Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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ક્રમાંક :એસ./પરિપત્ર/૨૧૭૮૩/૨૦૨૩
તા.૨૯/૦૮/૨૦૨૩

પ્રતિ,
વડાશ્રી,
બાયોટેકનોલોજી ડિપાર્ટમેન્ટ,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષયઃ– બી.એસસી.બાયોટેકનોલોજી વિષયનાં સેમેસ્ટર–૧ અને ૨ નો Major અને સેમ–૧ Minor, MDC, SEC નાં અભ્યાસક્રમ બાબત.

સંદર્ભઃ (૧) યુનિવર્સિટી કાર્યાલયના તા.૨૭/૦૬/૨૦૨૩, પરિપત્ર ક્રમાંકઃએસ./પરિપત્ર/૧૬૦૮૮/૨૦૨૩.
(૨) યુનિવર્સિટી કાર્યાલયના તા.૧૮/૦૮/૨૦૨૩, પરિપત્ર ક્રમાંકઃએસ./પરિપત્ર/૨૧૫૪૭/૨૦૨૩.

સુજ્ઞશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ–૨૦૨૩–૨૪ થી અમલમાં આવનાર NEP-2020 અંતર્ગત B.Sc. Biotechnology પ્રોગ્રામના સેમેસ્ટર– ૧ અને ૨ નો Major , Minor, MDC, SEC નાં અભ્યાસક્રમ સંદર્ભે Major Course Sem-1 & 2 અભ્યાસક્રમ બાયોટેકનોલોજી વિષયની (નિયુકત) એડહોક સમિતિની તા.૧૦/૦૬/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૧૯/૦૬/૨૦૨૩ની સભાનાં ઠરાવક્રમાંકઃ ૧૪ અન્વયે કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૨૩/૦૬/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ૩૪ થી મંજૂર કરેલ છે તથા Minor (Elective), MDC અને SEC Course અંગે વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૮/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ૭ અન્વયે સુચવેલ સુધારા મુજબ Biotechnology Sem - 1 ના માઈનર અને મલ્ટિડિસિપ્લિનરી અને SEC Courses ના અભ્યાસક્રમ બાયોટેકનોલોજી વિષયની એડહોક અભ્યાસ સમિતિ વતી કન્વીનરશ્રીએ અને વિજ્ઞાન વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખા વતી વિદ્યાશાખાનાં અધ્યક્ષશ્રી એ મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૭/૦૮/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૦૭ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

(બિડાણઃ ઉપર મુજબ)

કુલસચિવ

પ્રતિ,
૧) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા,
૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....જાણ સારૂ.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

In

Biotechnology

[3 years (Degree) & 4 years (Honours/Honours with Research)]

Program Outcome (PO):

1. Strong foundation in biological sciences: Students will have a comprehensive understanding of fundamental concepts in biology, genetics, microbiology, biochemistry, and molecular biology. This knowledge will provide a solid base for further specialization in biotechnology.
2. Practical laboratory skills: Learners will gain hands-on experience in various laboratory techniques and instrumentation commonly used in biotechnology research and industry. This includes DNA/RNA isolation & purification, DNA sequencing, protein purification, cell culture, genetic engineering, and bioinformatics.
3. Critical thinking and problem-solving abilities: Through coursework, projects, and research opportunities, students will develop analytical skills to identify and address scientific problems in the field of biotechnology. This involves experimental design, data analysis, and interpretation.
4. Knowledge of biotechnological techniques and applications: Students will learn about the latest advancements in biotechnology, including genetic engineering, gene therapy, bio-molecular engineering, and synthetic biology. Learners understand how these techniques can be applied in various sectors such as healthcare, agriculture, environmental science, and pharmaceuticals.
5. Research experience: Many programs offer research opportunities, allowing students to work on cutting-edge projects alongside faculty members or industry professionals. This hands-on research experience will enhance their understanding of scientific methodologies and foster innovation in biotechnology.
6. Communication and teamwork skills: Collaboration is an essential aspect of biotechnology. Through group projects, presentations, and scientific writing assignments, students will develop effective communication skills and the ability to work collaboratively with peers, scientists, and industry professionals.
7. Ethical considerations: Biotechnology has ethical implications, and learners will gain an understanding of the ethical, legal, and societal aspects associated with the field. This knowledge will help them make informed decisions and contribute responsibly to the biotechnology industry.
8. Entrepreneur Skill: In addition to scientific knowledge, the program may foster entrepreneurial skills and an entrepreneurial mind-set. This includes teaching learners how to identify market opportunities, develop business plans, understand intellectual property rights, and navigate the commercialization process for biotechnological innovations. These skills can empower students to turn scientific discoveries into viable products or services, start their own biotechnology venture, or contribute to the growth of existing biotech companies.

Overall, a 4-year undergraduate program in Biotechnology with honours & honours with research will equip student with a strong theoretical foundation, practical skills, and the ability to contribute to the advancement of biotechnology through research and innovation. It can prepare them for further academic pursuits, such as to provide a solid foundation for various career paths in biotechnology research, industry, or related fields.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program in Biotechnology (B. Sc.)

(3 Years Degree, 4 Years Honours/Honours with Research)

Semester-I: Course: BT-MJ-101: Introduction to Biotechnology

Course Code	BT-MJ-102
Course Title	**Introduction to Biotechnology**
Credit	3
Total engagement	3 Credits x 15 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	With the use of cutting-edge biotechnology, mankind are currently able to combat crippling and rare diseases, reduce our impact on the environment, alleviate hunger, use less and cleaner energy, and develop safer, cleaner, and more efficient industrial manufacturing processes.
Course Objective	The goal of the biotechnology curriculum is to provide students with a fundamental understanding of scientific theories of biotechnology, hands-on experiments, techniques, and methods. It also aims to apprise students with recent advancement in the field of Biotechnology.
Course Outcomes	CO1: To understand the basic concepts, history and knowledge about of Biotechnology by learning its global impact on society as well as environment. CO2: Students will learn about the recent advancement and trends in biotechnology sector both public and privet sector, different initiatives to encourage and motivate students to explore diverse avenues such as research funding, start-up endeavour's, skill-oriented training, and employment opportunities. CO3: Acquire knowledge in students of biotechnology enabling them applications in industry and research.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								

Pre-requisite	Biology	
Course Content	**UNIT-1: Basic Concept of Biotechnology:** Introduction, Definition of Biotechnology, History of Biotechnology, Old and New Biotechnology, Biotechnology as interdisciplinary area, Different colors of Biotechnology, Biotechnology: Three component central core, Global impact and current excitement of Biotechnology.	Teaching Hours: 12
	UNIT-2: Biotechnology in State and Nation: Role of GSBTM, STBI and GBRC; Innovation and Entrepreneurship Ecosystem, Incubation centres and Regulatory bodies; Introduction to DBT, Autonomous	Teaching Hours: 15

	institutions of DBT, Public Sector undertaking of DBT, BTIS-NET, Introduction to ABLE.	
	UNIT-3: Applications of Biotechnology Agricultural Biotechnology, Medical Biotechnology, Environmental Biotechnology, Food Biotechnology, Industrial Biotechnology, Genetic Engineering, Economics and Biotechnology: Advent of Econo-Biotechnology.	Teaching Hours: 18
Reference Books	• Sobti, R. C., & Pachouri, S. S. (2008). *Essentials of Biotechnology* (1st ed) Ane Books Pvt. Ltd. • Smith, *J.* E. (2009). *Biotechnology* (5th ed). Cambridge University Press; https://doi.org/10.1017/CBO9780511802751 • Ratledge, *C.* (2006). *Basic biotechnology (2006)* (1st ed), Publisher: Cambridge University Press, ISBN: 9780511802409. https://doi.org/10.1017/CBO978051180240 • Gupta, P. K. (2010). *Elements of biotechnology* (2nd ed). • Singh, B. D. (2010). *Biotechnology* (4th ed), Kalyani Publishers. Dubey, R. C. (2022). *A textbook of Biotechnology, S. Chand* (5th ed).	
e-learning resources	https://dbtindia.gov.in/ https://btm.gujarat.gov.in/ https://gbrc.gujarat.gov.in/ https://stbi.gujarat.gov.in/ https://dbtindia.gov.in/scientific-decision-units/computational-biology/btis-network http://www.btisnet.gov.in/ https://ableindia.in/	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program in Biotechnology (B. Sc.)

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I: Course: BT-MJ-102: Cell Biology

Course Code	BT-MJ-102
Course Title	**Cell Biology**
Credit	3
Total engagement	3 Credits x 15 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	The goal of this course is to introduce students with a very basic knowledge and understanding of the basic unit of life: the cell, its structure, composition and function.
Course Objective	The course will stand on its utility towards learning and implementing the aspects towards basic cell biology.
Course Outcomes	The student at the completion of the course will be able to CO1: Understand the structure and function of eukaryotic and prokaryotic cells. CO2: To be familiar with all the cell organelles. CO3: Students will acquire detailed knowledge of how a cell divides leading to the growth of an organism.
Mapping between COs with PSOs	
Pre-requisite	Biology

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								

Course Content	**UNIT-1: Cell as a Basic unit of Living Systems:** Discovery of cell, The cell theory, Ultra structure of a eukaryotic (plant and animal cells) and prokaryotic cell, Structural organization and functions of plasma membrane and cell wall of eukaryotes.	Teaching Hours:12
	UNIT-2: Cellular Organelles: Structure and functions of cell organelles– Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Peroxisomes, Nucleus (Nuclear envelope with nuclear pore complex, Nucleolus, Nucleoplasm and Chromatin). Vacuole, Cytosol and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments).	Teaching Hours:17

	UNIT-3: Cell Division: Cell cycle- Cell cycle *in vivo*, Control of cell cycle. M Phase: Mitosis and Cytokinesis- Prophase, Pro-metaphase, Metaphase, Anaphase, Telophase. Forces required for mitotic movements, Cytokinesis, Meiosis- The stages of meiosis, Genetic recombination during meiosis. Various cell division mechanism in prokaryotes.	Teaching Hours:16
Reference Books	• Gerald Karp (2014). Cell Biology VII Edition. WILEY. • Lodish *et al* (2008). Molecular Cell Biology. VI Edition. Freeman & Co, USA. • De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia. • Cooper, G.M. and Hausman, R.E. (2007). The Cell: A Molecular Approach. IV Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.	
e-learning resources	SWAYAM (https://swayam.gov.in/)	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Undergraduate Program in Biotechnology (B. Sc.)
(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I: Course: BTP-MJ-1: Practical

Course Code	BTP-MJ-1
Course Title	**Practical**
Credit	2
Total Engagement	2 Credits x 30 Hours = 60 Hours
Teaching per week	4 h X 1 day = 4 h
Minimum weeks per semester	15 weeks (Including Classwork, examination, preparation, holidays etc.)
Effective from	2023-2024
Purpose of Course	The purpose of this course is to provide participants with a comprehensive understanding of laboratory safety practices, essential laboratory equipment, sterilization techniques, proper handling of laboratory waste, and various staining and counting procedures commonly used in scientific research and analysis.
Course Objective	The objective of this course is to equip participants with the necessary knowledge and skills related to laboratory safety, equipment operation, sterilization techniques, waste management, and staining/counting procedures.
Course Outcomes	By the end of this course, students will have: • Developed a strong understanding of laboratory safety rules and regulations, ensuring their ability to create and maintain a safe working environment. • Acquired knowledge of the principles, working mechanisms, and applications of key laboratory instruments, enabling them to use these instruments effectively in scientific research and analysis. • Gained expertise in the principles, working mechanisms, and uses of sterilizers, allowing them to properly sterilize laboratory equipment and materials. • Mastered the techniques for preparing and sterilizing glassware and culture media, minimizing contamination risks in laboratory experiments. • Gained awareness of proper waste disposal and segregation practices, contributing to environmentally friendly and safe laboratory operations. • Acquired practical skills in DNA staining using Schiff's reagent and *Allium cepa* peel, facilitating genetic analysis. • Developed the ability to study and identify divisional stages in mitosis using onion root tips, enhancing understanding of cellular processes. • Attained knowledge and proficiency in identifying Barr bodies from Buccal smears, aiding in genetic investigations. • Gained practical experience in Geimsa staining for blood cell analysis, enabling them to identify and study various blood cell types.

<table>
<tr><td></td><td>• Acquired the skill to perform R. B. C. counts using a Haemocytometer, facilitating quantitative analysis in hematology.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td></tr>
<tr><td>CO 1-10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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</td></tr>
<tr><td>Pre-requisite</td><td>Basics of Biology, Biotechnology, Biochemistry, Microbiology</td></tr>
<tr><td>Course Content</td><td>1. Understanding laboratory safety and rules.
2. Principle, working and use of: Microscope, Incubator, pH meter & Centrifuge.
3. Principle, working and uses of sterilizer: Hot air oven and Autoclave.
4. Preparation and sterilization of glassware's and Culture media.
5. Laboratory waste and biomedical waste disposal and segregation.
6. DNA staining by Schiff's reagent using peel of Allium cepa.
7. Study of divisional stages in mitosis from onion root tips.
8. Barr body from Buccal smear.
9. Geimsa staining of blood cells.
10. R. B. C count by Haemocytometer.</td></tr>
<tr><td>Reference Books</td><td>• Patel, R. (2019) Experimental Microbiology vol 1 and vol 2, 5th ed. Aditya Publication.
• Nigam, A. and Ayyagari, A. (2007) Lab Manual in Biochemistry, Immunology and Biotechnology, Tata McGraw-Hill Publishing Company, New Delhi.
• Aneja, K. R. (2014) Laboratory Manual of Microbiology and Biotechnology, MedTech, Scientific International Pvt. Ltd., New Delhi.</td></tr>
<tr><td>Teaching Methodology</td><td>Laboratory work, Journal preparation</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal assessment based on class attendance, participation, internal examination, etc. 70% External based onsemester end University examination</td></tr>
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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program in Biotechnology (B. Sc.)

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-II: Course: BT-MJ-201: Biochemistry of Water

Course Code	BT-MJ-201
Course Title	**Biochemistry of Water**
Credit	3
Total engagement	3 Credits x 15 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	It provides a comprehensive understanding of the fundamental role of water plays in biological systems. It is designed to provide solid foundation for understanding the intricate interplay between water and biological systems.
Course Objective	By exploring the biochemistry of water, students will gain insights into its unique physical and chemical properties, including hydrogen bonding, polarity and its influence on bio-molecular interactions. Understanding these principles is vital for comprehending various biological processes, such as enzyme catalysis, protein folding, and the stability of biomolecules.
Course Outcomes	CO1: Upon completing this unit, student will have a strong understanding of the evolution of life on Earth, the chemical foundations of biochemistry, and the weak interactions in aqueous systems. They will be equipped with the knowledge and analytical skills necessary to study biological systems at the molecular level, interpret biological phenomena, and pursue further studies or careers in life sciences. CO2: By the end of this unit, students should have a solid understanding of the ionization of water, weak acids, and weak bases, as well as the principles and mechanisms behind buffering against pH changes in biological systems. CO3: The topics on water as a reactant and the fitness of the aqueous environment for living organisms aims to provide students with a comprehensive understanding of the role of water in chemical reactions and its significance for sustaining life.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								

Pre-requisite	Chemistry, Biology	
Course Content	**UNIT-1:** Introduction; Landmarks in the evolution of life on Earth; Chemical foundations of Biochemistry; Weak interactions in Aqueous systems.	Teaching Hours: 20

	UNIT-2: Ionization of water, weak acids and weak bases; Buffering against pH changes in biological systems.	Teaching Hours: 15
	UNIT-3: Water as a reactant; The fitness of the Aqueous Environment for Living Organisms.	Teaching Hours: 10
Reference Books	• Nelson, D. L. and Cox, M. M. (2017) Lehninger: Principles of Biochemistry 7th Edition, W. H. Freeman, Macmillan Learning, New York.	
e-learning resources	SWAYAM (https://swayam.gov.in/)	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program in Biotechnology (B. Sc.)

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-II: Course: BT-MJ-202: Biomolecules

Course Code	BT-MJ-202
Course Title	**Biomolecules**
Credit	3
Total engagement	3 Credits x 15 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	To give students basic idea regarding biomolecules
Course Objective	Students will know the basics about Biomolecules
Course Outcomes	CO1: Students will know about hetero-polysaccharides and nucleic acid CO2: Students will aware about basic structure, types and variety of amino acids proteins functions CO3: Students will get the knowledge of different types of lipids with its properties.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								

Pre-requisite	Biology	
Course Content	**UNIT-1: Carbohydrates and Nucleic Acid:** Carbohydrate: Definition and Classification, Polysaccharides and its types, Biologically important glycosides, Carbohydrates as information molecules, Nucleosides and nucleotides, Structure of DNA and RNA (m-RNA, t-RNA, r-RNA, hn-RNA).	Teaching Hours: 15
	UNIT-2: Amino acids and Proteins: Amino acids and its classification, Non-Standard amino acids, Non-protein amino acids, Classifications of proteins (based on –source, shape, composition and solubility) Properties of proteins, Structure of proteins, Biological roles of proteins.	Teaching Hours: 15
	UNIT-3: Lipids: Lipids: Definition and Classification, Physical properties of Lipids, Biological roles of Lipids.	Teaching Hours: 15

Reference Books	• Cox, D. N. (2017). Lehninger Principles of Biochemistry (7th ed.). New York: Macmillan education. • Jain & Jain (2009). Fundamentals of Biochemistry. New Delhi: S. Chand. • U. Satyanarayana, U. a. (2019). Biochemistry (5th ed.). new delhi: RELX india and Books and Allied Pvt. Ltd.
e-learning resources	SWAYAM (https://swayam.gov.in/)
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Undergraduate Program in Biotechnology (B. Sc.)
(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-II: Course: BTP-MJ-2: Practical

Course Code	BTP-MJ-2
Course Title	**Practical**
Credit	2
Total Engagement	2 Credits x 30 Hours = 60 Hours
Teaching per week	4 h X 1 day = 4 h
Minimum weeks per semester	15 weeks (Including Classwork, examination, preparation, holidays etc.)
Effective from	2023-2024
Purpose of Course	Course aims to provide students with a strong foundation in laboratory techniques and scientific methodology, enabling them to approach scientific investigations with confidence, precision, and a thorough understanding of the principles and techniques involved.
Course Objective	The objective of the course is to provide students with a comprehensive understanding of scientific methodology and laboratory techniques. It aims to develop their skills in experimental design, data collection, analysis, and interpretation. The course focuses on exploring various scientific phenomena, such as surface tension, buffer systems, and qualitative tests for carbohydrates, proteins, and lipids.
Course Outcomes	By the end of this course: • Students will understand the importance of formulating a hypothesis, collecting and analyzing data, and drawing conclusions based on the results obtained. • Participants will be proficient in measuring the surface tension of water and comparing it to solutions with varying concentrations. They will understand how solutes affect surface tension and be able to interpret the results obtained through experimental analysis. • Students will be able to plot a titration curve and determine the pKa value of a weak acid. They will understand the principles behind acid-base titrations and be able to analyze experimental data to obtain accurate pKa values. • Students will understand the concepts of buffering and be able to calculate the buffer capacity based on experimental measurements. • Participants will have a comprehensive understanding of buffer systems commonly found in biological systems. They will be able to identify and analyze the components of buffer systems, as well as their importance in maintaining pH stability in biological processes. • They will be familiar with various chemical reagents used in carbohydrate analysis and understand the principles behind these tests, enabling them to identify the presence of carbohydrates in different samples.

<table>
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They will possess the knowledge of specific reagents and techniques used in protein detection, allowing them to identify the presence of proteins in various samples.
They will understand the chemical reactions involved in lipid detection and be able to interpret the results obtained through these tests, enabling them to identify the presence of lipids in different samples.
Participants will be capable of determining various parameters such as acid value, iodine number, and saponification number. They will understand the principles behind these measurements and their significance in analyzing the quality and properties of oils and fats.
Participants will gain proficiency in protein estimation using methods such as Folin-Lowry, Bradford, and Bromo Cresol Green (BCG). They will be able to perform accurate protein estimations, and interpret the results obtained through these techniques.

</td></tr>
<tr><td>Mapping between COs with PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td></tr>
<tr><td>CO 1-10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Pre-requisite</td><td>Basics of Biology, Biotechnology, Biochemistry, Microbiology</td></tr>
<tr><td>Course Content</td><td>
1. Scientific method introduction: Design and conduct a simple experiment to investigate a scientific question, including formulating a hypothesis, data collection and analysis.
2. Measure the surface tension of water and compare it with solutions of different concentrations, investigating the impact of solutes on surface tension.
3. Plot a titration curve and determine the pKa value of the weak acid.
4. Determining capacity of buffer solution.
5. Explore buffer systems commonly found in biological systems.
6. Qualitative test for carbohydrates.
7. Qualitative test for proteins.
8. Qualitative test for lipids.
9. Acid Value/Iodine Number/Saponification Number.
10. Folin-Lowry/Bradford/Bromo Cresol Green (BCG) method for protein estimation.
</td></tr>
<tr><td>Reference Books</td><td>

Patel, R. (2019) Experimental Microbiology vol 1 and vol 2, 5th ed. Aditya Publication.
Kamboj, P. C. (2008) University Practical Chemistry, Vishal Publishing Company, Punjab.
Aneja, K. R. (2014) Laboratory Manual of Microbiology and Biotechnology, MedTech, Scientific International Pvt. Ltd., New Delhi.

</td></tr>
<tr><td>Teaching Methodology</td><td>Laboratory work, Journal preparation</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal assessment based on class attendance, participation, internal examination, etc. 70% External based on semester end University examination</td></tr>
</table>

Annexure - 1

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Minor Elective: BT-ME-101: Basics of Biochemistry

Course Code	BT-ME-101
Course Title	Basics of Biochemistry
Credits	2
Course Level	100-199
Total engagement	2 Credits x 15 Hours = 30 Hours
Teaching per week	2 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	The purpose of course to provide knowledge about physical and evolutionary foundation. It makes students to aware about pH meter, acids, bases, buffers and role of buffers in biological system.
Course Objectives	The objective of the course is to give knowledge about law of thermodynamics, Role of enzyme in regulations and functions of different buffer in body. Another objective is to provide knowledge regarding instrument, buffers, and enzyme activity.
Course Outcomes	CO 1: To learn evolution process of organisms as well as physical process. CO 2: To learn acids, base, pH, buffers and enzymes.
Mapping between COs with PSOs	<table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>
Pre-requisite	Fundamental understanding about science, biology and chemistry
Course Content	**UNIT-1: Evolutionary and Physical Foundation** A possible RNA world scenario and evolution of eukaryotic cells, Dynamic steady state of living organisms, Energy transformation in living organisms, Flow of electrons as source of energy, Requirement of work and energy for creation and maintenance, Energy coupling links reactions in biology, Enzymes promote sequences of chemical reactions, Metabolism is regulated to achieve Balance and Economy. — Teaching Hours: 20
	UNIT-2: Concept of pH and types of Buffers Hydrogen ion concentration, Handerson-hasselbalch equation, Ionization of water, weak acids and weak bases, pH meter-instrumentation and application, pH scale, Buffer-definition, types & its preparation, buffers of biological importance, Mechanism of action of buffers in biological systems. — Teaching Hours: 10

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Reference Books	• Cox, M. M., & Nelson, D. L., (2017) Lehninger: *Principles of Biochemistry*, 7th Edition, W.H. Freeman, New York. • Jain, J. L. (2004) Fundamentals of Biochemistry, S. Chand.
e-learning resources	---
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc.70% External based on semester end University examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Minor Elective: BTP-ME-1 Practical

Course Code	BTP-ME-1
Course Title	Practical: Basics of Biochemistry
Credits	2
Total Engagement	2 Credits x 30 Hours = 60 Hours
Teaching per week	4 h
Minimum weeks per semester	15 weeks (Including Classwork, examination, preparation, holidays etc.)
Effective from	2023-2024
Purpose of Course	The purpose of this course is to provide comprehensive understanding of buffer preparation, pH measurement, enzyme extraction and determination of enzyme activity.
Course Objective	The objective of this course is to equip students with the necessary knowledge and skills related to instrument, buffers, titration and enzyme activity.
Course Outcomes	Students are expected to know about how to calibrate pH meter and find out pH of solutions. To learn about buffer preparation. To gain vast knowledge about enzyme extraction, effect of various parameters on enzyme activity.
Mapping between COs with PSOs	
Pre-requisite	Basics of Biology and Chemistry

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO 1-10								

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Course Content	1. Preparation of 0.5 M solution. 2. Preparation of stock and working solutions. 3. Preparation of buffer solutions (Phosphate, Glycine-NaOH, Glycine-HCl). 4. Working principle of pH meter. 5. Estimation of xylose by orcinol method. 6. Estimation of proline by ninhydrine method. 7. Demonstration of enzyme extraction. 8. Titration curve of amino acids. 9. Effect of temperature on enzyme activity. 10. Effect of pH on enzyme activity.
Reference Books	• Shanmugam, S., Kumar, T. S. & Pareer Selvam K. (2019) Laboratory Handbook on Biochemistry, PHI Learning Pvt. Ltd. • Singh, R. (2000) Introductory Practical Biochemistry, Alpha Science International Ltd.
Teaching Methodology	Laboratory work, Journal preparation
Evaluation Method	30% Internal assessment based on class attendance, participation, internal examination, etc.70% External based on semester end University examination

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Minor Elective: BT-ME-102: Ecological Studies

Course Code	BT-ME-102
Course Title	Ecological Studies
Credits	2
Course Level	100 to 199
Total engagement	2 Credits x 15 Hours = 30 Hours
Teaching per week	2 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	The basic knowledge (or facts) of ecosystems and ecosystem management are known as ecological notions. Ecological ideas serve as the foundation for ecological principles, which are fundamental presumptions (or beliefs) regarding ecosystems and how they work.
Course Objectives	The objective of this paper is to study the interactions between living things, such as humans, and their natural surroundings. It aims to comprehend the crucial interconnections that exist between living things such as plants, animals, and humans.
Course Outcomes	CO1: Students will gain knowledge of and interest in how nature works, how everything is connected, and how different aspects of an ecosystem can be integrated to create a functional environment. Studying the interactions between animals and plants as well as how human influence and climatic changes affect ecosystems are all included in this. CO2: Students will be able to understand how environmental factors and an organism's evolutionary past influence behaviour, which in turn influences evolutionary processes.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								

Pre-requisite	Basic Science	
Course Content	**UNIT-1: Population Ecology and Species Interactions** Characteristics of a population, Population growth curves, Population regulation, Life history strategies (*r* and *K* selection), Concept of meta-population, Types of interactions, intra and Interspecific competition.	Teaching Hours: 14

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	UNIT-2: Animal Behaviour Introduction, Types and characteristics of Animal Behaviour, Types of Learning Behaviour Ecological Behaviour: Habitat-Food Selection, anti-predator mechanism, Aggregation, Territoriality and Dispersal Social Behaviour: Flocking in birds, herding in mammals, kin selection, altruism, inclusive fitness Reproductive Behaviour: Evolution of sex, Reproductive Strategies, Mating Systems, Courtship, Sperm Competition, Sexual Selection and parental care.	Teaching Hours: 16
Reference Books	• Eugene, O. P., & Gray, B. W. (2005). *Fundamentals of ecology* (5th ed). Cengage Learning, ISBN 978-81-315-0020-0. • Dash, M., & Dash, S. (2009). *Fundamentals of ecology*. McGraw-Hill Education, ISBN 978-0-07-008366-0. • Rockwood, L. L. (2015). *Introduction to population ecology, Wiley desktop editions series, (2)*. John Wiley & Sons Publications, ISBN 1118947576, 9781118947579.	
e-learning resources	*https://www.researchgate.net/publication/215622242_Textbook_of_Animal_Behaviour*	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Minor Elective: BTP-ME-2 Practical

Course Code	BTP-ME-2
Course Title	Practical: Ecological Studies
Credits	2
Total Engagement	2 Credits x 30 Hours = 60 Hours
Teaching per week	4 h
Minimum weeks per semester	15 weeks (Including Classwork, examination, preparation, holidays etc.)
Effective from	2023-2024
Purpose of Course	The purpose of ecological practical is to make small scale comparisons among biotic and abiotic community and relationship between different populations in respect to environment.
Course Objective	Students will able understand local and geographic distribution and abundance of an organism respect to living and non-living world.

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<table>
<tr><td>Course Outcomes</td><td>CO1: To make familiar the students regarding community present in fresh water ecosystem and how they interact with environment.
CO2: To provide practical knowledge on population density\diversity\richness present in surrounding environment.
CO3: To sensitize students towards presence of repeated species present during environmental concerns, issues, and impacts of climate change and related mitigation strategies.
CO4: To provide basic understanding to students that how animals response to various environmental stimulus.
CO5: To make the students to apply their knowledge for better description of population diversity (richness\evenness) present in ecosystem.
CO6: To sensitize students regarding relationship between weather condition and ecosystem
CO7: To improve student's observation regarding monitor biodiversity, conservation, restoration and sustainable management of nature
CO8: To sensitize students regarding presence or absence of animal biodiversity present in surrounding habitat.
CO9: To provide practical knowledge how to create miniature and enclosed ecosystem at laboratory level.
CO10: To make familiar the students how to enrich various microbes from sediments and soils.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td><table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td></tr><tr><td>CO 1-10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Pre-requisite</td><td>Basics of Biology, Biotechnology, Biochemistry, Microbiology</td></tr>
<tr><td>Course Content</td><td>1. To study pond ecosystem.
2. Study the plant population density by quadrant method.
3. Study the plant population frequency by quadrant method.
4. Report writing on Animal Behaviour Experiment.
5. Estimation of species diversity by Shanon-Weiner diversity index method.
6. Measurement of atmospheric humidity.
7. Preparation of field report based on the survey of local flora.
8. Study the fauna of local area/college campus.
9. Constructions of Winogradsky's Column.
10. Measurement of primary productivity of water body.</td></tr>
<tr><td>Reference Books</td><td>• Patel, R. (2019) Experimental Microbiology vol 1 and vol 2, 5th ed. Aditya Publication.
• Aneja, K. R. (2014) Laboratory Manual of Microbiology and Biotechnology, MedTech, Scientific International Pvt. Ltd., New Delhi.</td></tr>
<tr><td>Teaching Methodology</td><td>Laboratory work, Journal preparation</td></tr>
<tr><td>Evaluation Method</td><td>30% Internal assessment based on class attendance, participation, internal examination, etc. 70% External based on semester end University examination</td></tr>
</table>

Annexure - 2

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Multidisciplinary Course: BT-MDC-101: Basic Healthcare

Course Code	BT-MDC-101
Course Title	Basic Healthcare
Credits	4
Course Level	100-199
Total engagement	4 Credits x 15 Hours = 60 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	This course is for all students who wants to learn fundamental concepts related to self-care and care for others which gives them confidence to take immediate actions during emergencies. Basic health Care course orients learner to understand some important aspects to take care and steps in case of various types of health related emergencies.
Course Objectives	-To understand basic concepts of First aid, this can help to society as well as own self. -Person can deal with current emergency situation on quick base. -Knowledge of First aid can save life or may give temporary relief to prevent worst situation in absence of health professional. -It helps to realize moral duties and values.
Course Outcomes	CO1: Students will able to learn about primary aid skills. CO2: Student will deal to handle present emergency situation with confidence. Students will develop basic skill which is needed to assess the ill or injured person. CO3: Students will able to take logical decisions and shall be able to take appropriate immediate actions. Hospital visit is included for brief practical understanding and to visualize demonstration by expert regarding first aid.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								

Pre-requisite	Biology; Chemistry; Public Health; Ethics; Medical Terminology	
Course Content	**UNIT-1: Preparing to Help (First Aid)** First Aid Techniques; Aim and The Law; Dealing with an Emergency; Stress when giving First Aid and Resuscitation; Primary and Secondary Assessment; Hygiene and Hand Washing.	Teaching Hours: 15
	UNIT-2: Medical Emergencies Heart, Blood Circulation, Shock; GI tract, Diarrhoea, Food Poisoning and Diabetes; Respiratory System and Breathing; Nervous System and Unconsciousness; Urinary System,	Teaching Hours: 15

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	Reproductive System and Emergency Childbirth; Senses, Foreign Bodies in Eye, Ear, Nose or Skin and Swallowed Foreign Objects.	
	Unit 3: Injury Emergencies Control of Bleeding; Burns: Thermal, Electrical and Chemical; Head, Neck and Back injuries; Minor Injuries: Nosebleed, Injured Tooth; Wounds; Bones, Joints and Muscles.	Teaching Hours: 15
	UNIT-4: Environmental Emergencies Heat and Cold Emergencies; Bites and Stings; Poisoning and Poisonous Plants; Lightning; Emotional Considerations; Visits to Hospital.	Teaching Hours: 15
Reference Books	• Indian First Aid Manual (2016) 7th Edition, Indian Red Cross Society. • Basic First Aid, Student book, version 8.0, American Safety and Health Institute, ISBN 978-1-936515-64-6, 1st Edition (2016)	
e-learning resources	• https://www.indianredcross.org/publications/FA-manual.pdf • https://www.emcmedicaltraining.com/wp-content/uploads/2016/09/ashi-first-aid-student-book.pdf	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Multidisciplinary Course: BT-MDC-102: Introduction to Bioinformatics and Databases

<table>
<tr><td>Course Code</td><td colspan="2">BT-MDC-102</td></tr>
<tr><td>Course Title</td><td colspan="2">Introduction to Bioinformatics and Databases</td></tr>
<tr><td>Credits</td><td colspan="2">4</td></tr>
<tr><td>Course Level</td><td colspan="2">100-199</td></tr>
<tr><td>Total engagement</td><td colspan="2">4 Credits x 15 Hours = 60 Hours</td></tr>
<tr><td>Teaching per week</td><td colspan="2">4 h</td></tr>
<tr><td>Minimum weeks per semester</td><td colspan="2">15 weeks (Including classwork, examination, preparation & holidays)</td></tr>
<tr><td>Effective from</td><td colspan="2">2023-2024</td></tr>
<tr><td>Purpose of Course</td><td colspan="2">The purpose of the course is to give knowledge to the students regarding the fundamentals of bioinformatics and databases using computers.</td></tr>
<tr><td>Course Objectives</td><td colspan="2">Any use of tools and databases is based on bioinformatics. Biological databases are becoming more and more importance in today life for better knowledge.</td></tr>
<tr><td>Course Outcomes</td><td colspan="2">CO1: The student will be able clarify the fundamentals of computer including applications, generations, components, hardware, softwares and networking.
CO2: The student will be able to get knowledge of basic bioinformatics and various biological databases.</td></tr>
<tr><td>Mapping between COs with PSOs</td><td colspan="2"><table><tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Pre-requisite</td><td colspan="2">Biology; Chemistry; Computer Science</td></tr>
<tr><td>Course Content</td><td>UNIT-1: Computer Fundamentals - 1
Overview, Applications, Generations and its types; Components, CPU, Input Devices and Output Devices; Memory, RAM, ROM, Motherboard, Memory units and Ports.</td><td>Teaching Hours: 15</td></tr>
<tr><td></td><td>UNIT-2: Computer Fundamentals - 2
Hardware and Software; Number system, Number Conversion, Data and Information; Networking, Operating System, Internet and Intranet.</td><td>Teaching Hours: 15</td></tr>
<tr><td></td><td>UNIT-3: Introduction to Bioinformatics
What is Bioinformatics and its applications; Scope of Bioinformatics; Structure visualizing tools; Examples of related tools (FASTA, BLAST, RASMOL, SWISS PORT, Cn3D).</td><td>Teaching Hours: 15</td></tr>
</table>

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	UNIT-4: Biological Databases General Introduction of Biological Databases; Nucleic acid databases (NCBI, GENBANK, PubMed, DDBJ and EMBL); Protein databases (PDB and MMDB); Structure databases (CATH, SCOP and PDBsum); Metabolic pathway databases (KEGG)	Teaching Hours: 15
Reference Books	• E. Balagurusamy (2009), *Fundamentals of Computers*, Tata McGraw Hill Education Private Limited, New Delhi, ISBN 13: 978-0-07-014160-5 • S. C. Rastogi (2018), *Bioinformatics Methods and Applications (Genomics, Proteomics and Drug Discovery)*, PHI Learning Private Limited, Delhi, ISBN 978-81-203-4785-4	
e-learning resources	https://www.tutorialspoint.com/computer_fundamentals/index.htm https://www.ncbi.nlm.nih.gov/ https://www.embl.org/ https://www.rcsb.org/ https://www.cathdb.info/ https://scop.mrc-lmb.cam.ac.uk/ https://www.genome.jp/kegg/	
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination	

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Skill Enhancement Course: BT-SEC-101: Bacteriological Media and Isolation Techniques

Course Code	BT-SEC-101
Course Title	Bacteriological Media and Isolation Techniques
Credits	2 (1 credit theory & 1 credit practical)
Course Level	100-199
Total engagement	1 Credit x 15 Hours + 1 Credit x 30 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	This course will give students the introduction, necessity, composition and types of media, isolation techniques and practical skills regarding the preparation of culture media and other basic handling skills required in a lab.
Course Objectives	-To help understand the role of various nutrients in growth of organisms. -To create awareness regarding media preparation. - Types of media formed - Various techniques for the isolation of pure culture.
Course Outcomes	CO1: Students will gain knowledge about media, its ingredients, role, types and various techniques for isolation of pure culture. CO2: Students will gain skills regarding media preparation, cleaning and sterilizing of glassware and media, how to prepare a smear, how to stain a smear and how to perform serial dilution.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								

Pre-requisite	12^{th} Pass with Biology & Chemistry	
Course Content	**UNIT-1: Nutritional requirements and cultivation media** Introduction to Nutritional requirement and chemical elements required, Steps in preparation of media, Introduction and Basal Ingredients of culture media, Types of media (Solid, Semi-solid and Liquid), Techniques for isolation of pure culture-Single cell, serial dilution, pour plate, streak plate and spread plate techniques.	Teaching Hours: 15
	UNIT-2: Practical 1. Preparation of Culture media (Solid, Semi-solid and Liquid). 2. Cleaning and Sterilization of glassware and media. 3. Preparation, fixation and monochrome staining of a smear. 4. Preparation of Serial dilution. 5. Demonstration of different isolation techniques.	Teaching Hours: 30

Reference Books	• Dubey, M. (2009) *Practical Microbiology.* New Delhi: S. Chand. • Srivastava, M. L. (2008) *Microbial Biochemistry.* Narosa Publishing House. • Madigan, B. B. (2019) *Brock Biology of Microorganisms* (5 ed.). Pearson. • Rakesh Patel, K. P. (2016) *Experimental Microbiology* (9 ed., Vol. I). Aditya Publication.
e-learning resources	https://www.youtube.com/dbtvnsgu
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Program

(3 Years Degree; 4 Years Honours/Honours with Research)

Semester-I

Skill Enhancement Course: BT-SEC-102: Study of Soil Profile

Course Code	BT-SEC-102
Course Title	Study of Soil Profile
Credits	2 (1 credit theory & 1 credit practical)
Course Level	100-199
Total engagement	1 Credit x 15 + 1 Credit x 30 Hours = 45 Hours
Teaching per week	3 h
Minimum weeks per semester	15 weeks (Including classwork, examination, preparation & holidays)
Effective from	2023-2024
Purpose of Course	This course is for all students who wants to learn fundamental concepts related to understand Formation of soil and Properties of soil. Also, to learn about soil organism correlation.
Course Objectives	- This paper is meant to make students understand the importance of soil in agriculture and soil science. - Student will know various physical and chemical properties of soil. Also, will know about soil biology soil microbes' interaction.
Course Outcomes	CO1: Students will able to define soil texture. CO2: They can identify soil types accordingly to texture characteristics. CO3: They can identify source of organic matter in soil. CO4: They will able to define soil pH. CO5: Identify types of soil organisms and their functions within a soil ecosystem.
Mapping between COs with PSOs	<table><tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>
Pre-requisite	12th Pass with Biology and Chemistry
Course Content	**UNIT-1: Soil Profile** What is soil? Weathering-Formation of soil, Soil formation factors and processes, Soil Profile, Soil biology, Soil physical properties, Soil Structure and Consistency, Soil water, Concept of Soil pH and Nutrient Availability, Soil organic matter. — Teaching Hours: 15
	Practical: 1. Determination of Soil pH 2. Identification of soil texture- clay, sand, loamy by sieve method. 3. Identification of soil types-red soil, black soil. 4. Analysis of soil organic matter. 5. Microbiological analysis of soil (SPC/TVC) — Teaching Hours: 30

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Reference Books	• Mehra, R. K. (2011). *Textbook of Soil Science*. Indian Council of Agricultural Research. • Brady, N. C., Weil, R. R., & Weil, R. R. (2008). *The nature and properties of soils* (Vol. 13, pp. 662-710). Upper Saddle River, NJ: Prentice Hall.
e-learning resources	• https://agrimoon.com/wp-content/uploads/Fundamentals-of-Soil-Science-with-Practicals.pdf • https://agrigyan.in/fundamentals-of-soil-science-pdf-download-free/#preview-download-pdf • https://www.agriexam.com/introduction-to-soil-science-book-pdf
Teaching Methodology	Classwork, Discussion, Self-Study, Projects, Seminars and/or Assignment
Evaluation Method	30% Internal assessment based on class attendance, participation, class test, quiz, assignment, seminar, internal examination, etc. 70% External based on semester end University examination.