequate diet and the importance of nutrients in recommended Dietary Allowances.
- Determine physiological changes at different stages of lifecycle.

Student learning outcome:

1. The student will be able to apply basic nutrition knowledge in making foods choices and obtaining an adequate diet.
2. The student will gain knowledge about energy requirements and the Recommended Dietary Allowances.
3. The student learns the impact of various functional foods on our health
4. The students will understand the role and importance of food and nutrition for the welfare of the community and acquire the skills in planning diet.
5. The students will be able to relate nutrient needs to developmental stages and plan diets which will adequately meet nutritional needs during growth stage.

Reference Books:

1. Wiseman, G. (2002). *Nutrition and health*. Taylor & Francis.
2. Wadhwa, A., & Sharma, S. (2003). Nutrition in The Community, A Text Book.
3. Antia, F. P. (1973). *Clinical dietetics and nutrition*. Oxford University Press, Ely House, 37 Dover Street, London Wl.

Unit-1: Human Health and Nutrition **(Duration: 06 Hrs)**

1.1 Introduction to Health
1.2 Types of Health
1.3 Personal Health evaluation
1.4 Health and Nutrition

Unit-2: Concept of Community Health & Nutrition **(Duration: 06 Hrs)**

2.1 Concept of Community, types of community
2.2 Factors affecting health of the community
2.3 Health Care Levels: Primary Health Care
2.4 National immunization schedule.

Unit-3: Macronutrients **(Duration: 08 Hrs)**

3.1 Classification, functions, Digestion& absorption (in brief), and their food sources
3.2 Protein,
3.3 Carbohydrate
3.4 Fat

Unit-4: Micronutrients **(Duration: 08 Hrs)**

function, absorption, food sources for

4.1 Iron,
4.2 Zinc
4.3 Fluorine
4.4 Iodine
4.5 Vitamins:Fat-soluble and Water soluble vitamins

Unit-5: Nutrition In The Life Cycle **(Duration: 08 Hrs)**

5.1 Nutrition during Infancy
5.2 Nutrition in Adolescence
5.3 Nutrition in adults

Unit-6: Social health problems **(Duration: 06 Hrs)**

6.1 Smoking
6.2 Alcoholism
6.3 Drug addiction
6.3 AIDS including AIDS Control Programme

UNIT-7: Nutritional Disorders-I **(Duration: 08 Hrs)**

7.1 Causes, symptoms, treatment, prevention of the following
7.2 Protein Energy Malnutrition (PEM)
7.3 Vitamin A Deficiency (VAD)
7.4 Iron Deficiency Anaemia (IDA)

UNIT-8: Nutritional Disorders-II **(Duration: 08 Hrs)**

8.1 Causes, symptoms, treatment, prevention of the following
8.2 Iodine Deficiency Disorders (IDD)
8.3 Zinc Deficiency
8.4 Fluorosis

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Multidisciplinary Course
Subject: Exploring the Spectrum of Art	**Credits:** 4
Semester: 1	**Duration:** 60 hours

Course Description: It is a foundational course designed to introduce students to the world of arts through a multidisciplinary approach. This course offers an exploration of historical and modern sculptures and painting art forms. Through a combination of theoretical discussions and project exercises, students will develop a deeper understanding of artistic concepts, techniques, and historical contexts. Emphasis will be placed on fostering creativity, and encouraging students to engage with art as both creators and informed observers. The course helps to develop among students, a sense of ethical behavior, nationalism, appreciating Indian culture and art. This course serves as a gateway for students to embark on a journey of artistic discovery and appreciation.

Learning Outcomes:

By the end of the course, students will be able to:

1. Gain an understanding and appreciation of the historical and cultural context of different painting styles, sculptures, movements, and artists.
2. Demonstrate basic proficiency in fundamental artistic techniques of painting.
3. Engage in collaborative and reflective practices.
4. Explore connections between art and other disciplines, such as history, literature, and technology, fostering interdisciplinary thinking.

References:

1. Mohan Singh Mawdi. Fundamentals of Painting (3rd ed), Takshila Prakashan, New Delhi. ISBN 9788179653029.
2. Living Traditions Tribal and Folk Paintings of India. Centre for Cultural Resources and Training Ministry of Culture, Government of India, New Delhi.
3. The complete book of drawing techniques. A professional guide for the artist. Arcturus Publishing Ltd. ISBN 0-572-02916-0.
4. The Art of Acrylic Painting. Walter Foster Publishing, Inc. ISBN 978-1-61059-816-3.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Unit 1: Fundamentals of Art

1.1 What is Art?
1.2 Origin and Definition of Art
1.3 Classification of Art
1.4 Need of Art in the Present Scenario

Unit 2: Sculpture Art of India

2.1 History of Ancient Indian Sculptures
2.2 Famous Sculptures in India
2.3 Sculpture Artists of India

Unit 3: Painting Art of India

3.1 Six Limbs of Indian Painting
3.2 Essentials of Painting: Line, Form and Color
3.3 Medium and Technique of Painting: Dry and Wet

Unit 4: Indian Folk Art

4.1 Introduction to Tribal & Folk Paintings of India
4.2 Origin of Various Heritage Arts
4.3 Theme and Techniques of Folk Arts

Unit 5: Ancient Warli Art

5.1 Origin and History
5.2 Motifs and Patterns
5.3 Technique and Process (For Paintings)
5.4 Technique and Process (For Artifacts)
5.5 Painting Projects: Glass bottles/Canvas/Stone

Unit 6: Charcoal in Art

6.1 History of Charcoal Art
6.2 Basics of Working with Charcoal
6.3 Tools and Materials Used
6.4 Modern Charcoal Techniques
6.5 Charcoal Projects: Still life/Landscape/Portrait Sketch

Unit 7: Contemporary Art of Acrylic & Oil Painting

7.1 Introduction and History
7.2 Tools and Materials Used

7.3 Drawing and Painting Techniques
7.4 Painting Projects: Canvas/Fabric

Unit 8: Art Entrepreneurship

8.1 Developing Artistic Skills
8.2 Crafting Unique Style and Brand
8.3 Understanding the Art Market
8.4 Marketing and Selling Art
8.5 Managing Business

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Multidisciplinary
Subject: Social and Economic Geography	
Semester: 1	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Understand and analyze geographical terrain of India.
2. Understand population type, migration and growth.
3. Learn various socio-geographical policies of India
4. Address importance of demographics and census in Indian Economy.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Jayakrishna Sanapa (2017): World Geography, Wiley Publications. ISBN: 978-9357465885
2. Majid Hussain (2022): Geography of India, McGrew Hill Publishers. ISBN: 978-9355322128
3. D. R. Khullar (2020): Geography Textbook. New Saraswati House India Pvt Ltd, India. ISBN: 9789350412435.
4. Anoop Kumar Singh (2021): Applied Geography, K. K. Publications, India. ISBN: 9789388399012

Unit 1: Geography of India 07 hours

1.1 Location, latitude, longitude, time zone, etc.
1.2 Neighbouring Countries, India's 'Neighbourhood First policy'
1.3 States and their position, States with international boundaries, Boundary conflicts
1.4 Rights of state according to Article 12 of Indian Constitution
1.5 Union territories

Unit 2: Physical features of India
07 hours

2.1 The Himalayas – geological formation, climate and major passes
2.2 The Great North Indian Plains - geological formation, climate and vegetation
2.3 Peninsular Plateau - geological formation, climate and vegetation
2.4 Indian desert, coastal plains and islands

Unit 3: River system of India
08 hours

3.1 Himalayan and Peninsular rivers, Ganga river system, peninsular river system
3.2 Mains Rivers and their tributaries
3.3 Inter linking of rivers
3.4 Inter-state river water sharing disputes and mechanism of resolution, The Inter-state river water disputes (Amendment) Bill, 2017

Unit 4: Physical Geography **08 hours**

4.1 Origin and structure of earth, rock types

4.2 Folding and Faulting, tectonic plates and movements
4.3 Structure and composition of atmosphere
4.4 Origin and types of soil

Unit 5: World Geography
5.1 Continents, Countries and Cities
5.2 Economic Classification of Countries of the World
5.3 Population problems of developing and developed countries
5.4 Climatic zones of the world, Koppen's Classification Climatic Zones

Unit 6: Human Geography
6.1 Concept of Population and Community, Principles of population dynamics
6.2 Man & environment; relationship, growth and development of human geography;
6.3 Man and the Biosphere Programme (MAB)
6.4 Population, tribes and migration in India, India's refugee policy

Unit 7: Census and human demographics
7.1 India's Population Distribution by Density, Population Growth
7.2 National Population Policy
7.3 Census-History and procedure, Cohort analysis
7.4 Census in India, Socio-Economic and Caste Census (SECC)

Unit 8: Agricultural Geography
8.1 Agricultural Revolution in India
8.2 Subsistence Agriculture and types
8.3 Cropping pattern, agricultural productivity and Agroecological regions
8.4 Agriculture census 2021-22

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Semester 2

B.Sc. (Hons) Chemistry Semester 2

Sr. No.	Category	Course Title	Course Type
1	Major	Foundation Major in Applied Sciences 3	Compulsory
2		Foundation Major in Applied Sciences 4	Compulsory
3	Minor	Foundation Minor in Applied Sciences 2	Compulsory
4	SEC	Dairy Farmer	Elective
		Florist	
5	VAC	Indian Knowledge Systems (Chemistry)	Elective
		Indian Knowledge Systems (Health Science)	
		Indian Knowledge Systems (Antiquity of Bharat)	
6	AEC	IPDC-2	Elective
		MIL Gujarati-2	
7	Multidisciplinary	Energy Management and Audit in Green Schools	Elective
		Mastering Your Money: An Entry-Level course to Financial Planning and Smart Investments	
		Nutrition & Fitness	
		Aapnu Gujarat/State of Gujarat	

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department**: All
Program: B.Sc. (Hons)	**Type**: Major
Subject: Foundation Major in Applied Sciences-3	**Credits**: 4
Semester: 2	
Course Description: The objectives of this course are able to apply the skills of basic Biotechnological, Chemistry, Environmental Science and Microbiology concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Obtained ideas on application of various branches Biotechnology, Chemistry, 2. Environmental Science and Microbiology. 3. Identify ways in which science is applied and used to solve local and global problems. 4. Apply the knowledge to explore how science and technology are interdependent. 5. To uncover the fundamental principles, developments and potential applications.	

References and Textbooks:

Biotechnology:

1. R.C. Dubey (2014) Advanced Biotechnology S.Chand ISBN 81-219-4290-X
2. Gupta, P. K. (2010). *Elements of biotechnology* (2nd ed), ISBN 8171339379, 9788171339372.
3. Singh, B. D. (2010). Biotechnology (4th ed), Kalyani Publicers, ISBN: 8127256390, 9788127256395.
4. India Bioeconomy Report-2022, BIRAC
5. Verma, Das and Singh (2014) Laboratory Manual for Biotechnology, S.Chand ISBN-978-93-83746-22-4

Chemistry:

1. Selected Topics in Inorganic Chemistry,By Wahid Malik, G.D. Tuli, R.D.Madan S.Chand ISBN: 81-219-0600-8
2. Satya Prakash's modern inorganic chemistry By Dr.R.D.Madan S.chand ISBN-9789352837298

Environmental Science:

1. P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN:8171338143.
2. Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd ISBN-13: 978-0471906254.

Microbiology:

1. Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J. (2014). Brock biology of microorganisms.14th edi., Upper Saddle River (NJ): Prentice-Hall.

Science:

1. Buckingham, L. (2014). Fundamental Laboratory Mathematics: Required Calculations for the Medical Laboratory Professional. United States: F. A. Davis Company.
2. Cheesbrough, M. (2005). District laboratory practice in tropical countries, part 1. Cambridge university press.
3. Moorthy, K. (2007). Fundamentals of Biochemical Calculations. United States: CRC Press.

Unit-1 Preparation of Graphs and Standard curves **(8 hrs)**

1.1 Types of Standards
1.2 Graphs and Graphing
1.3 Stock Standard and Plotting of Standard Curve
1.4 Determining concentration from graph
1.5 Use of Spreadsheets for graph plotting

Unit-2 Basic care and safety while preparing solutions **(7 hrs)**

2.1 Chemical and reagent hazards in laboratory
2.2 Control of spillage in laboratory
2.3 Safety guideline for Compressed and Non-compressed gases
2.4 Safety Signs in Laboratory

Unit-3 Scope of Biotechnology **(8 hrs)**

3.1 Recombinant DNA and Genetic Engineering
3.2Vaccines
3.3 Monoclonal Antibodies
3.4 Mammalian Cell Culture
3.5 Plants and Plant Cell Culture

Unit-4 Elements and Periodicity **(7 hrs)**

4.1 Genesis of periodic table
4.2 Classification of elements
4.3 Concept of atomic and ionic radii
4.4 Ionization energy
4.5 Electron affinity

Unit-5 Ecology and Environment **(8 hrs)**

5.1 Types, classification, structure and function of Ecology
5.2 Classification, characterization and importance of population and population dynamics and population ecology
5.3 Concept of Community Ecology and Ecological Succession
5.4 Autoecology of Species and Ecological Amplitude

Unit-6 Major Groups of Microorganisms **(7 hrs)**

6.1 Origin and Evolution of Microorganisms
6.2 Universal Tree of Life
6.3 Classification of Microorganisms
6.4 Major groups of Microorganisms

List of Practicals:

1. Introduction of Common Instruments: Autoclave, Incubator, pH Meter, Hot Air Oven, Weight Balance, Water Bath, Refrigerator, Spectrophotometer and/or Colorimeter, Microscope, Shaker, Stirrer, Centrifuge, Hemocytometer, Vortex. Laminar air flow

2. Estimation of carbonate and hydroxide present together in mixture.

3. Study of topographical features using different topographic maps.

4. Observation of motile organisms by Hanging drop preparation.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department**: All
Program: B.Sc. (Hons)	**Type**: Major
Subject: Foundation Major in Applied Sciences-4	**Credits**: 4
Semester: 2	
Course Description: The objectives of this course are able to apply the skills of basic Biotechnological, Chemistry, Environmental Science and Microbiology concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Obtained ideas on application of various branches Biotechnology, Chemistry, 2. Environmental Science and Microbiology. 3. Identify ways in which science is applied and used to solve local and global problems. 4. Apply the knowledge to explore how science and technology are interdependent. 5. To uncover the fundamental principles, developments and potential applications.	

References and Textbooks:

Biotechnology:

1. R.C. Dubey (2014) Advanced Biotechnology S.Chand ISBN 81-219-4290-X
2. Gupta, P. K. (2010). *Elements of biotechnology* (2nd ed), ISBN 8171339379, 9788171339372.
3. Singh, B. D. (2010). Biotechnology (4th ed), Kalyani Publicers, ISBN: 8127256390, 9788127256395.
4. India Bioeconomy Report-2022, BIRAC
5. Verma, Das and Singh (2014) Laboratory Manual for Biotechnology, S.Chand ISBN-978-93-83746-22-4

Chemistry:

1. Organic Chemistry, Volume-1,2, I.L.Finar, 6 th Edn., 2002, , Pearson
2. Organic Chemistry, Seventh Edition, By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson
3. Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand
4. Organic Chemistry, W.H. Perkin and F. S. Kipping, 2012, Nabu Press

Environmental Science:

1. Keller E.A (2012): Introduction to Environmental Geology, Pearson Publication, USA.
2. Basudeb Bhatta, (Oxford Publications, New Delhi). Remote Sensing and GIS. ISBN: 9780195692396

Microbiology:

1. Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J. (2014). Brock biology of microorganisms.14th edi., Upper Saddle River (NJ): Prentice-Hall.

Science:

1. Mendham J., Denney R C., (2008). Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Person Education.

Unit-1 Statistics and metrics -1 **(8 hrs)**

1.1 Classification of Error and reduce systematic errors
1.2 Accuracy
1.3 Precision
1.4 Significance of digit (Figures)

Unit-2 Statistics and metrics -2 **(8 hrs)**

2.1 Mean and standard deviation
2.2 Distribution of random errors
2.3 Reality of results
2.4 Confidence intervals
2.5 Comparison of result

Unit-3 Scope of Biotechnology **(7 hrs)**

3.1 Biofertilizers
3.2 Biopesticides
3.3 Biofuels
3.4 Biotechnology Products: Insulin, BT Cotton, Golden Rice
3.5 Status of biotechnology industry in India

Unit-4 Stereochemistry of organic compounds **(8 hrs)**

4.1 Isomerism: Definition and classification
4.2 Introduction to Geometrical isomerism: cis–trans , syn-anti and E/Z notations with C.I.P rules
4.3 Optical Isomerism: Optical Activity, Specific Rotation, Chirality, Enantiomers,
4.4 Molecules with two or more chiral-centres
4.5 Di-stereoisomers, meso structures, Racemic mixture and their resolution. Relative and absolute configuration: D/L and R/S designations

Unit- 5 Geospatial Technologies in Environment **(8 hrs)**

5.1 Basics of Remote Sensing
5.2 Satellite launch vehicles
5.3 Introduction to Geographical Information System (GIS)
5.4 Application of Geoinformatics in environmental science & management

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Unit-6 Principles of Microscopy **(8 hrs)**

6.1 Light Microscopy
6.2 Improving Contrast in Light Microscopy
6.3 Imaging Cells in Three Dimensions
6.4 Electron Microscopy

List of Practicals:

1. Field / Virtual Visit: Local Biotechnology Unit / Laboratory
2. Estimation of carbonate and bicarbonate present together in a mixture.
3. Determination trophic status index of given water body.
4. Simple staining by using acidic and basic dyes
5. Observation of specimens by Dark field and Phase contrast microscopy.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Minor
Subject: Foundation Minor in Applied Sciences-2	Credits: 4
Semester: 2	
Course description: The objectives of this course are to provide students with fundamental scientific knowledge of basics of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts. It will help students in creating a strong foundation necessary for science based careers.	
Student Learning Outcome: 1. Develop undersatnding in various subjects viz. Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts. 2. Students will be acquainted with the traditional and applied aspects of the subjects. 3. Able to learn general concerts and industrial application of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health.	

References and Textbooks:

Agriculture & Forestry:

1. Alikhan I & Khanum A. 2008. *Role of Biotechnology in Medicinal and Aromatic Plants*. UKAZ Publ.
2. Chadha KL & Gupta R.. 2006. *Advances in Horticulture*. Vol. XI. *Medicinal and Aromatic Plants*. Malhotra Publ. House.
3. Gupta AK & Sharma M. 2008. *Reviews on Indian Medicinal Plants*. ICMR. Gupta AK, Tandon N & Sharma M. 2008. *Quality Standards of Indian*
4. *Medicinal Plants*. ICMR.
   Johnson CB & Franz C. 2005. *Breeding Research on Aromatic and*
5. *Medicinal Plants*. International Book Distr.
   Sharma R. 2004. *Agrotechniques of Medicinal Plants*. Daya Publ.

Analytical Chemistry:

1. Daniel C Harris: Exploring Chemical Analysis.
2. Daniel C Harris: Quantitative Chemical Analysis.
3. Quantitative Analysis, R.A Day, A.L Underwood, 6th Edition, 1991, Prentice-Hall
4. Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, 2008, New Age International Publishers

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Forensic Science:

1. Criminalistics: An Introduction to Forensic Science, 9th edn.: Richard Saferstein
2. Computer Crime and Computer Forensic:Dr. R.K. Tiwari 7. Criminal Profiling: An Introduction to a Behavioral Evidence Analysis, 3rd edn. : Brent E. Turvey
3. Forensic Science in Criminal Investigation and Trial, 4th edn.: B.R. Sharma
4. Handbook of Forensic Psychology: Dr. Veerraghavan

Industrial Fermentation Technology:

1. Crueger, W., Crueger, A., (2017). Crueger's Biotechnology: A textbook of Industrial Microbiology, 3rd Ed.., Medtech publisher.

Medical Laboratory Technology:

1. P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, Vol I, 3rd ed.,¬
2. Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)
3. Mukharjee K.L. (1999), Medical Laboratory Technology, Vol I, 2nd ed., Tata MacGraw Hill. (ISBN: 9789352606818)

Occupational Health:

1. Mistry K.U (2012): Fundamentals of Industrial Safety & Health-I, Siddharth Prakashan, Ahmedabad.
2. Mistry K.U (2012): Fundamentals of Industrial Safety & Health-II, Siddharth Prakashan, Ahmedabad.
3. Benjamin O. Alli (2008): Fundamental principles of occupational health and safety, International Labour Office; 2nd edition, 978-9221204541.

Unit-1: Application of traditional knowledge of forestry: (10 hrs)

1.1 Identification of important herbs used in traditional medicine
1.2 formulation, validation and process of allopathic drugs based on traditional drugs
1.3 national and international institutions involved in scientific validation of traditional \ knowledge (CDRI, CIMAP, PRL'S, WHO etc.)
1.4 Composition of major herbal formulations and their sources
1.5 Role of local forest traditions in primary health care and socio-economic development.

Unit-2: Basic principles and general concepts of analytical chemistry (10 hrs)

2.1 General steps in chemical analysis
2.2 Classification of analytical methods according to property
2.3 Types of analysis – Complete analysis, partial analysis and assay of ingredients, the analytical chemist and analyst
2.4 Introduction to methods of detecting analytes: Physical, electromagnetic radiations, electric charge

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Unit-3 Crime and Crime Scene **(10 hrs)**

3.1 Crime: definition and types of crime
3.2 Reasons of crime and criminal behaviour
3.3 Prevention of crime
3.4 Difference in blue and white collar crime
3.5 Introduction of cyber crime
3.6 Introduction and significance
3.7 Role of investigator
3.8 Evaluation, Protection & Photography of crime scene

Unit-4 Screening for new metabolites & Important microbial Products **(10 hrs)**

4.1Primary and secondary metabolites
4.2 Strains used in screening
4.3 Test system
4.4 Important Primary & Secondary metabolites
4.5 Microbial biomass production
4.6 Recombinant products
4.7 Microbial enzymes (Bulk, Analytical, Therapeutic and Diagnostic, Immobilized)
4.8 Application of microbes in health care products, food & beverage fermentation
4.9 Microbes classified as GRAS category.

Unit-5 Clinical specimen collections & Quality Control **(10 hrs)**

5.1 Methods of Blood collection

- 5.1.1 By venipuncture
- 5.1.2 By capillary puncture

5.2 Role of Anticoagulants
5.3 Other clinical specimen (Urine, Sputum, Throat swab, Stool, CSF)
5.4 Quality control in different sections of clinical laboratory
5.5 Laboratory regulations
5.6 Medico-legal problems

Unit-6 Applications of ISOH **(10 hrs)**

6.1. Confined Space Virtual Reality training.
6.2. Hazard-specific preventive measures.
6.3. Personal Protection and protective devices.
6.4.Workplace-specific preventive measures.
6.5. Human error analysis and safety

Practicals:

1. Production of Drakshasav and detection of sugar from it by Cole's method.
2. Estimation of protein from forest based products.
3. Preparation of buffers
4. Use of pH meter: determination of pH of given dilute solutions of shampoos/ soaps
5. Titration of acid-base using pH meter
6. To compare and calculate diameter of given bangle piece
7. Packaging and forwarding of physical evidences.
8. Screening of antimicrobial compounds producing microorganisms by crowded plate & wilkin's method.
9. Blood collection by venipuncture method (Demonstration).
10. Submission of report based on industrial visit.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Skill Enhancement Course
Subject: Dairy Farmer	**Credits:** 2
Semester: 2	

Unit 1: Introduction to Dairy Farming (07 hours)

Unit 2: Establishing Livestock Accommodation (07 hours)

Unit 3: Provide Feed and Water for Livestock (08 hours)

Unit 4: Maintain Healthy Performance of Livestock (08 hours)

Training:

45 Hours training at a dairy farm.

Reference:

Participant's Handbook by Agriculture Skill Council of India

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Skill Enhancement Course
Subject: Florist	**Credits:** 2
Semester: 2	

Unit 1: Procurement and storage of cut flowers and foliage (07 hours)

Unit 2: Preparation of cut flowers for arrangements (07 hours)

Unit 3: Designing and Creating Floral Designs (08 hours)

Unit 4: Packing and Shipping Floral Arrangements (08 hours)

Training:

45 Hours training at a florist.

Reference:

Participant's Handbook by Agriculture Skill Council of India

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Value Added Course (VAC)
Subject: Indian Knowledge System (Chemistry)	Credits: 2
Semester: 2	

Reference:

1. Ray PC. History of Hindu Chemistry, Vol. I, 1902, Vol. II, 1908. P. Ray: History of Chemistry in Ancient & Medieval India, Calcutta. 1956.

Unit 1: (08 hours)

- About the author of 'History of Hindu Chemistry'
- Vedic Period
- Atomic Theory
- Chemistry in Kautilya
- Chemistry in Charaka and Susruta
- Chemistry in Bower Manuscript
- Chemistry in Vagbhata
- Chemistry in Vrinda and Chakrapani

Unit 2: (07 hours)

- A general survey of Tantrik Period
- A general survey of Iatrochemical Period

Unit 3: (08 hours)

- Metallurgy and Working with Metals

Unit 4: (07 hours)

- Gunpowder, Saltpetre and Mineral acids, etc.
- Paper, Ink, Soap, Cosmetics, etc.
- Weights and Measures

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Value Added Course (VAC)
Subject: Indian Knowledge System (Health Sciences)	Credits: 2
Semester: 2	

Reference:

1. Subbarayappa BV. Science in India: A historical perspective. Rupa Publisher; 2013.

Unit 1: Ayurveda-1 (08 hours)

- Ayurveda: Philosophical Foundation
- Structure of Ayurveda
- Diseases and Their Characterization
- Ayurvedic Approach to Treatment

Unit 2: Ayurveda-2 (08 hours)

- Surgery
- Rasayana and Vajikarana
- Transmission of Ayurveda
- Present Status of Ayurveda

Unit 3: Siddha Medicine (07 hours)

- Introduction and Alchemical Origin
- Diagnostic methods
- Therapeutic principles
- Siddha Drugs, muppu and its classification
- Kaya-kalpa
- Present status

Unit 4: Yoga (07 hours)

- Textual resources for ancient indian yoga
- Ashtanga yoga

- Shatkarmas
- Health benefits of Asanas
- Health benefits of Pranayama
- Health benefits of Meditation
- Yoga as therapy in modern world

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Value Added Course (VAC)
Subject: Indian Knowledge System (Antiquity of Bharat)	Credits: 2
Semester: 2	

References:

1. Oak NN. When Did the Mahabharata War Happen?: The Mystery of Arundhati. Subbu; 2018.
2. Oak NN. 12209 BCE: Rama - Ravana Yuddha. Subbu; 2019.
3. Sastry S. Tearing Down Aryan Invasion Myth. Subbu; 2021.
4. Danino M. Aryans and the Indus civilization: Archaeological, skeletal, and molecular evidence. A companion to South Asia in the past. 2016 Jun 8:205-24.
5. Bansal JG. Aryan Invasion Theory: Why it Must be Purged from School Textbooks. From: https://hindudvesha.org/thearyaninvasion-myth-textbooks/

Unit 1: Bharatiya System of Recording Dates (07 hours)

- Indian Calendar System
- Origin of Weekday Names

Unit 2: Study of Indian Antiquity and Ramayana (08 hours)

- World Civilizations, River Sarswati and Dating of Veda
- Out of India Migrations
- Domestication of Horses
- Overview of Existing Proposals of Dating Ramayana
- Contributions, Theory and Timeline Proposed by Nilesh Oak

Unit 3: Study of Indian Antiquity: Mahabharata (08 hours)

- When did the Mahabharata War Happen?
- Brief Review of Mahabharata Research
- Summary of the Theory Proposed by P. V. Vartak
- Contributions, Theory and Timeline Proposed by Nilesh Oak

Unit 4: Aryan Migration Controversy (07 hours)

- Aryan Invasion Theory: How and Why?
- Aryan Migration Controversy: Unmasking
- Evidences Against the Aryan Invasion Theory

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** All
Program: B. Sc. (Hons)	**Type:** Ability Enhancement Course
Subject: MIL Gujarati-2	**Credits:** 2
Semester: 2	

Unit 1: વર્ણનાત્મક-1

- કાવ્યપંક્તિઓ કે ગદ્યસૂક્તિનો વિચારવિસ્તાર
- નિબંધ (વર્ણનાત્મક / વિશ્લેષણાત્મક / ચિંતનાત્મક / સાંપ્રત સમસ્યા પર આધારિત)

Unit 2: વર્ણનાત્મક-2

- પ્રચાર માધ્યમો માટે નિવેદનો તૈયાર કરવા
- પત્રલેખન (અભિનંદન/શુભેચ્છા/વિનંતી/ફરિયાદ વગેરે)

Unit 3: વર્ણનાત્મક-3

- ચર્ચાપત્ર (વર્તમાનપત્રમાં પ્રજાના પ્રશ્નો/સાંપ્રત સમસ્યાઓ/વ્યક્તિગત અભિપ્રાય રજુ કરતુ ચર્ચાપત્ર)
- ભાષાંતર : અંગ્રીજીમાંથી ગુજરાતીમાં અનુવાદ

Unit 4: વર્ણનાત્મક-4

- અહેવાલલેખન
- પુસ્તક સમીક્ષા (સૂચીમાં દર્શાવેલ પુસ્તકોમાંથી એક ઉપર)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Multidisciplinary
Subject: Energy Management and Audit in Green Schools	**Semester:** 2
Credits: 4	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Students' awareness about energy management and its conservation.
2. Aware of various governmental programs and energy audit practices.
3. Teaching methodology for General practices for energy audit for school children.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. A manual to assess the energy performance of your school by Centre for Science and Environment (CSE).
2. Manual of Energy Audit, BEE India.

Unit 1: Introduction To Energy Management

1. definition and objectives of energy management
2. Need for energy audit

Unit 2: Energy Audit: Types and Methodology

1. Type of Energy Audit
2. Ten steps methodology for energy audit
3. Phase wise audit activity

Unit 3: Detailed Energy Audit

1. Checklist of information to be collected during audit
2. Preparation of detail energy audit: Case study Penicillin-G Fermentation
3. Understanding Energy Costs
4. Benchmarking energy performance and Calculation

Unit 4: System Efficiency

1. Introduction
2. Fuel and Energy Substitution
3. Energy Audit Instruments

Unit 5: Introduction to GSP

1. What is the Green School Programme?
2. Audit Champs: Case studies of GSP schools

Unit 6: The process of audit

1. Profiling and Auditing the schools
2. Tasks of Energy Audit

Unit 7: Important Information

1. Important Information on Energy
2. Sources of Energy
3. Unequal distribution of energy
4. Tips to save energy
5. India's energy scenario
6. Rooftop solar panels in schools and its advantages

Unit 8: Case studies

1. Case studies of two GSP schools
2. How to make a school 'Energy Literate'
3. Case studies of 6 types of activities
4. Other Formulae

Name of Faculty: Science	**Department**: All
Program: B.Sc. (Hons)	**Type:** Multidisciplinary
Subject: Mastering Your Money: An Entry-Level course to Financial Planning and Smart Investments	**Semester:** 2
Credit: 04	**Total learning hours:** 60

Course description: This course provides students with a comprehensive introduction to financial and personal planning, empowering them to shape their current and future financial trajectories. Through theoretical exploration and practical application, students will gain a deep understanding of various investment avenues offered by governmental and private sectors, as well as other benevolent societies. Additionally, students will develop the skills necessary to navigate the complexities of the stock market, including equities and commodity derivatives, while effectively managing financial risks and adapting to the dynamic nature of the global market.

Student learning outcome:

By the end of this course, students will be able to:

1. Understand Financial Concepts: Demonstrate a solid comprehension of fundamental financial concepts, including budgeting, saving, investing, and debt management.
2. Analyze Investment Opportunities: Evaluate various investment options provided by governmental, private sector organizations, and benevolent societies to make informed decisions aligned with financial goals.
3. Navigate Stock Market Dynamics: Explain the components of the stock market, including equities and commodity derivatives, and analyze market trends to anticipate fluctuations and make strategic investment choices.
4. Manage Financial Risks: Identify and assess financial risks associated with different investment vehicles, and employ risk management strategies to mitigate potential losses.
5. Adapt to Global Market Changes: Recognize the dynamic nature of the global market and its impact on personal financial planning, and adapt strategies accordingly to optimize financial outcomes.

References

1. Arthur J. Keown: Personal Finance, Pearson India.
2. Eric Tyson: Personal Finance, 6th Edition Wiley publishing
3. Faith Glasgow: Personal Finance and investing, John Wiley and sons
4. Halan, Monika, Lets Talk Money: You've Worked Hard for It, Now Make It Work for You, July 2018, Harper Business.
5. Jack R. Kapoor, Les R. Dlabay, Robert J. Hughes, Melissa Hart: Personal Finance, Tata McGraw Hill India.
6. Lewis Altfest: Personal Financial Planning, Tata McGraw Hill.
7. Madura Jeff: Personal Finance, Pearson India.
8. Sinha. Madhu, Financial Planning: A Ready Reckoner July 2017 McGraw Hill.

Unit 1- Introduction to Financial Literacy

1.1 Meaning, Importance and Scope of Financial Literacy
1.2 Setting Financial Goals and Objectives
1.3 Various Financial Institutions: Banks, Insurance Companies, Post Offices
1.4 Time Value of Money: Compounding and Discounting

Unit 2- Banking Services

2.1 Types of Banks
2.2 Banking Products and Services
2.3 Types of Bank Deposit Accounts: Savings Bank Account, Term Deposit, Current Account, Recurring Deposit, PPF, NSC etc.
2.4 Prerequisite for Opening Various Types of Bank Accounts

Unit 3- Financial Services from Post Office

3.1 Post Office Savings Schemes: Savings Bank, Recurring Deposit, Term Deposit
3.2 Monthly Income Scheme, Kishan Vikas Patra, NSC, PPF, Senior Citizen Savings Scheme (SCSS), Sukanya Samriddhi Yojana (SSY)
3.3 India Post Payments Bank (IPPB), Indian Postal Order (IPO)
3.4 International Money Transfer Service, Electronic Clearance Services (ECS)

Unit 4- Investing in Mutual Funds

4.1 Basics of Investment, Introduction to Asset Management Companies
4.2 Strategies for Identifying Suitable Mutual Fund
4.3 Mutual Fund Investing Platforms

Unit 5- Investing in Stock Markets and Real Estate

5.1 Identifying Stocks, Holding, Day Trading, Hedging
5.2 Investing in Real Estate: Identifying Properties, Likely Legal Issues in Purchase of Property
5.3 Documents in Purchase of Property

Unit 6- Investing in Bonds

6.1 Investing in Gold Bonds, Sovereign Bonds, other Government Issued Bonds
6.2 Tax Saving Instruments: PF, PPF, POMIS, SSY, etc.
6.3 Housing Loans: Institutions Providing Housing Loans, Loans under Pradhan Mantri Awas Yojana - Rural and Urban

Unit 7- Financial Fraud and Its Preventive Framework

7.1 Financial Fraud: Definition and Types
7.2 Causes of Cheating and Fraud in Investment
7.3 Basics of Regulatory Framework for Investing: SEBI, IRDA, RERA, AMFI, Bank ombudsman

Unit 8- Insurance Services

8.1 Life Insurance, Term Life, Endowment Policies, Pension Policies, ULIP, Health Insurance and its Plans
8.2 Considerations in Purchase of Insurance
8.3 Comparison of Policies Offered by Various Life Insurance Companies
8.4 Retirement Planning: Pension Plans and NPS

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** Microbiology
Program: B. Sc. (Hons)	**Type:** Multidisciplinary Course
Subject: Nutrition and Fitness	**Credits:** 4
Semester: 2	
Course Description: The Fit India initiative, launched by the Indian government, seeks to embed fitness into the daily routines of all Indian citizens, recognizing the manifold health benefits of physical activity. This course delves into the synergistic relationship between nutrition and fitness, highlighting the importance of balanced dietary choices and physical exercise in achieving optimal health and well-being.	
Learning Outcome: By the end of the course, students will gain an understanding of how dietary choices and physical activity intersect to influence overall health. They will adeptly identify essential nutrients crucial for supporting optimal performance in various fitness endeavors. Students will assess the physiological effects of exercise on the body, enabling them to design effective fitness regimes that align with nutritional requirements. Ultimately, students will be equipped with the knowledge and skills to promote lifelong habits of health and wellness through education.	

Reference:

1. Dietary guidelines for Indians (2011). National Institute of Nutrition, ICMR, India.
2. Fitness Protocols and Guidelines, by Fit India Mission, Ministry of Youth Affairs and Sports, Government of India, India.

Unit 1: Fundamentals of Nutrition (7 hours)

1.1 Basics of health, nutrient requirements, and dietary standards

1.2 Definition and concept of: RDA and balanced diet

1.3 Understanding food groups, functions of food, and food in relation to health

Unit 2: Dietary Guidelines and Planning (8 hours)

2.1 Dietary guidelines for Indians

2.2 Balanced diet: Principles and components

2.3 Strategies for achieving a balanced diet: Food pyramid, MyPlate and healthy eating patterns

Unit 3: Nutritional Requirements (8 hours)

3.1 Nutritional needs of adults
3.2 Poor eating habits of current generation
3.3 Functional foods: Definition, benefits and uses
3.4 Nutrition and weight management: Over nutrition and Under nutrition

Unit 4: Healthy and Positive Food Concepts (8 hours)

4.1 Use of safe and clean foods
4.2 Restrict salt intake to minimum
4.3 Moderate use of edible oils
4.4 Eat plenty of vegetables and fruits

Unit 5: Participation in Physical Activity for Fitness (7 hours)

5.1 Fitness: Types and components
5.2 Benefits of fitness for physical wellbeing
5.3 Yoga for fitness
5.4 Role of exercise, dance, games, and sleep in fitness

Unit 6: Physical Fitness Assessment (8 hours)

6.1 Concept of physical fitness
6.2 Assessment tests: Flexibility, Muscular strength, Abdominal strength, Body Composition-BMI, Cardiovascular fitness, and Static balance test.

Unit 7: Psychological Aspects of Physical Fitness (7 hours)

7.1 Stress and anxiety management
7.2 Reduce depression
7.3 Improve self-esteem
7.4 Character development

Unit 8: Guidelines and Safety Considerations (7 hours)

8.1 Yoga guidelines: Before, During, and After the Practice
8.2 Environmental Considerations
8.3 Warm up, Hydration, Cool down and other considerations

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Name of Faculty: Science	**Department:** Biotechnology
Program: B.Sc. (Hons)	**Type:** Multidisciplinary
Subject: Aapnu Gujarat	**Credits:** 04
Semester: 2	
Course Description: The main objective of the course is to provide information about the historical perspective of Gujarat along with the geographic location, the Culture and Tourism observed in Gujarat that will help students in preparation of state level Public Services examinations.	
Student Learning Outcome: After completion of this course the students will be able to: 1. Understand the influence of historical events in the present status of Gujarat's Heritage. 2. Be informed about the Tourism and Culture of Gujarat. 3. Geographic location that puts Gujarat as a hub for vast business avenues.	

REFERENCES:

GPSC Exam Preparation Books

Unit 1: :Brief history of gujarat-1

1.1 Ánartta the first Puráṇic king of Gujarát, and the Yádavas in Dwárika
1.2 Mauryan and Greek Rule (B.C. 319–100)
1.3 The Kshatrapas (B.C. 70–A.D. 398):
1.4The Traikúṭakas (A.D. 250–450):
1.5 The Guptas (G. 90–149; A.D. 410–470):
1.6 The Valabhis (A.D. 509–766)
1.7The Chálukyas (A.D. 634–740)

Unit 2: :Brief history of gujarat-2
2.1 The Gurjaras (A.D. 580–808)
2.2 The Ráshṭrakúṭas (A.D. 743–974)
2.3The Mihiras or Mers (A.D. 470–900)
2.4 THE KINGDOM OF AṆAHILAVÁḌA (A.D. 720–1300), The Chávaḍás (A.D. 720–956), The Chaulukyas or Solaṅkis (A.D. 961–1242),The Vághelás (A.D. 1219–1304)
2.5 MARÁTHA PERIOD (A.D. 1760–1819)
2.6 GUJARÁT DISTURBANCES (A.D. 1857–1859)
2.7 Post Independence era

Unit 3:Geography of gujarat
3.1 Geographic location of Gujarat
3.2 Climatic conditions
3.3 Water resources of Gujarat
3.4 Sanctuaries
3.5 Districts of Gujarat
3.6 Flora and fauna of Gujarat
3.7 Mineral resources

Unit 4: Cultural Heritage of Gujarat

4.1 The people diversity of Gujarat
4.2 Folk Fairs
4.3 Culture of Coastal Gujarat
4.4 Tribal Culture of Gujarat (Festivals, dance, rituals tradition)

Unit 5 Satyagrahas of Gujarat
5.1 Kheda satyagraha
5.2 Bardoli Satyagraha
5.3 Ahmedabad Satyagraha
5.4 Dandi Kuch

Unit 6 Tourism in Gujarat
6.1 Tourism policy of Gujarat
6.2 Pilgrimage places
6.3 Historical monuments
6.4 Tourism places

Unit 7 Gujarati Theatre
7.1 Pre-independence and Post-independence
7.2 Prominent Actors and their contribution,
7.3Prominent playwrights and their contribution,
7.4 The new Gujarati Theatre

Unit 8 Folk culture and oral tradition of Gujarat
8.1 Painting
8.2 Handicrafts
8.3 Languages and literature
8.4 Folk songs and music
8.5 Folk Dance (Garba, Bhavai, Dandiya, Padhar, Tippani)

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Semester 3

B.Sc. (Hons) Chemistry Semester 3

Sr. No.	Category	Course Title	Course Type
1	Major	Organic Chemistry-1	Compulsory
2		Inorganic Chemistry-1	Compulsory
3		Biochemistry and Enzymology	Compulsory
4	SEC	Mushroom Cultivation Technology	Elective
		Economical Arthropods	
5	VAC	Indian Knowledge Systems (Temple Architecture and Design)	Elective
		Indian Knowledge Systems (Gananshastra)	
6	AEC	Communication Skills	Elective
		Mastering Google Drive	
7	Multidisciplinary	Entrepreneurship and Innovation- Indian Context	Elective
		Green Schools	
		Personal Finance and Investment Planning	
		Pharmaceutical Product	

Program: B.Sc. (Hons.)	**Type:** Major
Subject: Biochemistry and Enzymology	**Semester**: 3
Credit: 04	**Department:** Chemistry
Course description: This course provides fundamental knowledge of biochemistry. It gives an overview of classification of enzyme and mechanism of enzyme action. This course also deals with types and properties of biomolecules important for life. It also give an idea regarding bio-energetics.	
Student learning outcome: **Students will:** 1. Get an idea about the basic concepts of biochemistry 2. Know about the importance of biochemistry 3. Understand mono, di and polysaccharides 4. Able to comprehend the structure, function and acid base properties of amino acids and protein 5. Learn the nature and importance of enzymes in living systems 6. Understand the basic tenets of bioenergetics	

Reference books:

1. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.

2. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Lt

3. Nelson.D.L. and Cox.M..M -Lehninger's Principles of Biochemistry-Freeman & Co.- 7 th Edition

4. Voet, D.J., Voet, J.G., Pratt, C.W. (2008). Principles of Biochemistry (3rd ed.).

Unit: 1 Fundamentals of biochemistry **(05 Hrs)**

1.1 History, scope and avenues of biochemistry

1.2 Water as a biological solvent

1.3 Biological relevance of buffers

1.4 Outlines of surface tension, adsorption and osmosis and their biological relevance

Unit: 2 Carbohydrates **(08 Hrs)**

2.1 Classification

2.2 Monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers,

2.3 Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose)

2.4 Structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen).

Unit: 3 Lipids **(08 Hrs)**

3.1 Classification - neutral lipids, Phospho lipids (lecithines, cephalins, plasmalogens) and glycolipids

3.2 Fatty acids – saturated, unsaturated fatty acids, essential fatty acids

3.3 Properties – Hydrolysis-acid number, saponification number. Auto-oxidation (Rancidity), iodine value, Polenske number, Reichert-Meissl number, acetyl number.

3.4 General properties and structures of phospholipids, sphingolipid Prostaglandins- structure, types and biological role

Unit-4 Amino acids and protein **(08 Hrs)**

4.1 Classification of all amino acids

4.2 General methods of preparation and properties of amino acids

4.3 Proteins: structure of protein

4.4 Qualitative and quantitative analysis of proteins

Unit: 5 Enzymes **(08 Hrs)**

5.1 Introduction, classification and nomenclature of enzymes

5.2 Specificity and mechanism of enzyme action (Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.)

5.3 Factors affecting enzyme action

5.4 Enzyme inhibitors and their importance, phenomenon of inhibition.

Unit: 6 Concept of energy in biosystems **(08 Hrs)**

6.1 Introduction to metabolism (catabolism, anabolism)

6.2 ATP: The universal currency of cellular energy, hydrolysis and free energy

6.3 Agents for transfer of electrons in biological redox systems: NAD^+, FAD

6.4 Outline of catabolic pathways of carbohydrate- glycolysis, fermentation, Krebs cycle

Practical (Minimum four):

1. Qualitative tests for carbohydrates
2. Estimation of sugar by Cole's method
3. Determination of Iodine number of an oil/ fat
4. Estimation of proteins by Lowry's method
5. Determination of enzyme activity
6. Separation of amino acids by paper chromatography

Reference books:

1. Mu P, Plummer DT. Introduction to practical biochemistry. Tata McGraw-Hill Education; 2001.
2. Sawhney, S. K. & Singh, R. (2008) Introductory Practical Biochemistry Narosa Publishing House Pvt. Ltd. New Delhi.
3. Sadasivam, S. & Manickam, A. (2006) Biochemical Methods New Age International (P) Limited, New Delhi.

Program: B.Sc. (Hons.)	**Type:** Major
Subject: Organic Chemistry-I	**Semester**- 3
Credits: 04	**Department:** Chemistry
Course description: This course provides a systematic study of the theories, principles, and techniques of basic organic chemistry. Topics include structure and structural theories of organic compounds, organic reactions and their mechanisms, study of aliphatic and aromatic hydrocarbons and stereochemistry.	
Student learning outcome: **Students will be able:** 1. To identify functional groups. 2. To describe alkanes, alkenes, and alkynes. 3. To describe isomerism in alkenes and cyclic compounds. 4. To understand aromaticity and aromatic compounds 5. To distinguish between variety of polynuclear compounds	

Reference books:

1. Organic Chemistry, Volume-1,2, I.L.Finar, 6th Edn., 2002, Pearson
2. Organic Chemistry, 7th , By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson
3. Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand
4. Organic Chemistry, W.H. Perkin and F. S. Kipping, 2012, Nabu Press
5. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand

Unit: 1 Alkanes **(08 Hrs)**

1.1 Introduction and nomenclature
1.2 Structural isomerism in alkane
1.3 Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, Grignard reagent
1.4 General Chemical/physical properties of the alkanes
1.5 Reactions of alkaness

Unit: 2 Alkenes, dienes and alkynes **(08 Hrs)**

2.1 Method of Preparation of alkenes and Saytzeff Rule
2.2 Reactions of alkenes and Markownikoff's and anti-Markownikoff's addition
2.3 Classification of dienes
2.4 1, 3-butadiene: preparation and properties
2.5 Preparation and reaction of alkynes

Unit: 3 Alkyl halides **(08 Hrs)**

3.1 Preparation: from alkenes and alcohols
3.2 Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions
3.3 Williamson's ether synthesis
3.4 Elimination vs substitution
3.5 Monohalogen, dihalogen, trihalogen and polyhalogen derivatives

Unit: 4 Aryl halides **(06 Hrs)**

4.1 Preparation, including preparation from diazonium salts
4.2 Nucleophilic aromatic substitution; SNAr, Benzyne mechanism
4.3 Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.
4.4 Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds

Unit: 5 Cycloalkanes **(07 Hrs)**

5.1 Types of cycloalkanes and their relative stability
5.2 Baeyer strain theory
5.3 Theory of strainless ring
5.4 Method of preparation
5.5 Chemical reactions

Unit-6 Aromatic hydrocarbons **(08 Hrs)**

6.1 The Concept of aromaticity –Aromatic, Antiaromatic and non-aromatic compounds, Huckel's rule and applications of Huckel'srule,
6.2 Structure of benzene, stability of benzene ring
6.3 Heats of hydrogenation and combustion, C-C Bond lengths, resonance structure of benzene
6.4 Molecular orbital picture of benzene
6.5 Nomenclature of benzene derivatives

Practical (Minimum four)

Organic spotting:

Acid: Anthranilic acid, Hippuric acid, Sulphanilic acid

Phenol: Resorcinol, o-nitrophenol

Base: o-nitroaniline, p-chloroaniline

Neutral: Nitrobenzene, Chlorobenzene, Thiourea, Bromobenzene

Reference book:

1. Vogel, A.I. Quantitative Organic Analysis, Part 3, 2012, Pearson
2. Practical Organic Chemistry, Mann, F.G. & Saunders, B.C., 2009, Pearson Education

Program: B.Sc. (Hons.)	**Type:** Major
Subject: Inorganic Chemistry-I	**Semester**- 4
Credit: 04	**Department:** Chemistry
Course description: This course provides an overview of fundamental topics in inorganic chemistry. This course includes knowledge in the areas of basic inorganic chemistry. Course comprises information about bonding, molecular structure, acid base concept and inorganic polymers.	
Student learning outcome: **Students will be able:** 1. To understand various theories of chemical bonding 2. To apply theories of chemical bonding of molecules. 3. To understand the concept of acid and bases and its application 4. To know about various aspects of metallurgy 5. To understand the chemistry of elements of zero and s, p block elements	

Reference books:

1. Advanced Inorganic Chemistry, Satya Prakash Tuli, Basu & Madan, 6thEdn, S. Chand and Company Limited.
2. Quantitative Inorganic Analysis, Vogel AI, 3rdEdn, Longmans Group Ltd.
3. Theoretical Inorganic Chemistry, Day, M.C. and Selbin, J, East West Press
4. Concise Inorganic Chemistry, Lee J. D, 5thEdn, Wiley India
5. Inorganic chemistry: principles of structure and reactivity, Huheey JE, Keiter EA, Keiter RL, Medhi OK, Pearson Education India; 2006.
6. Principles of Inorganic Chemistry, Puri, Sharma, Kalia, 33rdEdn, Vishal Publishing co.
7. Selected Topic in Inorganic Chemistry, Malik, Tuli, Madan, 17th Edn, 2010, S. Chand, New Delhi
8. Basic Inorganic Chemistry, Cotton, F. A. Wilkinson, G., & Gaus, P. L, 1995, John Wiley & Sons.

Unit: 1 Molecular structure **(08 Hrs)**

1.1 VSEPR theory

1.2 MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals

1.3 Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, F_2, CO, NO and their ions (CO^+, NO^+, NO^-)

1.4 Electron deficient compounds

Unit: 2 Ionic bonding (08 Hrs)

2.1 General characteristics of ionic bonding
2.2 Energy considerations in ionic bonding, lattice energy and solvation energy
2.3 Born-Landé equation for calculation of lattice energy (no derivation) and Born-Haber cycle
2.4 Polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Unit: 3 Acid-base and buffers (06 Hrs)

3.1 Brönsted-Lowry concept of acid-base reactions, Lewis acid-base concept
3.2 Lux-Flood concept and solvent system concept
3.3 Concept of Hard and Soft Acids and Bases (HSAB) and its application
3.4 Buffer solutions

Unit-4 Chemistry of zero group and s-block elements (08 Hrs)

5.1 Isolation and separation of inert gases from air and compounds of inert gases
4.2 Importance of inert gases in theoretical chemistry
4.3 Anomalous behavior of Li, Be
4.4 Diagonal relationship between Li and Mg
4.5 Polymer complexes (Crown ether complexes) of alkali metals

Unit: 5 Chemistry of p- block elements (08 Hrs)

5.1 Periodicity with respect to electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity,
5.2 Catenation, Allotropy of C, P, S
5.3 Diagonal relationship between B and Si and anomalous behaviour of first member of each group
5.4 Preparation and applications in industrial and environmental chemistry of: Hydrides of nitrogen (NH_3, N_2H_4, N_3H, NH_2OH), Oxoacids of P, S and Cl, Halides and oxohalides: PCl_3, PCl_5, $SOCl_2$ and SO_2Cl_2.

Unit: 6 General principles of metallurgy (07 Hrs)

6.1 Chief modes of occurrence of metals based on standard electrode potentials
6.2 Ellingham's diagrams: Salient features, selection of reducing agents using Ellingham diagrams and electrolytic reduction
6.3 Hydrometallurgy with reference to cyanide process for silver and gold
6.4 Methods of purification of metals: Electrolytic process, van Arkel-de Boer process and Mond's process, Zone refining.

Practicals (Minimum four):

Inorganic qualitative analysis

Cations: NH_4^+, Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, K^+, Na^+

Anions: CO_3^{2-}, S^{2-} , SO_4^{2-}, NO_2^- , Cl^-, Br^-, I^-, NO_3^-,CrO_4^{2-} , PO_4^{3-} , BO_3^{3-} , F^-, O^{2-}

Reference book:

Vogel's Qualitative Inorganic Analysis, Prentice Hall.

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department:** Microbiology
Program: B. Sc. (Hons)	**Type:** Skill Enhancement Course
Subject: Mushroom Cultivation Technology	**Credits:** 2
Semester: 3	
Learning Outcome: Upon finishing the Mushroom Cultivation Technology course, students will 1. Acquire diverse skills encompassing mushroom cultivation methods, substrate preparation, environmental management, and harvesting practices. Furthermore, they will gain insights into assessing market opportunities and crafting effective strategies for thriving mushroom cultivation enterprises. 2. Aligns with the SKILL INDIA MISSION ('Kaushal Bharat, Kushal Bharat') by fostering professional competency among students, nurturing their entrepreneurial capabilities for sustainable growth.	

Reference:

1. Participant Handbook by Agriculture Skill Council of India.
2. National Horticulture Board (NHB): Cultivation Technology and Technical Standards of Components of Integrated Button Mushroom Unit, Ministry of Agriculture and Farmers Welfare, Government of India.
3. ED, A. M., ED, S. S., & Thakur, M. P. (2016). Mushroom Training Manual. ICAR, India.

Unit 1: Introduction to Mushrooms (8 hours)

1.1 Overview of mushrooms and their importance
1.2 Basic biology of mushrooms
1.3 Edible vs. non-edible mushrooms
1.4 Health benefits of edible mushrooms
1.5 Popular edible mushroom species available in India

Unit 2: Cultivation Techniques and Practices (8 hours)

2.1 Overview of cultivation methods
2.2 Container selection
2.3 Substrate selection, preparation, and sterilization
2.4 Preparation of spawn and spawning
2.5 Controlling temperature, humidity, and light

Unit 3: Harvesting and Post-Harvest Handling (7 hours)

3.1 Understanding the mushroom growth cycle
3.2 Harvesting techniques and timing
3.3 Storage

Unit 4: Market Potential of Mushrooms (7 hours)

4.1 Overview of the mushroom market and demand
4.2 Considerations for scaling up mushroom production
4.3 Funding and support options for mushroom cultivation businesses

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** SEC
Subject: Economical Arthropods	
Semester: 3	
Credits: 2	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. The paper will introduce students to insects economically useful to humans.
2. Students will also learn the classification, morphology and morphology of insects.
3. Students will also gain skilful knowledge regarding rearing, culturing, preservation and processing techniques of various products of selected insects.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Jordan and Verma (2015): Invertebrate Zoology, S.Chand Publication, New-Delhi.
2. Kotpal, R. L (2005): Arthropoda, Rastogi Publication, Meerut.
3. Kotpal, R.L (2011): Invertebrates, Rastogi Publication, Meerut.
4. Upadhyay and Shukla (2002): Economic Zoology, Rastogi Publication, Meerut.

Unit 1: Introduction to Arthropoda **7 Hours**

1.1 Biological Success
1.2 Habits & Habitat
1.3 General Characters
1.4 Classification of Arthropoda

Unit 2: Apiculture

7 Hours

2.1 Species & Social Organization of Honey Bee
2.2 External Morphology & Selection of Bees
2.3 Appliances & Methods for Bee Keeping
2.4 Products & Economic importance of Bee Keeping

Unit 3: Prawn Culture **8 Hours**

3.1 Types & Species of Prawn
3.2 Culturing of Fresh & Marine Water Prawn
3.3 Preparation & Methods of Farming
3.4 Preservation & Processing of Prawn

Unit 4: Lac Culture **8 Hours**

4.1 Distribution & Life History
4.2 Selection of Host Plant
4.3 Cultivation & Processing of Lac
4.4 Threats & Economic importance of Lac Industry

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Value Added Course
Subject: IKS (Temple Architecture and Design)	
Credits: 2	
Semester: 3	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Understand architectural diversity of ancient and modern Hindu temples.
2. Learn different parts and styles of Hindu temples.
3. Gain knowledge about history and design of famous Indian temples.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Krishna Dev (1963): Temples of Northern India, National Book Trust of India, Delhi.
2. S. Kremirish (1946): Hindu Temples Part I and II, Calcutta.
3. Shri K.R. Nivason (2016): Dakshin Bharat Ke Mandir, National Book Trust of India, Delhi.
4. Surendra Sahai (2007): Indian Architecture-Hindu, Buddhist, and Jain, Prakash Books, India. ISBN: 9788172341299

Unit 1: Introduction and Fundamentals of Forest Mensuration System (07 hours)

1.1 Introduction and basic form of Hindu temple
1.2 Terminology of Hindu temple
1.3 Key features of Hindu temples

Unit 2: Styles of temple Architecture (07 hours)

2.1 Nagara (North Indian) Style
2.2 Vesara Style
2.3 Dravida (South Indian) Style

Unit 3: Features of temple architecture (08 hours)

3.1 Features of Nagara and Dravida Temple Style Architecture of India
3.2 Classification of Nagara Temple Style
3.3 Classification of Dravida Temple Style
3.4 Deccan, Buddhist and Jain temple architecture, Hill temples

Unit 4: Major Hindu temples of India (08 hours)

4.1 Meenakshi Amman Temple
4.2 Khajuraho Group of Temples
4.3 Brihadeeswarar Temple
4.4 Puri Jagannath Temple
4.5 Shri Somnath Temple

Sarvajanik University

Faculty of Science

Faculty: Science	**Department**: Computer Sci
Program: B.Sc. (Hons)	**Type**: Value Added Course (VAC)
Subject: Indian Knowledge System (Gananshastra)	**Credits**: 2
Semester: 3	

References:

1. Introduction to Indian Knowledge Systems - Concepts and Application, B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pava R.N., PHI Publication
2. Sivananda S. All about hinduism. Sivananda literature research institute; 1988.
3. Dharampal G. Essential Writings of Dharampal. Publications Division Ministry of Information & Broadcasting; 2017 Nov 3.
4. Bajaj J, Śrīnivāsa MD. Sanatana Bharat, jagrita Bharat= Timeless India, resurgent India: a celebration of the land and people of India. (No Title).

Unit 1: Number System in IKS - Part 1 (07 hours)

- Number System in India - Historical Evidence
- Features of Indian Numeral System - Concept of zero and its importance, Large Number Representation, Place Value Numerals, Decimal System

Unit 2: Number System in IKS- Part 2 (07 hours)

- Unique Approaches to Represent Numbers

- Bhuta Samkhya System,
- Katapyadi system

- Pingala and Binary System
- Binary word system

Unit 3: Arithmetic (08 hours)

- Square of Number,
- Square Root
- Square Root of Imperfect Squares
- Binary Mathematics and Combinatorial Problems in Chanda Shahstra of Pingala 300 BCE
- Magic Squares in India

Unit 4: Series and Progression (08 hours)

- Series - upaciti
- Sum of Series of Squares and Cubes
- Repeated sum of series - Varasnkalita
- Pi approximation techniques
- Contribution of Indian Mathematicians

Name of Faculty: Science	**Department: All**
Program: B.Sc. (Hons)	**Type: Ability Enhancement Course (AEC)**
Subject: Communication Skills	**Semester: 3**

Credits: 02	**Total Learning Hours:** 30 Hours

Course Description:

- Identify common communication problems that may be holding learners back
- Perceive what the non-verbal messages are communicating to others
- Understand the role of communication in the teaching-learning process
- Learn to communicate through the digital media
- Understand the importance of empathetic listening
- Explore communication beyond language

Student Learning Outcome:

After completion of the course the student will be able to

1. Get a clear understanding of good communication skills
2. Know what they can do to improve their communication skills.

Unit – 1 Listening & Speaking Skills (08 Hours)

1.1. Techniques of Effective Listening
1.2. Listening and Comprehension
1.3. Probing Questions
1.4. Barriers to Listening
1.5. Pronunciation
1.6. Enunciation
1.7. Vocabulary
1.8. Common Errors

Unit – 2 Reading Skill (06 Hours)

2.1. Techniques of Effective Reading
2.2. Gathering Ideas and Information from a Given Text
2.3. Evaluating these Ideas and Information
2.4. Interpreting the Text

Unit – 3 Writing and Different Modes of Writing (08 Hours)

3.1. The Writing Process
3.2. Effective Writing Strategies
3.3. Different Modes of Writing
3.4. Types of Business Letters - Inquiry, Reply, Complaint
3.5. Email, Blogs

Unit – 4 Non – Verbal Communication (08 Hours)

4.1. Meaning of Nonverbal Communication (NVC)
4.2. Advantages of Using Nonverbal Communication
4.3. Introduction to Modes of Nonverbal Communication
4.3.1. Open and Closed Body Language
4.3.2. Eye Contact and Facial Expression
4.3.3. Hand Gestures
4.4. Do's and Don'ts in NVC
4.5. Learning from Experts
4.6. Activities-based Learning

Recommending Reading:

1. Kumar, S and Pushp Lata. Communication Skills. New Delhi, OUP, 2015.
2. Raman, Meenakshi and Sangeeta Sharma. Technical Communication: Principles and Practice. New Delhi, OUP, 201

Online Resources:

1. https://www.thoughtco.com/what-is-nonverbal-communication-1691351
2. https://www.skillsyouneed.com/ips/nonverbal-communication.html
3. https://www.andrews.edu/~tidwell/bsad560/NonVerbal.html
4. https://artofeloquence.com/pages/the-importance-of-body-language
5. https://www.tutorialspoint.com/body_language/body_language_open_closed.htm# Life Skills (Jeevan Kaushal) Facilitators' Manual 2022 39
6. https://study.com/academy/lesson/facial-expressions-in-nonverbal-communicationimportance-lesson-quiz.html
7. https://www.sophia.org/tutorials/eye-contact-and-facial-expression
8. https://socialtriggers.com/21-hand-gestures-for-powerful-communication/
9. https://www.gqrgm.com/interview-dos-donts-importance-nonverbal-communication/ Video
10. https://www.lifemasterygym.com/blog/power-of-non-verbal-communication
11. https://www.youtube.com/watch?v=vyrGNZ4Lzrw
12. https://www.youtube.com/watch?v=FU0DkL184_4
13. https://www.youtube.com/watch?v=qRnwdWXbwDY
14. https://www.youtube.com/watch?v=1zs-DRBWLmE
15. Bailey, Stephen. 2010. Academic Writing: A handbook for International Learners. Routledge
16. Hogue, Ann. 1995. First Steps in Academic Writing. Pearson Longman.
17. Taylor, Shirley. 2006. Communication for Business. Pearson Education.
16. https://learnenglishteens.britishcouncil.org/skills/writing
18. http://www.sciedu.ca/journal/index.php/ijhe/article/view/9190
19. https://www.britishcouncil.in/
20. https://literarydevices.net/context/
21. https://courses.lumenlearning.com/waymaker-level3-english/chapter/text-inductivereasoning/
22. http://www.criticalreading.com/interpretation.htm
23. http://www.criticalreading.com/restatement.htm
24. http://www.criticalreading.com/description.htm
25. https://www.britishcouncil.in/sites/default/files/day_3_-_sruti_akula.pptx
26. https://www.cs.kau.se/cs/education/courses/dvad07/Lectures/Critical_Reading.pdf

27. https://www.youtube.com/watch?v=fOYtzoiI2XI 2.
https://www.youtube.com/watch?v=VrD9-In6C1o
28. https://literarydevices.net/context
https://www.strategiesinlanguagelearning.com/how-to-improve-english-pronunciation/
29.
http://giftarist.expertscolumn.com/article/speech-delivery-importance-enunciation-andpronunciation
30.
https://www.wikihow.com/Enunciate
31. https://englishforeveryone.org/PDFs/Homonyms,%20Homographs,%20Homophones.pdf
32. https://learnenglishteens.britishcouncil.org/exams/speaking-exams/fluency
33. https://www.learnpick.in/blog/8-common-mistakes-make-speaking-english
34. https://www.fluentu.com/blog/english/common-mistakes-in-english

Faculty: Science	**Department: Microbiology**
Program: B. Sc. (Hons)	**Type:** Ability Enhancement Course (AEC)
Semester: 3	
Subject: Mastering Google Drive	
Credit: 02	**Total learning hours: 30 hr**

Rationale: / Course description:
In today's digital age, proficiency with online tools like Google Drive is essential. Google Drive provides a free and accessible platform for storing, sharing, and collaborating on documents. Google Drive is widely used in educational settings for assignments, collaboration among students and teachers, and managing course materials. Mastery of Google Drive can enhance one's professional skill set, making individuals more competitive in the job market and more valuable to employers.

Students Learning Outcome:
Upon completion of the course, students will be able to:

1. Understanding Google Drive Basics
2. Effective File Management Skills
3. Collaborative Editing and Real-Time Collaboration

References:

1. **Steve, R. (2020).** Google Drive, Docs, and Sheets for Beginners 2021: Using Google Drive, Docs, and Sheets and Utilizing All Its Features. United States: RS Publishing House.
2. **Lamont, I. (2018).** Google Drive & Docs in 30 Minutes: The Unofficial Guide to Google Drive, Docs, Sheets & Slides. United States: I30 Media Corporation. ISBN: 9781641880107
3. **Darbyshire, P., Darbyshire, A. (2010)**. Getting StartED with Google Apps. Netherlands: Apress.

Unit-1: Basics of Google drive		
	1.1	Use of Google Drive
	1.2	Interface of Google drive
	1.3	Navigating the main screen of google drive
	1.4	Making of folder, Management of folders
Unit-2: Use of Google Docs		
	2.1	Creating Google Doc, Naming the file
	2.2	Editing the file
	2.3	Understanding of Various Tabs and their function
	2.4	Import, Export and Sharing of Google Docs
Unit-3: Use of Google Sheet		
	3.1	Creating and naming the Google Sheet
	3.2	Importing the data
	3.3	Formatting the sheet
	3.4	Basic Functions in Google sheet and sharing
Unit-4: Use of Google Slide and Google forms		

	4.1	Creating and launching of Google slide
	4.2	Import the presentation and add slide to the presentation
	4.3	Editing the google slide
	4.4	Export, share and present the google slide
	4.5	Creating , editing and formatting google form and quiz
	4.6	Host control; Sharing and collecting the data by Google Form

Name of Faculty: Science	**Department:** Biotechnology
Program: B.Sc. (Hons)	**Type:** Theory
Subject: Entrepreneurship and Innovation- Indian Context	**Semester:** 03
Credit: 04	**Total learning hours:** 60
Type: Multidisciplinary course	
Course description: This multidisciplinary course is designed to provide students with a comprehensive understanding of entrepreneurship and innovation in the Indian context, equipping them with the knowledge, skills, and networks needed to succeed as entrepreneurs in India's diverse and dynamic market landscape.	
Student learning outcome: 1. Students will be able to demonstrate the ability to recognize market needs and gaps, generate innovative ideas and evaluate the feasibility and viability of entrepreneurial opportunities. 2. Students will be able to create well-structured and actionable business plans that outline the mission, vision, goals, strategies, and financial projections of a new venture, integrating market analysis, competitive positioning, and growth strategies. 3. Students will be able to get idea about to the entrepreneurial landscape in India, historical perspectives, and current trends 4. Students will understanding the Indian startup ecosystem, funding options, and support mechanisms for entrepreneurs 5. Students will developing comprehensive business plans and strategies tailored to the Indian market.	

References:

1. Startup India: Insight for Aspiring Entrepreneurs by Varun Aggarwal (2017) Publisher: Penguin Random House India
2. The lean Start Up: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Business by Eric Ries (2011) Publisher: Crown Business
3. India Startup Ecosystem: An Entrepreneur's Guide to Navigating the Indian Startup Landscape by Mukesh Bansal (2020) Publisher: Harper Collins India

Unit-1 Introduction to Entrepreneurship in India (8 hrs)

1.1 Overview of Indian entrepreneurial ecosystem: opportunities, challenges, and key players
1.2 Historical evolution of entrepreneurship in India
1.3 Role of government policies, regulatory environment and cultural factors in shaping entrepreneurship

Unit-2 Opportunity Recognition and Ideation (8 hrs)

2.1 Market research and analysis for identifying unmet needs in the Indian market
2.2 Idea generation methods tailored to the Indian context
2.3 Identifying opportunities in emerging sectors such as technology, agriculture, healthcare and renewable energy

Unit-3 Indian Startup Ecosystem and Funding Landscape (8 hrs)

3.1 Overview of Incubators, accelerators and start up support organization in India
3.2 Sources of funding for startups: angel investors, venture capital, government schemes
3.3 Case studies of successful Indian startups and their funding journeys

Unit-4 Business planning and strategy (8 hrs)

4.1 Component of business plan: market analysis, financial projections, marketing strategy
4.2 Adapting global business models to the Indian context
4.3 Strategies for navigating regulatory and bureaucratic hurdles in India

Unit-5 Marketing and Sales Strategies for Indian Markets (8 hrs)

5.1 Market segmentation and targeting strategies in diverse Indian demographics
5.2 Pricing, distribution and promotional stretagies tailored to Indian consumer behavior
5.3 Digital marketing and e-commerce trends in India

Unit-6 Innovation and Technology in India (6 hrs)

6.1 Emerging technologies with potential for disruption in India
6.2 Startups leveraging technology to address Indian societal challenges
6.3 Government Initiative promoting innovation and technology entrepreneurship

Unit-7 Legal and Regulatory Environment in India (6 hrs)

7.1 Business registration, intellectual property protection and compliance requirement in India
7.2 Contract Law, employment regulation and taxation for startups
7.3 Challenges and opportunities in navigating the Indian legal system

Unit-8 Scaling and Growth Strategies for Indian Startups (8 hrs)

8.1 Scaling models and growth strategies for Indian start ups
8.2 Accessing international markets and global expansion strategies
8.3 Managing organizational growth and maintainin startup culture

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Multidisciplinary
Subject: Green Schools	**Semester:** 3
Credits: 4	

Student Learning Outcomes (SLOs):

1. The course is designed to provide the basic understanding of teaching methodology for green education.
2. It will be helpful to students to develop teaching capacity to teach school students with understanding nature and sustainable goals to save energy and environment.

References and Textbooks:

1. Towards a Green School on Education for Sustainable Development for Elementary Schools by National Council of Educational Research and Training
2. Joy Palmer, Philip Neal, The handbook of Environmental Education, Routledge.

Unit 1: Green School Concept and Curriculum

1. Green School: Concept and Background
2. Green School and ESD
3. Essential Aspects
4. Towards Green School Curriculum
5. What is Greening of Curriculum?
6. Understanding Green Curriculum

Unit 2: Green Practices

1. The Classroom
2. Common Spaces
3. Conserving Water
4. Conserving Electricity
5. Managing Garbage
6. Plantation

Unit 3: Greening of School Activities

1. School Assembly
2. Occasions and Festivals
3. Safe School Environment
4. Infrastructure Safety Audit

Unit 4: Assessment

1. How Green is a School?
2. Profile of a Green School

Unit-5: Planning and Practices at Primary Level

1. Overall model for teaching and learning
2. Issue-Based themes and topics

Unit-6: Planning and Practices at Secondary Level

1. Lesson plan
2. Individual efforts- litter as an example
3. Concentric Approach
4. Blocking time-table

Unit-7: The Out Of school approach (The Field Work)

1. Out of classroom
2. Local action for a better environment
3. School case studies

Unit-8 Practicalities For Environmental Education

1. Developing policies
2. Implementation of School Policies

Faculty: Science	**Department:** Microbiology
Program: B. Sc. (Hons)	**Type:** Multidisciplinary
Subject: Personal Finance and Investment Planning	
Credits: 4	**Semester:** 3

Course description:

The course is designed to provide basic financial literacy which is a prerequisite for the students to manage financial aspects of the life.

Student learning outcome:

1. To familiarize students with the Financial System, Institutions & Market.
2. To expose students to the various avenues available for effective investment and risk management.
3. Acquire skill to protect assets by insurance planning.
4. Understanding of the Indian tax system.
5. Able to plan financially independent retirement.

Reference Books:

1. Jeff Madura, Personal Finance, 7edition, Pearson Education, 2020 (ISBN: 978-0-13-498996-9)
2. Shalu Garg, Personal Financial Planning, 1st Edition (2024) Sultan Chand & Sons, New Delhi (ISBN: 978-93-91820-90-9)
3. M.K. Sarva, Personal Financial Planning, LPU, Excel Books Pvt. Ltd., new Delhi
4. Arthur J. Keown: Personal Finance, Pearson India.
5. Eric Tyson: Personal Finance, 6th Edition Wiley publishing
6. Faith Glasgow: Personal Finance and investing, John Wiley and sons
7. Jack R. Kapoor, Les R. Dlabay, Robert J. Hughes, Melissa Hart: Personal Finance, Tata McGraw Hill India.
8. Lewis Altfest: Personal Financial Planning, Tata McGraw Hill.
9. Sinha. Madhu, Financial Planning: A Ready Reckoner July 2017 McGraw Hill.

Unit-1: Structure of Indian Financial System **(Duration: 08 Hrs)**

3.1 Features of Indian financial system

3.2 Components of Indian financial system

- 3.2.1 Financial Institutions
- 3.2.2 Financial markets
- 3.3.3 Financial Instruments/Assets/Securities
- 3.3.4 Financial Services

3.3 Functions of Indian financial system

3.4 Regulators of Indian Financial markets.

Unit-2: Introduction to personal financial planning (Duration: 07 Hrs)

2.1 Meaning and concept of finance
2.2 Different definition of finance
2.3 Meaning and concept of financial planning
2.4 Importance of financial planning
2.5 Financial goals: Types of financial goals & SMART financial goals
2.6 Components of financial plan
2.7 Process of financial planning

Unit-3: Fundamentals of Investment (Duration: 07 Hrs)

3.1 Objective of investments
3.2 Types of investments
3.3 Managing Investment Risk – Types of risk, Measurement of risk
3.4 Return from Investment – Types of return and their calculations

Unit-4: Investment Instruments - I (Duration: 08 Hrs)

4.1 Government Securities & Small Saving Schemes
4.2 Fixed income Instruments
4.3 Bond
4.4 Precious metal
4.5 Real estate & REITs
4.6 Digital currency
4.7 International Investment Avenues

Unit-5: Investment Instruments - II (Duration: 08 Hrs)

5.1 Stocks: Stock exchanges, Stock Price Quotations, Purchasing and selling stocks – Selecting broker, Placing an order, Buying stocks on margin, Short selling stock, Analyzing stocks – Firm's Financial and economic condition, Industry condition, Limitation of stock analysis.

5.2 Mutual Fund: Introduction – NAV, Open-End V/s Closed-End fund, Load v/s No load fund, Expense ratio., Types of mutual funds: Stocks, Bonds., Exchange traded funds: Types, Advantage & Disadvantage., Return and risk of mutual fund, Reviewing a Mutual Fund's Prospectus.

Unit-6: Insurance Planning (Duration: 07 Hrs)

6.1 Need for insurance
6.2 Characteristics of Insurance
6.3 Rights of the Insurer
6.4 Rights of the Insured
6.5 Types of Insurance

Unit-7: Personal Tax Planning (Duration: 07 Hrs)

7.1 Concept of tax structure in India – Direct tax and Indirect tax
7.2 Need for tax planning
7.3 Objectives & Advantages of tax planning

7.4 Exemption and Deduction
7.5 Tax Saving Options

Unit-8: Retirement Planning **(Duration: 08 Hrs)**

8.1 Why plan for retirement
8.2 Retirement assets
8.3 Retirement planning goals
8.4 Process of retirement planning
8.5 Pension plans available in India
8.6 Will

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Name of Faculty: Science	**Department**: Biotechnology
Program: B.Sc. (Hons)	**Type:** Theory
Subject: Pharmaceutical Product	**Semester:** 04
Credit: 04	**Total learning hours:** 60
Type: Multidisciplinary course	**Semester:** 3
Course description: The objectives of this course are to provide students with a comprehensive understanding of the process involved in developing pharmaceutical products from conception to market launch. This course integrates principles from various fields including pharmacology, chemistry, biology, engineering and marketing to equip students with the necessary knowledge and skills to contribute effectively to the pharmaceutical industry.	
Student learning outcome: 1. Students will develop an understanding of pharmaceutical industry and its products. 2. Students will gain knowledge about techniques of drug formulation, dosage , drug delivery and along with excipients. 3. The units will also focus on and thus provides knowledge of drug stability and shelf life, along with pharmaceutical packaging and labelling. 4. At the end of the course, the students will have sufficient scientific understanding of the subject and have good knowledge of current trends and future direction in pharmaceutical product.	

References:

Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists" by David G. Watson

Unit-1 Introduction to Pharmaceutical Products **(6 hr)**

1.1 Overview of the pharmaceutical industry
1.2 Historical perspective
1.3 Milestone in drug development

Unit-2 Drug formulation and Dosage forms **(8 hr)**

2.1 Types of drug dosage forms
- 2.1.1 Solid
- 2.1.2 liquid
- 2.1.3 semi solid
- 2.1.4 parenteral

2.2 Principle of drug dosage formulation and dosage form design
2.3 Manufacturing process and techniques for different dosage forms

Unit-3 Pharmaceutical Excipients **(6 hr)**

3.1 Role of excipients in drug formulation
3.2 Common excipients used in pharmaceutical products and their fundtions

Unit-4 Drug delivery system **(8 hr)**

4.1 Controlled release drug delivery system
4.2 Targeted drug delivery system

4.3 Novel drug delivery techniques – Nasal, Osmosis, RNAi
4.4 Personalize medicine and personalize drug target

Unit-5 Drug stability and Shelf life **(8 hr)**
5.1 Factors affecting drug stability
5.2 Method of assessing shelf life of pharmaceutical products
5.3 Method of extending shelf life of pharmaceutical products

Unit-6 Quality control and drug stability testing **(8 hr)**
6.1 Definition and importance of Quality control
6.2 Role of QC in pharmaceutical manufacturing
6.3 Types and Importance of drug stability testing
6.4 Factor affecting stability testing

Unit-7 Pharmaceutical packaging and labelling **(8 hr)**
7.1 Packaging materials for pharmaceutical products
7.2 Packaging techniques for pharmaceutical products
7.3 Labelling requirement and regulation

Unit-8 Case studies of popular pharmaceutical products **(8 hr)**
8.1 Aspirin
8.2 Viagra
8.3 Lipitor

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Semester 4

B.Sc. (Hons) Chemistry Semester 4

Sr. No.	Category	Course Title	Course Type
1	Major	Physical Chemistry-1	Compulsory
2		Industrial Chemicals and Environment	Compulsory
3		Organic Chemistry-2	Compulsory
4	Minor	Fundamentals of Agroforestry	Elective
		Analytical chemistry-I	
		Criminalistics-1	
		Introduction to Industrial Fermentation Processes	
		Fundamentals of Industrial Safety	
		Introduction to Clinical Laboratories and GLP	
5	SEC	Forest Mensuration	Elective
6	VAC	Indian Knowledge Systems (Parampara : Sustainable Practices of Bharat)	Elective
		Indian Knowledge Systems (Vedic Microbiology)	
		Indian Knowledge Systems (Tark evam Krutrim Buddhimata)	
7	AEC	Environmental Studies	Compulsory

Faculty: Science	**Department:** Chemistry
Program: B.Sc.	**Semester** - 4
Subject: Physical Chemistry - 1	**Type:** Major
Credits: 04	
Course description: This Course Paper proposes to teach about: The physical states of matter: solid, liquid, gases – their physical properties and relative behaviour at varying conditions of temperature, pressure, volume, constitutive properties, chemical kinetics and nuclear chemistry.	
Student learning outcome: After completing this course, the students 1. will be able to learn: Characteristics and parameters, properties and behaviour of gases, liquids, solutions, solids, constitutive properties of liquids, chemical kinetics and nuclear chemistry- principles and laws, theories-equations and applications in different fields.	

Reference Books:

1. General Chemistry, John C. Kotz, Paul M. Treichel, John R. Townsend, 1st Edition, 3rd Reprint, 2011, Brooks/Cole, Cengage Learning.
2. University Chemistry, Bruce H. Mahan, 3rd Edition, 13th Reprint, 1998, Narosa Publishing House.
3. Text Book of Engineering Chemistry, O.P.Aggarwal, 3rd Edition, 2001,Khanna Publishers.
4. Essentials of Physical Chemistry, Arun Bahl, B.S. Bahl, G.D. Tuli, 1st Revised Edition 2008, Reprint 2016, S. Chand and Company Limited.
5. Chemistry for Environmental Engineering and Science, C. N. Sawyer and P. L. Mc Carty, G.F. Parkin, 5th Edition, 21st Reprint, 2015, McGraw Hill Education (India) Private Limited.
6. Physical Chemistry, G. M. Barrow, 5th Edition, 2007, Tata McGraw Hill Publishing Company Limited.
7. Physical Chemistry, R.S. Berry, 2nd Edition, 2000, Oxford University Press.
8. Advanced Physical Chemistry, D.N.Bajpai, 1st Edition, 2001, S. Chand and Company.
9. Arun Bahl, B.S. Bahi, G.D. Tuli; Essentials of Physical Chemistry; 1st Revised Edition (2008), Reprint (2016), S. Chand and Company Limited.

Unit 1: Gaseous State: (06 Hours)

1.1 General characteristics and parameters of gases
1.2 The gas laws: Boyle's, Charles, Gay Lussac and Avogadro
1.3 The ideal gas equation
1.4 Applications of Gas Laws: Dalton's & Amagat's law of partial pressures, Avogadro's Principle, Graham's law of diffusion, Henry's law
1.5 Numerical

Unit 2: Kinetic Molecular Theory and Velocities of Gases (08 Hours)

2.1 Assumptions of kinetic molecular theory
2.2 Derivation of kinetic gas equation
2.3 Kinetic gas equation in terms of kinetic energy
2.4 Deduction of gas laws from the kinetic gas equation
2.5 Maxwell's law of distribution of molecular velocities
2.6 Different kinds of velocities
2.7 Calculation of molecular velocities for different physical condition

2.8 Numerical

Unit 3: Liquid State: Constitutive Properties (10 Hours)

3.1 Surface Tension: units, origins, effects, surface energy, parachor
3.1.1 Effects of Temperature on Surface Tension
3.1.2 Determination of Surface Tension by various methods
3.1.3 Applications of surface tension
3.2 Viscosity: Units, Newton's law of viscosity
3.2.1 Effects of temperature on Viscosity of a liquid
3.2.2 Factors affecting viscosity of liquid
3.2.3 Measurement of Viscosity by various methods
3.2.4 Applications of viscosity
3.3 Refractive Index: specific and molar refraction
3.3.1 Determination of Refractive Index
3.3.2 Molar refraction and chemical constitution
3.4 Optical Activity: specific rotation
3.4.1 Measurement of optical activity

Unit 4: Introduction to Chemical Kinetics (05 Hours)

4.1 Chemical kinetics and its scope
4.2 Macroscopic and microscopic kinetics
4.3 Slow and fast reactions
4.4 Rate of reaction
4.5 Factors affecting rate of reaction
4.6 Velocity constant or rate constant

Unit 5: Solid State-I: (06 Hours)

5.1 Types of solids
5.2 Isotropy and anisotropy
5.3 The habits of a crystal
5.4 Symmetry of a crystal
5.5 Miller indices
5.6 Crystal lattice

Unit 6: Nuclear Chemistry (10 Hours)

6.1 Radioactivity and it's Units, Rate of Radioactive Decay, Half-Life, Average Life, Radioactive Equilibrium, Radioactive Dating, Artificial Radioactivity, Nuclear Isomerism
6.2 Types and Properties of Radiations, Types of Radioactive Decay and The Group Displacement Law, Neutron-Proton Ratio and Nuclear Stability
6.3 Detection and Measurement of Radioactivity - Cloud Chamber, Ionisation Chamber, Geiger Muller Counter, Scintillation Counter, Film Badges
6.4 Radioactive Disintegration Series - Uranium, Thorium and Actinium
6.6 Nuclear Reactions - Fission, Fusion and Chain, Nuclear Equations - Examples
6.7 Energy Released in Nuclear Reactions - Einstein's Equation Relating Mass and Energy, Mass Defect, Nuclear Binding Energy
6.8 Nuclear Fission Process: Nuclear Energy - First Chain reaction, Atomic Bomb Nuclear Power Reactor, Light-Water Nuclear Power Plant, Breeder Reactor Nuclear Fusion Process: Solar Energy, Hydrogen Bomb, Fusion Reactor - A Source of Energy in 21st Century

Physical Chemistry Laboratory Practicals

Minimum 4 from the following list:

1. Determination of the surface tension of the given liquid at room temperature by Stalagmometer.
2. Determination of the surface tension of the given liquid at room temperature by Conductivity meter.
3. Calculate the parachor value of $-CH_2$ group.
4. Determination of the relative viscosity of given liquids with respect to water at room temperature by Ostwald's Viscometer.
5. Determination of refractive index of a given compound by refractometer.
6. Determination of optical activity of a given compound by polarimeter.

Reference Books:

1. J.B. Yadav, Advanced Physical Chemistry; 14th Edition, 1995, Goel Publishing House.
2. S.K.Bhasin, Sudha Rani, Laboratory Manual on Engineering Chemistry;3rd Edition, 2011, Dhanpatrai Publishing Company.
3. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry,* R. Chand & Co.: New Delhi (2011).

Program: B.Sc. (Hons.)	**Type:** Major
Subject: Industrial Chemicals and Environment	**Semester**- 4
Credits: 04	**Department:** Chemistry
Course description: This course is about the concepts of different gases and their industrial production, uses, storage and hazards. Manufacturing, applications, analysis and hazards of the inorganic chemicals, preparation of ultra-pure metals for semiconducting technology, catalyst and biocatalyst, energy and environment is also covered in this course. It gives an idea regarding wastewater as well as sludge.	
Student learning outcome: **Students will be able to understand:** 1. Different toxic gases and their toxicity hazards 2. Safe design systems for large scale production of industrial gases. 3. Manufacturing processes, handling and storage of inorganic chemicals. 4. Application and effect of organic solvents in industries 5. Different sources of energy 6. Generation of nuclear waste and its disposal. 7. Use of biocatalyst in chemical industries	

Reference books:

1. Manahan, S.E. (2017),Environmental Chemistry, CRC Press
2. Buchel, K.H.; Moretto, H.H.; Woditsch, P.(2003),Industrial Inorganic Chemistry, Wiley-VCH.
3. De, A.K.(2012), Environmental Chemistry**,** New Age International Pvt., Ltd.
4. Khopkar, S.M.(2010), Environmental Pollution Analysis, New Age International Publisher.
5. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996)

Unit: 1 Industrial gases (08 Hrs)

1.1 Large scale production of Oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene

1.2 Uses of all above gases

1.3 Storage of all above gases

1.4 Hazards in handling of all above gases

Unit: 2 Inorganic chemicals (08 Hrs)

2.1 Manufacture and applications of hydrochloric acid, nitric acid, sulphuric

acid, caustic soda, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potassium dichromate and potassium permanganate

2.2 Applications of hydrochloric acid, nitric acid, sulphuric acid, caustic soda, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potassium dichromate and potassium permanganate

2.2 Analysis of all above chemicals

2.3 Hazards in handling of all above chemicals

Unit: 3 Organic solvents and environment (06 Hrs)

3.1 Introduction to organic solvents

3.2 Impact of solvents leading to environmental pollution

3.3 Solvents in household products and their effects

3.4 Remedies to reduce the pollution due to solvents

Unit-4 Environmental toxicology (08 Hrs)

4.1 Health and environment

4.2 Environmental toxicology and non-metallic compounds of B, C, N, P, S and Halogens and asbestos

4.3 Technologies available for defluorination

4.4 Environmental toxins, genes and mutations

Unit-5 Heavy metals in environment (08 Hrs)

5.1 Introduction of trace metals, light metal and heavy metal

5.2 Deadly heavy metals and their sources to environment

5.3 Heavy metal poisons in food

5.4 Metals in water and soil

Unit: 6 Energy and environment (07 Hrs)

6.1 Sources of energy: Coal, petrol and natural gas. Nuclear fusion / fission, solar, hydrogen, geothermal, tidal and hydel

6.2 Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management

6.3 Bio-catalysis: Introduction to bio-catalysis

6.4 Importance in green chemistry and chemical industry

Practicals (Minimum four):

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method. (AgNO3 and potassium chromate)
6. Estimation of total alkalinity of water samples (CO_3, HCO_3) using double titration method

Reference books:

1. Vowles, P.D.; Connell, D.W. (1980), Experiments in Environmental Chemistry: A Laboratory Manual, Vol.4, Pergamon Series in Environmental Science.
2. Gopalan, R.; Anand, A.; Sugumar R.W. (2008),A Laboratory Manual for Environmental Chemistry, I. K. International.

Program: B.Sc. (Hons.)	**Type:** Major
Subject: Organic Chemistry-II	**Semester**- 4
Credits: 04	**Department:** Chemistry
Course description: This course provides a better understanding of the organic functional groups, which include halogenated hydrocarbons and oxygen containing functional groups and their reactivity patterns. The detailed reactions mechanistic pathways for each functional group will be discussed to unravel the spectrum of organic chemistry and the extent of organic transformations.	
Student learning outcome: **Students will be able:** 1. To understand preparation, properties and reactions of haloarenes and oxygen containing functional groups. 2. To use the synthetic chemistry learnt in this course to do functional group transformations. 3. To understand heterocyclic compound chemistry 4. To gain theoretical understanding of chemistry of compounds having nitrogen containing functional groups	

Reference books:

1. Organic Chemistry, Volume-1,2, I.L.Finar, 6th Edn., 2002, Pearson
2. Organic Chemistry, 7th , By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson
3. Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand
4. Organic Chemistry, W.H. Perkin and F. S. Kipping, 2012, Nabu Press
5. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand

Unit: 1 Alcohol and phenols **(08 Hrs)**

1.1 Preparation, properties and relative reactivity of 1°, 2°, 3° alcohols
1.2 Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement
1.3 Phenols: Preparation and properties; Acidity and factors effecting
1.4 Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt reactions, Fries and Claisen rearrangements

Unit: 2 Carbonyl compounds **(08 Hrs)**

2.1 Preparation and properties; nucleophilic additions, nucleophilic addition-elimination reactions with ammonia derivatives
2.2 Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation,

Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction,

2.3 Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation, α-substitution reactions

2.4 Oxidations and reductions (Clemmensen, Wolff-Kishner, $LiAlH_4$, $NaBH_4$, MPV, PDC)

Unit: 3 Carboxylic acid and derivatives (08 Hrs)

3.1 Preparation, physical properties and reactions of monocarboxylic acids

3.2 Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids

3.3 Preparation of acid chlorides, anhydrides, esters and amides

3.4 Reactions of acid chlorides, anhydrides, esters and amides

Unit: 4 Polynuclear hydrocarbons-I (08 Hrs)

4.1 Classification

4.2 Synthesis, Chemical Reactions and Uses:

- **4.2.1** Naphthalene
- **4.2.2** Anthracene
- **4.2.3** Phenanthrene

Unit: 5 Heterocyclic compounds-I (07 Hrs)

5.1 Classification and nomenclature, structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom

5.2 Synthesis, reactions and mechanism of substitution reactions of:

- **5.2.1** Furan,
- **5.2.2** Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis)
- **5.2.3** Thiophene

Unit: 6 Nitrogen containing functional groups (08 Hrs)

6.1 Preparation and important reactions of nitro compounds, nitriles and isonitriles

6.2 Amines: Effect of substituent and solvent on basicity; Preparation and properties: Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction;

6.3 Distinction between 1°, 2° and 3° amines with Hinsberg reagent and HNO_2

6.4 Diazonium Salts: Preparation and their synthetic applications.

Practical (Minimum four)

Organic Estimation (Any two)
1) Vitamin-C
2) Gycine
3) Aniline/Phenol
Organic Preparation(Single Step) (Any two):
1) Preparation of m-dintrobenzene from nitrobenzene.
2) Preparation of benzoic acid from benzaldehyde.
3) Preparation of p-aminobenzoic acid from p-nitrobenzoic acid.

Reference book:

1. Vogel, A.I. Quantitative Organic Analysis, Part 3, 2012, Pearson
2. Practical Organic Chemistry, Mann, F.G. & Saunders, B.C., 2009, Pearson Education

SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Minor
Subject: Fundamentals of Agroforestry	
Semester: 4	
Credits: 4	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Understand the need of agroforestry and the role of agroforestry systems in soil fertility, nutrient cycling and sustainable development
2. Aware of various governmental programs, opportunities for employment and economic reforms through agroforestry systems
3. Analyze principal challenges and Indian perspective for the agroforestry system.
4. Address multifaceted environmental and scientific issues related to various agroforestry systems.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. P. K. Ramachandran Nair (1993): An introduction to agroforestry, Kluwer Publications, The Netherlands. ISBN: 0792321340.
2. P.S Pathak and Ram Newaj, (2012), Agroforestry, Potentials and Opportunities, Agrobios, India. ISBN: 978-81-7754-200-4
3. S.R. Reddy (2018). Principles of Agronomy. Kalyani Publishers, Ludhiana, India. ISBN: 978-9327297942
4. Handbook of Agriculture, 6th Revised Edition, Indian council of Agricultural Research, New Delhi, India. ISBN: 81-7164-050-8
5. P. L. Maliwal (2023): Principles of Organic Farming, Scientific Publishers, India. ISBN: 978-9389184501

Unit 1: Introduction and Fundamentals of Agroforestry System **07 hours**

1.1 Agroforestry definitions, objectives, potential and distinction between agroforestry and social forestry

1.2 Origin and History of agriculture in India, Indus Valley Civilization

1.3 Crop types, Crop Cycle and factors affecting crop production

1.4 Social forestry – Types, Objectives and Need

Unit 2: Agroforestry Planning **07 hours**

2.1 Classification and practices in agroforestry systems

2.2 Planning for agroforestry

2.3 Selection of tree crop species for agroforestry

2.4 Different national and international institutes working in the field of

Agroforestry (FAO, IBPGR, WII, ICRAF, IUCN, UNEP, NRCAF, IGFRI)

Unit 3: Silviculture **08 hours**

3.1 Scope of silviculture in agroforestry

3.2 Silviculture of agroforestry trees with special reference to *Acacia nilotica*, *Azadirachta indica*, *Emblica officinalis*, *Tamarindus indica* and *Madhuca latifolia*.

Unit 4: Weed Management **08 hours**

4.1 Definition and classification of weeds,

4.2 Methods of weed control

4.3 Integrated Weed Management

4.2 Herbicides- Definition, types and Mode of action

Unit 5: Nursery and management **07 hours**

5.1 Concept of nursery, temporary and permanent nursery

5.2 Importance of nursery and criteria for nursery site selection

5.3 Multipurpose tree species and their management, Tree architecture

Unit 6: Socio-Economical Agroforestry **07 hours**

6.1 Basic principles of economics applied to agroforestry

6.2 Cost- benefits analysis, estimation of demand and supply, Supply chain management in agriculture

6.3 Role and Importance of Agricultural Finance. Financial Institutions (NABARD and Regional Rural Banks), Importance and scope of micro finance

6.3 Govt. Scheme – PM KISHAN, NBHM, MIS-PSS, National Agro-forestry Policy 2014, RKVY

6.4 Economic, social, and environmental impacts of agroforestry.

Practicals

1. Survey and study of nursery techniques of medicinal plants.
2. Identification of seeds and seedlings of multipurpose tree species.
3. Cultivation and nursery practices for *Acacia*
4. Study of life cycle of silkworm: Morphology of egg, larva, pupa and adult.
5. Sericulture map of India

Program: B.Sc. (Hons)	**Type:** Minor
Subject: Analytical Chemistry – 1	
Credit: 4	**Semester:** 4
Course description: This course paper proposes to teach about: Basic Tools and Operations of Analytical Chemistry, Seperation and Purification Methods, Gravimetric Methods, Errors, Accuracy and Precision and statistical analysis of the result data.	
Student learning outcome: After completing this course, the students will be able to learn: 1. Tools of Analytical Chemistry, Isolation and Purification Methods, Principle, Reaction Mechanism, Analysis Procedure and Applications of Gravimetric Methods - Precipitation gravimetry , Electrogravimetry, Volatilization Gravimetry, Thermal Gravimetry, Errors, Types, Sources and Effects of Errors, Accuracy and Precision, Determination of Accuracy, Minimization of Errors Accuracy and Precision and statistical analysis of the result data.	

Reference Books:

1. Chemistry for Environmental Engineering and Science, C. N. Sawyer and P. L. Mc Carty, G.F. Parkin, 5th Edition, 21st Reprint, 2015, McGraw Hill Education (India) Private Limited.
2. Quantitative Analysis, R.A Day, A.L Underwood, 6th Edition, 1991, Prentice-Hall.
3. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, 9th Edition, Reprint 2014, Cengage Learning.
4. Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, 2008, New Age International Publishers.
5. King, C.J. Separation Processes , Tata McGraw - Hill Publishing Co.,Ltd., 1982.
7. Ronald W.Roussel - Handbook of Separation Process Technology, John Wiley, New York, 1987.
8. Analytical Chemistry, H. Kaur, 1st Edition, 2013, Pragati Prakashan.
9. Vogel, Arthur Israel [Textbook of quantitative chemical analysis] Vogel's textbook of quantitative chemical analysis. - 5th ed./ revised by ... G. H. Jeffery ... [et al.] 4th ed. 1978.

Unit 1: Basic Tools and Operations of Analytical Chemistry (07 Hours)

1.1 Equipments for Measuring Mass - Analytical Balance
- 1.1.1 Rules for Weighing
- 1.1.2 Types of Balance - Top-pan balance, Analytical balance, Microbalance, Ultra microbalance
- 1.1.3 Principle of Operation and Procedure

1.1.4 Trouble shooting
1.1.5 Drift in Measurements with Analytical Balances - Causes and Avoid

1.2 Equipment for Measuring Volume - Graduated Glassware Measuring Cylinder,Volumetric Pipett and Burette, Digital Micropipet and Volumetric Flask, Erlenmeyer Flask, Titration Assembly, Beaker, Test Tube

1.3 Equipment for Distillation and Digetion- Fume Hood, Round Bottom Flask, Kjeldahl Flask, Distillation Assembly

1.4 Equipment for Filtration
1.4.1 Filtration Assembly with Pump - Filtration by Counterpoise method - Sintered Glass Crucible
1.4.2 Filteration Concept and Terms, Types of Filter Holder and Funnel
1.4.3 Filter Guide - Grade, Size, Properties and Applications of Whatman, Glass Micro Fibre and Membrane Types
1.4.4 Typical Particle Size and Selection of Right Filter

1.5 Equipment for Heating and Drying- Crucible, Silica Crucible, Evaporating Dish, Water Bath, Hot Air Oven, Hot Plate, Heating Mantle, Muffle Furnace, Metal Cone and Desiccator

Unit 2: Seperation and Purification Methods (10 Hours)

2.1 Introduction & Objectives

2.2 Criteria for the Assessment of Degree of Purity
2.2.1 Examination of Physical Properties- Melting point, freezing point, boiling point, and the freezing curve, Density, Refractive index, Specific conductivity, Optical rotation
2.2.2 Empirical analysis, for C, H, N, ash, etc.
2.2.3. Chemical tests
2.2.4 Physical tests - Emission and atomic absorption spectroscopy, Chromatography, Electron spin resonance
2.2.5 Examination of spectroscopic properties
2.2.6 Electrochemical methods
2.2.7 Nuclear methods

2.3 Techniques of Isolation and Purification of Chemicals
2.3.1 Affinity purification, Adsorption, Chromatograph
2.3.2 Filtration, Centrifugation, Evaporation , Liquid–liquid extraction
2.3.3 Crystallization and Recrystallization
2.3.4 Trituration , Distillation
2.3.5 Smelting, Refining, Electrolysis, Sublimation
2.3.6 Water Purification, Downstream Process, BioLeaching

2.4 Classification of Methods

2.4.1 Isolation and purification based on rate phenomena
2.4.1.1 Barrier isolations
2.4.1.2 Field isolations
2.4.2 Isolation and purification based on phase equilibria
Gas-liquid, Gas-solid, Liquid-solid, Liquid-liquid , Supercritical fluid-solid, Supercritical fluid-liquid

2.5 Sublimation
2.5.1 Principle
2.5.2 Apparatus
2.5.3 Procedure
2.5.4 Applications

Unit 3 Gravimetric Analysis -I (10 Hours)

3.1 Types of Precipitate - Crystalline, Curdy and Gelatinous

3.2 Conditions for Precipitation - Solubility, Solubility Product and Ionic Product

3.2 Factors affecting the solubility, solubility products and Precipitates Completeness
Common Ion Effect, Diverse Ion Effect, Temperature, pH, Complexation,
Nature of the solvent

3.3 The Process of Precipitation
Controlling Particle Size, Clustering, Nucleation, Growth

3.4 The Role of Different Steps involved in Precipitation Gravimetric Analysis Preparation of the test solution, Precipitation, Digestion of Precipitate Filtration of precipitate, Washing of precipitate, Drying and /or ignition of precipitate, Weighing and Calculation

3.5 Applications of Precipitation Gravimetric Analysis
Ni^{+2} as Ni-DMG, S in organic Compound as $BaSO_4$, Al^{+3} as Al_2O_3

Unit 4: Gravimetric Analysis -II (06 Hours)

4.1 Principle, Theory, Procedure and Applications of
4.1.1 Electrogravimetry - Electrogravimeter
4.1.1.1 Constant Current Electrolysis
4.1.1.2 Constant Potential Electrolysis
4.1.2 Volatilization Gravimetry
4.1.3 Thermal Gravimetry

Unit 5: Errors and Treatment in Chemical Analysis (06 Hours)

5.1 Types, Sources and Effects of Errors

5.2 Accuracy and Precision

5.3 Determination of Accuracy

5.4 Minimization of Errors

5.5 Significant Figures
5.6 Numericals

Unit 6: Statistical Analysis (06 Hours)

6.1 Statistical Evaluation of Data
6.2 Statistical Terms: Mean, Arithmatic Mean in a Discrete Frequency Distribution
6.3 Mean Deviation and Relative Mean Deviation
6.4 Median, Mean in case of a Discrete Frequency Distribution
6.5 Numericals

Analytical Chemistry -Laboratory Practicals

Minimum 4 Practicals From the Following List:

1. Gravimetric estimation of Ni as Ni(Dimethyl Glyoxime)$_2$.
2. Gravimetric estimation of Ba as $BaSO_4$.
3. Purification of Organic Compound by Sublimation Technique.
4. Electrogravimetric determination of Cu.
5. Recovery of Metal from the Wastewater by Electrogravimetry.
6. Determining the Inorganic Ash content of an Organic Material-Polymer/ Any Other Sample.

Reference Books:

1. Standard Methods for Examination of Water & Wastewater – Andrew D. Eaton, Lenore S. Clesceri, Eugene W. Rice, Arnold Greenberg, 23rd Edition, 2017, published by APHA, AWWA, WEF.
2. Analytical Chemistry, H. Kaur, 1st Edition, 2013, Pragati Prakashan.
3. Vogel, Arthur Israel [Textbook of quantitative chemical analysis] Vogel's textbook of quantitative chemical analysis. - 5th ed./ revised by ... G. H. Jeffery ... [et al.] 4th ed. 1978.
4. Laboratory Manual on Engineering Chemistry, S.K. Bhasin and Sudha Rani, 3rd Edition, Reprint 2011, Dhanpat Rai Publishing Company (P) Ltd.

Program: B.Sc. (Hons)	**Type:** Minor
Subject: Criminalistics-1	**Semester :** 4
Credits: 4	
Course description: Criminalistics explores the scientific exploration and application of physical evidence within crime investigation and prosecution. This course aims to equip students with a holistic understanding of the principles, methodologies, and applications involved in analysing physical evidence within criminal investigations.	
Student learning outcomes: 1. Introduce students to the fundamental concepts of criminalistics. 2. Acquaint students with a variety of methods utilized in collecting, securing, and examining physical evidence. 3. Help students understand the crucial significance of physical evidence in investigating and resolving crimes. 4. Foster the development of critical thinking and analytical skills necessary for the interpretation of forensic evidence.	

Reference Books:

1) "Textbook of Forensic Science and Criminalistics" by J.K. Sharma
2) "Forensic Science: An Introduction" by R.N. Karmakar
3) "Forensic Medicine and Toxicology" by K.S. Narayan Reddy
4) "Handbook of Forensic Ballistics" by P.K. Das
5) Forensic Science: An Introduction to Scientific and Investigative Techniques" by Stuart H. James et al.
6) "Crime Scene Forensics: A Scientific Method Approach" by Robert C. Shaler
7) "Principles of Forensic Document Examination" by Albert H. Lyter
8) "Forensic Science in Criminal Investigation and Trials" by B.R. Sharma
9) "Practical Aspects of Forensic Science" by Dr. B. N. Chattopadhyay
10) "Criminalistics: An Introduction to Forensic Science" by Richard Saferstein

Unit-1 Introduction to Criminalistics **(7 hours)**

1.1 Overview of Criminalistics
1.2 History and Development of Criminalistics in India
1.3 Locard's Exchange Principle
1.4 Ethics in Criminalistics

Unit-2 Crime Scene Investigation-1 **(7 hours)**

2.1 Protection
2.2 Recognition of Evidence
2.3 Searches
2.4 Documentation
2.5 chain of Custody

Unit – 3 Crime Scene Investigation-2 **(7 hours)**

3.1 Collection of evidence
3.2 Making of evidence
3.3 Packaging and transport
3.4 Final survey and release of crime scene

3.5 Reconstruction of crime scene

Unit – 4 Blood Stain Pattern Analysis (8 hours)

4.1 Biological properties of human blood
4.2 Formation of blood stains
4.3 Chemical enhancement and documentation
4.4 Analysing spatter stains
4.5 Types of patterns

Unit – 5 Trace Evidence Analysis (8 hours)

5.1 Types of Trace Evidence (e.g., fibres, hairs, glass, paint, Ink, Dyes etc.)
5.2 Collection and Examination Techniques
5.3 Microscopic Analysis
5.4 Instrumental Analysis (e.g., SEM, FTIR)

Unit-6 Forensic Ballistics (8 hours)

6.1 Introduction to Forensic Ballistics
6.2 Types of Firearms and Ammunition
6.3 Examination of Firearms and Tool marks
6.4 Ballistic Comparison and Identification

Practicals

Perform the following experiments: (Any Four) (30 Hours)

1. Thin Layer Chromatography (TLC) for Separating Pigments (Simulating separation of coloured compounds from inks or dyes)
2. Chemical Tests for Identifying Fibres (Natural vs. Synthetic)
3. Microscopic examination and comparison of different types of fibres found at a simulated crime scene.
4. Analysis of various bloodstain patterns on different surfaces using mock blood samples.
5. Detection of blood stains by the Kastle–Meyer test.
6. Examination and comparison of glass fragments and paint chips using microscopy and elemental analysis.
7. Analysis of handwriting samples and forged documents using magnification and comparison techniques.

Reference Books:

1. "Practical Manual of Forensic Chemistry" by Dr. B. R. Sharma
2. "Textbook of Forensic Science and Criminalistics" by J.K. Sharma
3. "Forensic Science: Fundamentals and Investigations" by Dr. B.C. Gore
4. "Forensic Medicine and Toxicology" by K.S. Narayan Reddy
5. "Textbook of Forensic Medicine and Toxicology" by Dr. Nageshkumar G. Rao
6. "Handbook of Forensic Ballistics" by P.K. Das
7. "Practical Aspects of Forensic Science" by Dr. B. N. Chattopadhyay
8. "Forensic Science in Criminal Investigation and Trials" by B.R. Sharma

Faculty: Sciences	**Department:** Microbiology
Program: B.Sc. (Hons)	**Type:** Minor
Subject: Introduction to Industrial Fermentation Processes	
Credit: 4	**Semester:** 4

Course description: This course provides an in-depth exploration of the fundamentals of industrial fermentation, focusing on the design, development, and optimization of fermentation processes. Students will gain practical knowledge of microbial isolation, screening techniques, preservation methods, bioreactor design, fermentation media formulation, and industrial sterilization practices essential for bioprocess industries.

Learning Outcomes:

By the end of the course, students will be able to:

1. Understand the principles of fermentation processes.
2. Describe the key aspects of upstream and downstream processing in fermentation.
3. Isolate suitable microorganisms and apply appropriate screening techniques to identify relevant microbes, and implement storage techniques for preservation of culture.
4. Comprehend the basic design of bioreactor, able to identify and differentiate between various types of bioreactors, and classify the processes based on mode of operation.
5. Select and formulate suitable fermentation media.
6. Apply appropriate sterilization techniques for media and fermenter sterilization.

Reference:

1. Okafor N., (2007). Modern Industrial Microbiology and Biotechnology, Science Publishers. ISBN: 9781138036147.
2. Patel, A. H., (2016). Industrial Microbiology, 2nd Ed., Trinity press; An Imprint of Laxmi Publications PVT. Ltd. ISBN: 9789385750267.
3. Richard K.M. & Durbin S.R., (2020). Fermentation and Biochemical Engineering, Vol 1, CBS Publishers & Distributors Pvt Ltd. ISBN: 9789389185911.
4. Shivkumar P. K., Joe M. M., Sukesh K., (2010). An Introduction to Industrial Microbiology, S Chand Publishers. ISBN: 9788121935197.
5. Stanbury, P.F., (2006). Principles of Fermentation Technology, 2nd Ed., Elsevier Science Ltd. ISBN: 9780750645010.
6. Waites, M.J., et al., (2001). Industrial Microbiology: An Introduction, 1st Ed., Blackwell Publishing. ISBN: 9780632053070.

Unit-1: Basics of Industrial Fermentation (Duration: 6 Hrs)

1.1 Overview and Design of Fermentation Process
1.2 Fermentation Process Development
1.3 Outline of Upstream and Downstream Processing

Unit-2: Isolation and Screening of Industrially Important Strains (Duration: 9 Hrs)

2.1 Isolation of Suitable Microorganisms from the Environment

2.2 Screening Techniques
  2.2.1 Primary Screening: The Crowded Plate Technique, Auxanography, Enrichment Culture Technique, Use of an Indicator Dye
  2.2.2 Secondary Screening

Unit-3: Preservation of Industrially Important Microbes (Duration: 7 Hrs)

3.1 Culture Collections
3.2 Storage at Reduced Temperature
3.3 Storage in Dehydrated Form
3.4 Quality Control of Preserved Stock Cultures

Unit-4: Fermenter and Fermentation Process (Duration: 9 Hrs)

4.1 Typical Bioreactor Design- Components & their Functions
4.2 Types of Bioreactors- Stirred and Continuous Stirred Tank Bioreactors, Bubble Column Bioreactor, Airlift Reactor, Fixed and Fluidized Bed Reactors
4.3 Types of Fermentation Processes
  4.3.1 Based on Mode of Operation: Batch, Continuous and Fed-batch
  4.3.2 Based on Oxygen Requirement: Aerobic and Anaerobic
  4.3.3 Based on Free Water in the Medium: Submerged and Solid state and its properties

Unit-5: Fermentation Media (Duration: 7 Hrs)

5.1 Criteria of Suitable Media
5.2 Carbon Sources
5.3 Nitrogen Sources
5.4 Precursors, Inducers, and Inhibitors

Unit-6: Industrial Sterilization (Duration: 7 Hrs)

6.1 Principles of Sterilization
6.2 Sterilization of Equipment
6.3 Sterilization of Production Media
6.4 Sterilization of Air

List of Practicals

1. Screening of amylase producing microorganisms
2. Screening of antimicrobial compounds producing microorganisms by crowded plate & Wilkin's method.
3. Screening of organic acid producing microorganisms.
4. Demonstration of laboratory fermenter.

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SARVAJANIK UNIVERSITY

FACULTY OF SCIENCE

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Minor
Subject: Fundamentals of Industrial Safety	
Semester: 4	
Credits: 4	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Understand the need for safety in industries, the factors affecting accidents, chemistry and stages of fire.
2. The paper will also make students aware of various theories to industrial accidents.
3. Address various legislations, conventions and recommendations on industrial safety.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. SHAH R.C (2018): Safety Management, Capital Offset, Gandhinagar.
2. SHAH R.C (2021): Legislations on Safety & Health, Capital Offset, Gandhinagar.
3. MISRY K.U (2012): Fundamentals of Industrial Safety & Health – I, Siddharth Prakashan, Ahmedabad.
4. MISRY K.U (2012): Fundamentals of Industrial Safety & Health – II, Siddharth Prakashan, Ahmedabad.

Unit 1: Introduction to Industrial Safety **7 Hours**

1.1 Terminology
1.2 Philosophy of Safety
1.3 Problems of Industrial Safety
1.4 Concept of Safety

Unit 2: Safety Psycology **7 Hours**

2.1 Introduction
2.2 Factors affecting Accident
2.3 Behavior Based Safety
2.4 Maslow's Hierarchy of Needs

Unit 3: Industrial Fire – I **8 Hours**

3.1 Chemistry of Fire
3.2 Stages of Fire
3.3 Factors contributing to Fire
3.4 Classification of Fire & Extinguishers

Unit 4: Theories On Industrial Accident **8 Hours**

4.1 Heinrich's Theory
4.2 Frank Bird's Domino Theory
4.3 V.L Grose's Multiple Causation Theory
4.4 Energy Theory

UNIT 5: INDUSTRIAL ACCIDENT PREVENTION **7 Hours**

5.1 Types of Accident
5.2 Fundamentals of Accident Prevention
5.3 Five 'E's of Accident Prevention
5.4 Five Steps of Japanese 5s

UNIT 6: LEGISLATION ON FACTORIES **7 Hours**

6.1 Legislative Process
6.2 ILO Conventions & Recommendations
6.3 History of Factories Legislations
6.4 Factories Act, 1948

Practicals

1. Measurement of Noise in the surrounding environment.
2. Measurement of Temperature and Relative Humidity in ambient air.
3. Measurement of Illumination by Lux meter.
4. Submission of Report based on Fire Prevention Equipments.

Faculty: Science	**Department:** Microbiology
Program: B. Sc. (Hons)	**Type:** Minor
Subject: Introduction to Clinical Laboratories & GLP	
Credits: 4	**Semester:** 4
Course description: The main aim of the subject is to inform the knowledge about clinical diagnosis and clinical laboratory set up. Also add the understanding of laboratory hazards and safety precautions. This course also introduces students to various laboratory solutions and instruments. The information regarding Good laboratory practices and quality control will enhance the depth of the subject.	
Student learning outcome: At the end of the course, the students will get knowledge of 1. Basics of clinical laboratory, Standard clinical laboratory set up and its types 2. Basics of clinical laboratory organization 3. Laboratory Ethics and Code of safe laboratory practice 4. Different types of glassware & plastic ware and its use 5. Laboratory hazards and safety 6. Component and use of basic laboratory instruments **7.** Good laboratory practices	

Reference Books:

1. Ochei J. & Kolhatkar A. (2000), *Medical Laboratory Science: Theory & Practice,* Tata McGraw Hill Pub. (ISBN: 9780074632239)
2. P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, 3rd ed., Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)
3. Mukharjee. L. K , Medical Laboratory Technology,Vol.1, 3rd edition, Tata McGraw Hill ISBN: (9789352606801)

Unit-1: Human health and clinical diagnosis in developing countries (Duration: 07 Hrs)

1.1 Human health and disease.
1.2 Medical care in India.
1.3 Various kinds of laboratories and commonly requested laboratory tests in India and other developing countries.
1.4 Fundamental needs for a standard clinical laboratory set up.

Unit-2: Clinical Laboratory Organization and Ethics (Duration: 07 Hrs)

2.1 Organization of clinical laboratories.
2.2 The responsibilities of clinical laboratory technician.
2.3 Factors reducing and increasing productivity of a Laboratory.
2.4 Professional Ethics of Clinical Laboratory Professional.

Unit-3: Laboratory Accidents and Safety **(Duration: 08 Hrs)**

3.1 Laboratory Hazards- Physical, Chemical and Biological, Accidents and Safety Measures in clinical laboratory

3.2 First Aid measures in clinical laboratory.

3.3 Biosafety level and Biosafety programme.

3.4 Universal work precautions for Laboratory Personnel

Unit-4: Laboratory Instruments and Equipments **(Duration: 08 Hrs)**

4.1 Principle, Component, Use, Care and Maintenance of:

4.1.1 Colorimeter, Centrifuge, Weighing Balance

4.1.2 Semi-automated analyzer

4.1.3 Equipments for sterilization: Hot air oven & Autoclave

4.2 Use and care of common laboratory glass wares and plastic wares.

Unit-5: Good Laboratory Practices **(Duration: 07 Hrs)**

5.1 Sources of common errors in laboratory

5.2 Proficiency testing

5.3 Quality council of India

5.4 Accreditation of Clinical Laboratory: NABL

5.4.1 Introduction and scope

5.4.2 Aims and objectives

5.4.3 Description and types of laboratory

5.4.4 Qualification norms

Unit-6: Quality Control and Laboratory Solutions **(Duration: 08 Hrs)**

6.1 Commonly used terms in quality control

6.2 Various ways of maintaining internal and external quality control

6.3 Statistics in clinical laboratory: Central tendency, Standard deviation & Coefficient of variation

6.4 Preparation of Solution: Normal Solution, Molar Solution, Percent Solution, Primary Standard Solution

6.5 Units of Measurements

List of Practicals

1. Laboratory Hazards and Prevention
2. First Aid measures in Clinical Laboratory
3. Operation of Colorimeter, Centrifuge & Weighing balance
4. Operation of Semi-automated analyzer, Hot air oven & Autoclave
5. Preparation of Normal solution, Percent solution and Molar solution
6. Measurement of Standard deviation and Coefficient of variation from control serum samples.

SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. (Hons)	**Type of Subject:** Skill Enhancement Course (SEC)
Subject: Forest Mensuration	
Semester: 4	
Credits: 2	

Student Learning Outcomes (SLOs):

After completing the course, students will be able to:

1. Understand and analyze use of different instrumental techniques for crop measurement.
2. Learn types of sampling techniques and its importance.
3. Analyze principles of geometric and trigonometric methods for direct and indirect measurements..
4. Address multidisciplinary structure of community and its dimentions.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Vikas Kumar *et. al.* (2017): Practical Manual of Forest Mensuration, Agri-Biovet Press, New Delhi, India. ISBN: 978-93-84502-45-4.
2. A. N. Chaturvedi and L. S. Khanna (2000): Forest Mensuration and Biometry, Khanna Bandhu Publishers, India. ISBN: 9788185933238.
3. G.J. Hamilton (2021): Forest Mensuration Handbook, Scientific Publishers, India. ISBN: 9789388399012

Unit 1: Introduction and Fundamentals of Forest Mensuration System 07 hours

1.1 Introduction, definition, objectives and scope of forest mensuration
1.2 Units of measurement
1.3 Scales of measurement (nominal, ordinal, interval and ratio scale)
1.4 Instruments used in forest mensuration: visual observation, sketches and utilities

Unit 2: Sampling Methods **07 hours**

2.1 Sampling - definition, advantages, size and shape of the sampling units
2.2 Random sampling - simple, stratified, multistage and multiphase sampling
2.3 Non random sampling - Selective, systematic and sequential sampling
2.4 Point sampling - horizontal and vertical point sampling
2.5 Qualitative and quantitative characters in forest community studies

Unit 3: Tree Measurement **08 hours**

3.1 Comparison between tape and caliper measurements
3.2 Bark measurements - objectives, thickness, surface area and volume.
3.3 Height measurements - direct and indirect methods. Height measurement employing geometric and trigonometric principles
3.4 Biomass measurement, Determination of age of trees, Tree growth measurements

Unit 4: Experimental Forest Mensuration **08 hours**

4.1 To study the standard rules for measurement of Diameter or Girth at breast height (DBH or GBH) of standing trees
4.2 To estimate the bark thickness of trees
4.3 Illustrating height measurement on a level ground
4.4 To study the form of tree (form factor and/or form ratio) for volume estimation of standing trees to prepare taper table and volume table
4.5 Determination of age, volume and biomass of crop
4.6 To find out frequency, density and abundance of given crop in a community structure

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	**Department**: Environmental Science
Program: B.Sc. (Hons)	**Type**: Value Added Course (VAC)
Subject: Indian Knowledge System (Parampara: Sustainable Practices of Bharat)	**Credits**: 2
Semester: 4	

Reference:

1. Parampara: India's Culture of Climate Friendly Sustainable Practices by Center for Environment Education, Ministry of Environment, Forest and Climate Change, Government of India.

Unit 1: (08 hours)

1.1 Introduction

1.2 Solar and Wind Energy

1.3 Water

Unit 2: (08 hours)

2.1 Agriculture

2.2 Biodiversity

Unit 3: (07 hours)

3.1 Food

3.2 Health

Unit 4: (07 hours)

4.1 Shelter

4.2 Textile, Clothing and Lifestyle Products

Faculty: Science	**Department:** Microbiology
Program: B.Sc. (Hons)	**Type:** VAC
Subject: IKS (Vedic Microbiology)	
Credit: 02	**Semester:** 4

Course description:

This course informs and signifies the practice followed from vedic period for management of microorganisms and provides healthy human life with scientific validation.

Student learning outcome:

1. Able to Understand the fundamental concepts of microorganisms as presented in Vedic texts.
2. Analyze the connections between Vedic practices and their potential impact on microbial life.
3. Understand the significance of age-old practice of yajna followed in vedic period.

Reference Books:

1. Dubey RC (2021). Vedic Microbiology: A Scientific Approach. India: Motilal Banarsidass

Unit-1: Introduction to Vedas and Cosmology. (Duration: 08 Hrs)

1.1 The origin of Vedas
1.2 Concept of Vedic Period
1.3 Microbial disease described during vedic period
1.4 Who are the creators of the Universe?
1.5 Concept of atoms and molecules in vedic period
1.6 Scientific concept of atoms and particles

Unit-2: Pandemic / Epidemic diseases during Vedic Period (Duration: 07 Hrs)

2.1 Viral diseases and its cure.
2.2 Expression of respect v/s Social distancing
2.3 Precaution for spread of infectious microorganisms

Unit-3: Elimination of pathogen by Sun rays and Eradication of Pathogen by medicinal plants (Duration: 07 Hrs)

3.1 Elimination of microorganisms by sun rays
3.2 Germicidal properties in the sun rays
3.3 Occurrence and prevention of Yaksma
3.4 Eradication of microbes by Vaca
3.5 Eradication of leprosy by Prsniparni

Unit-4: Science of Agnihotra (Sacrificial Fire) (Duration: 08 Hrs)

4.1 Significance of Havan/Yajna
4.2 Method of daily Yajna
4.3 Scientific validation of Agnihotra
4.4 Effect of Agnihotra on human health
4.5 Effect of Agnihotra on plant health

Sarvajanik University

Faculty of Science

Faculty: Science	**Department**: Computer Sci.
Program: B.Sc. (Hons)	**Type**: Value Added Course (VAC)
Subject: Indian Knowledge System (Tark evam Krutrim Buddhimata)	**Credits**: 2
Semester: 4	

References:

1. Introduction to Indian Knowledge Systems - Concepts and Application, B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pava R.N., PHI Publication
2. Sivananda S. All about hinduism. Sivananda literature research institute; 1988.
3. Dharampal G. Essential Writings of Dharampal. Publications Division Ministry of Information & Broadcasting; 2017 Nov 3.
4. Bajaj J, Śrīnivāsa MD. Sanatana Bharat, jagrita Bharat= Timeless India, resurgent India: a celebration of the land and people of India. (No Title).

Unit 1: Knowledge and Logic (08 hours)

- Tarka : Indian Art of Debate
- The Knowledge Triangle
- Prameya - Dravyas, Attributes, Action
- Pramana - Means of Valid Knowledge
- Samasya - AMbiguities in existing knowledge

Unit 2: Knowledge Frameworks (07 hours)

- Deductive/Inductive KF
- Potential Fallacies in Reasoning Process
- Established Tanets in field of Study

Unit 3: Sanskrit Linguistic - I (07 hours)

- Components of Language
- Panini's work on Sanskrit Grammar
- Computational Concepts in Ashtadhyayi
- Phonetics in Sanskrit

Unit 4: Sanskrit and NLP (08 hours)

- Patterns in Sanskrit Vocabulary
- Logic for Sentence Construction
- Importance of Verbs
- Role of Sanskrit in NLP

Program: B.Sc. (Hons)	**Type:** Ability Enhancement Course (AEC)
Semestre: 4	
Subject: Environment Studies	
Credit: 02	**Total learning hours:** 30
Prerequisite: Efficacy towards understanding natural systems and its sustainability. **Rationale:** Sustainability is the prime goal of today's modern world. Transformation and pro-conservation actions is the prime approach to conserve the environmental values. Honourable Supreme Court of India has made it 'mandatory' to introduce a basic course on environment at the undergraduate level.	

Unit 1: Introduction to environmental studies and Natural Resources: Renewable & Non-renewable Resources ● Multidisciplinary nature of environmental studies; ● Scope and importance; Concept of sustainability and sustainable development. ● Energy Resources: Renewable and non-renewable energy sources, use of alternate energy sources.	(6 lectures)
Unit 2 : Ecosystems & Biodiversity ● Ecosystems: Basic concepts. ● Forest, Grassland, Desert and Aquatic Ecosystems. ● Introduction to Biodiversity. ● Biodiversity Conservation.	(7 lectures)
Unit 3: Environmental Pollution & Environmental Issues ● Environmental pollution : Air, water, soil and noise pollution; effects and controls ● Nuclear hazards and human health risks. ● Climate change, global warming, ozone layer depletion, acid rain. ● Impacts on human communities and agriculture.	(7 lectures)
Unit 4: Environmental Policies/ Practices & Role of Human Communities ● Environment Laws: Environment Protection Act: Air (Prevention & Control of Pollution) Act: Water (Prevention and control of Pollution) Act ● Wildlife Protection Act: Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) ● Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. ● Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. **Field work** ● Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. ● Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.	(10 lectures)

Reference Books:

Sr. No	Title of book /article	Author(s)	Publisher and details like ISBN	Year of Publication	Publicati-on Edition
1.	Textbook of Environmental Studies for Undergraduate Courses	Erach Bharucha	Universities Press (India) Private Ltd, Hyderabad ISBN: 978-8173718625	2013	2nd
2.	Environmental Studies	Dr. Suresh K Dhameja	S K Kataria & Sons New Delhi ISBN: 978-93-5014-385-8	2018	4th
3.	Basics of Environmental Studies	Prof Dr N S Varandani	LAP -Lambert Academic Publishing ,Germany ISBN: 978-3-8473-2102-6	2013	1st
4.	Environmental Studies	Anindita Basak	Darling Kindersley (India) Pvt. Ltd Pearson ISBN: 978-8131721186	2009	1st
5.	Basics of Environmental Studies	U K Khare	Tata McGraw Hill ISBN: 978-0071077781	2011	1st
6.	A Textbook of Environmental Studies	Dr. K Raghvan Nambiar	Scitech ISBN: 97881837111111	2009	1st
7.	Environmental Studies	Dr. B S Chauhan	University Science Press ISBN: 9788131803288	2008	1st
8.	Environmental Sciences	Daniel B Botkin & Edward A Keller	John Wiley & Sons ISBN: 9788126534142	2011	8th

9.	Environmental Studies	R. Rajagopalan	Oxford University Press ISBN: 978-0199459759	2015	3rd