

B.Sc. (Hons) BT/CHE/ENV/MB															
CREDIT FRAME WORK															
Semester	Majors				Minors		Skill		Ability		Multidiscipl.		Value Added		Total Credits
	Theory		Lab				Enhancement		Enhancement						
	No. of Papers	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	1	4	8	4	1	4	1	3	1	2	1	3	1	2	22
2	1	4	8	4	1	4	1	3	1	2	1	3	1	2	22
3	1	4	8	4	1	4	1	3	1	2	1	3	1	2	22
4	3	12	8	2	1	4			1	2				2	22
5	2	8	8	4	1	6	Intrnsp	4							22
6	3	12	8	4	1	6									22
Total after 3y	11	44	48	22	6	28	3+1	9+4	4	8	3	9	3	8	132
7	3	12	8	4	1	6									22
8 (Research)	1	4			1	6		12							22
8 (Honors)	3	12	8	4	1	6									
Total after 4y	17	68	20	30	8	40	3	9+4	4	8	3	9	3	8	176

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Minor
Subject: Foundation Minors 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: <ul style="list-style-type: none">● Obtained ideas on various branches Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts.● Students will be acquainted with the historical account and development.● Able to learn scientific principles and scope of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health.● 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.	

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

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- 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 hyrophytes (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.

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

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Faculty of Science

B.Sc. (Hons)

Agriculture & Forestry:

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

Analytical Chemistry:

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

Forensic Science:

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

Industrial Fermentation Technology:

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

Medical Laboratory Technology:

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

Occupational Health:

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

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Major
Subject: Foundation Majors 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: <ul style="list-style-type: none">● Obtained ideas on various branches Biotechnology, Chemistry, Environmental Science and Microbiology.● Students will be acquainted with the historical account and development.● Able to learn scientific principles and scope of Biotechnology, Chemistry, Environmental Science and Microbiology.● Will be aware of general characteristics and able to gather knowledge about Biotechnology, Chemistry, Environmental Science and Microbiology.	

Unit-1 Basic Biotechnology-1:

(8 hrs)

- 1.1 History and introduction to Biotechnology
- 1.2 Definition of Biotechnology, Traditional and New
- 1.3 The World of Biotechnology- Red, Green, White and Blue Biotechnology
- 1.4 Biotechnology-an Interdisciplinary Pursuit
- 1.5 Biotechnology- a three-component central core

Unit-2 Biotechnology in India

(7 hrs)

- 2.1 Role of GSBTM, STBI and GBRC
- 2.2 Gujarat Biotechnology Policy 2022-27
- 2.3 Introduction to DBT, Its Mandate and Strategy
- 2.4 Autonomous and Public sector undertakings of DBT
- 2.5 BIRAC and ABLE

Unit-3: Foundation of chemistry

(7 hrs)

- 3.1 Qualitative observation Vs quantitative observation
- 3.2 Theory vs law
- 3.3 Mass vs weight, Density: Solid, liquid, gas

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3.4 Physical changes and chemical changes

3.5 Chemical bonds (Types, bond length, bond energy)

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 Natural Resources and Management

(7 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 Ecology and Environment

(8 hrs)

6.1 Types, classification, structure and function of Ecology

6.2 classification, characterization and importance of population and population dynamics and population ecology

6.3 Concept of Community Ecology and Ecological Succession

6.4 Auto ecology of Species and Ecological Amplitude

Unit-7 Introduction and major themes of Microbiology

(7 hrs)

7.1 Microbiology & its importance

7.2 Structure and Activities of Microbial cell

7.3 Evolution and Diversity of Microbial Cell

7.4 Microorganisms and Their Environment

7.5 The Impact of Microorganisms on Humans

Unit-8 Microbiology in historical context

(8 hrs)

8.1 The Discovery of Microorganisms

8.2 Pasteur & Spontaneous Generation

8.3 Koch, Infectious Disease and Pure Cultures

8.4 The Rise of Microbial Diversity

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Faculty of Science

B.Sc. (Hons)

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

Biotechnology:

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

Chemistry:

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

Environmental Science:

- P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN: 8171338143.
- Keller E.A (2012): Introduction to Environmental Geology, Pearson Publication, USA.
- Sagar Rajendra (2014): Geochemistry and Environmental Geology, Anmol Publications Pvt. Ltd., New Delhi.
- Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd ISBN-13: 978-0471906254.

Microbiology:

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

Sarvajanik University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Major
Subject: Foundation Laboratory in Applied Sciences-1	Credits: 4
Semester: 1	
Course description: The objectives of this practical course is to introduce and explain basic skills of Biotechnological, Chemistry, Environmental Science and Microbiology techniques.	
Student Learning Outcome: <ul style="list-style-type: none">● Practical part of the paper will help to understand various laboratories and their fundamental work.● It will also help in development of basic preparation & handling skills of glasswares and instruments available in Biotechnology, Chemistry, Environmental Science and Microbiology laboratories.	

List of Practicals:

1. Introduction to three Biotechnology laboratories and Instrumentation Room.
2. Introduction to Biosafety and Biohazards.
3. 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)
4. Determination of minimum quadrat size by species-area curve method.
5. Determination of porosity, bulk density, water holding capacity and field capacity of soil.
6. Study of bright field microscope
7. 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: Skill Enhancement Course
Subject: Arogya Mitra	Credits: 3
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: 3
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, amphoteric), 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.

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

Sarvajanik University
Faculty of Science
B.Sc. (Hons)

Sarvajani University

Faculty of Science

B.Sc. (Hons)

Faculty: Science	Department: All
Program: B.Sc. (Hons)	Type: Value Added Course (VAC)
Subject: Indian Knowledge System (Foundation)	Credits: 2
Semester: 1	

Unit 1: Foundational Literature of Indian Civilisation

(08 hours)

- The Vedic Corpus
- Caturdaśa vidyāsthāna-s: 14 branches of learning in ancient India- purāṇa, nyāya, mīmāṃsā, dharmaśāstra, six vedāṅga-s: (śikṣā, vyākaraṇa, nirukta, chanda, jyotiṣa, kalpa) and four Veda-s- rgveda, yajurveda, sāmaveda and atharvaveda; introductory information on them
- Upaveda-s and Upaniṣads: introductory information on them
- śāstra-s and some introductory information on them
- 18 purāṇa-s: Their names and five general characteristics
- The Itihasas: Ramayana and Mahabharata (Learnings from them in brief)

Unit 2: Indian Philosophical System

(07 hours)

- Four Purusartha: Dharma, artha, kama and moksha (Definitions and Meaning)
- Astika and Nastika Darshan
- Tarkashastra
- Hetu-lakṣaṇa and hetvabhāsa lakṣaṇa (Cause and Fallacies)
- Pañca adhikaraṇa System- viśaya, saṃśaya, pūrvapakṣa, uttarapakṣa and saṃgati
- The purpose of knowledge: Para Vidya and Apra Vidya

Unit 3: Indian Mathematics and Astronomy

(08 hours)

- Important texts on Indian Mathematics
- Development of numbers, fractions, decimals, algebra, trigonometry and calculus
- Further continuity of Indian Mathematics: Kerala school and Ramanujan, their influence
- Important texts on Indian Astronomy
- Observations and records on the movement of celestial bodies, equinoxes, solstices, eclipses
- Planetary model of Aryabhata and its revision by Nilkantha
- Further continuity of Indian astronomy by Jaisingh, Sankaravarman, Chandrasekhara Samanta.

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B.Sc. (Hons)

Unit 4: Indian Sciences

(07 hours)

- Important Texts of Ayurveda
- Basic concepts of Ayurveda
- Surgical practices, inoculation, current revival of Ayurveda and Yoga
- Indian agriculture as mentioned by the Greek historians and later travelers
- The Ery system of south India
- Indian attitude towards agriculture based on Walker
- Indian texts which refer to metallurgy
- Mining and manufacture in India of Zinc, Iron, Copper, Gold, etc., from ancient times

References:

1. Sivananda S. All about hinduism. Sivananda literature research institute; 1988.
2. Dharampal G. Essential Writings of Dharampal. Publications Division Ministry of Information & Broadcasting; 2017 Nov 3.
3. Bajaj J, Śrīnivāsa MD. Sanatana Bharat, jagrita Bharat= Timeless India, resurgent India: a celebration of the land and people of India. (No Title).