

**GUJARAT VIDYAPITH: AHMEDABAD**  
**Faculty of Science and Applied Science, Sadra,**  
**Department of Biogas Research and Microbiology**  
**Course Structure For B.Sc Microbiology (Semester I to VI)**  
**Effective from June 2023**

Availability of time for direct teaching in each semester = 15weeks = 517.5 hours (15weeks × 34.5 hours)

Monday to Friday (excluding prayer and recess)= 30 hours (6 hours × 5 days)

Saturday (excluding prayer and recess) = 4.5 hours

Therefore 1week = 34.5 hours

<b>B.Sc.Semester-2</b>							
Sr. No.	Broad Category of Course	Subject Name	Semester	Hours		Credits	
				Theory	Practical	Theory	Practical
1	Major(Core)	Microbiology	Second	45	45	3	1.5
2	Minor	Chemistry	Second	45	45	3	1.5
3	Multidisciplinary	Physics	Second	45	45	3	1.5
4	Ability Enhancement course	English	Second	25	-	1.5	-
5	Value added Courses	Environmental Studies	Second	60	-	4	-
6	Skill Enhancement Course	Physico-chemical analysis of soil and water	Second	-	90	-	3
7	Community Life	Community Life	Second	-	-	-	-
<b>Total</b>				<b>220</b>	<b>225</b>	<b>14.5</b>	<b>7.5</b>

**Available Total Credits= 22 Total required hours per semester=445**

**Total available hours per semester=517.5 hours**

**Available hours per week= 34.5 hours**

**Calculation of required hours per week**

14.5 credits for theory=14.5 hours

7.5 credits for practicals=15 hours

**Total required hours per week=29.5 hours**

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**Extra hours =5 hours (we can arrange tutorial class, remedial class, library class and other co-curricular activities during these hours).**

**UG Certificate:** Students who opt to exit after completion of the first year and have secured 40 credits will be awarded a UG certificate **if, in addition, they complete one vocational course or internship / Apprenticeship of 4 credits during the summer vacation of the first year.** These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

**GUJARAT VIDYAPITH : AHMEDABAD**  
**Faculty of Science and Applied Science**  
**Department of Biogas Research and Microbiology**  
**BSc. Semester-II**  
**MIC -201 Basic Bacteriology**

(Syllabus of theoretical portion) (In force from June, 2023)  
(External Evaluation: 60% + Internal Evaluation: 40%)  
(Total Teaching Hours=45, Credit=03)

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**LEARNING OUTCOMES**

**After studying this paper student will be able to.....**

- Get Knowledge regarding Prokaryotes, and different systems of classification of bacteria
  - Understand cellular organization of bacterial cell and external structures of bacterial cell
  - Get knowledge regarding nutritional diversities and diversified nutritional requirements of bacteria
  - Learn the basic skills of cultivation techniques of bacteria and also get the techniques of media preparation in laboratory
  - Know about Pure culture techniques and maintenance and preservation
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**Unit 1: Cellular Organization and External Structures of Bacterial cell Teaching Hours: 12**

- > Cellular organization: size, shape and arrangement of bacterial cells **(2 Hours)**
- > External structures of bacterial cell
- Structure and chemical composition of cell wall of Gram-positive and Gram negative bacteria / Archaeobacteria, Acid fast bacteria **(2 Hours)**
- Mechanism of Gram stain and Acid-fast staining **(2 Hours)**
- Cell wall less bacteria, protoplast, spheroplast **(0.5 Hour)**
- Flagella of Gram-positive bacteria and Gram-negative bacteria , endo-flagella (axial filaments), bacterial motility **(2.5 Hours)**
- Capsules, slime layer, pili and fimbriae, sheaths, prosthecae and stalks **(3 Hours)**

**Unit 2: Internal Structures of Bacterial cell Teaching Hours: 11**

- > Cytoplasmic membrane of Eubacteria and Archaeobacteria **(2 Hours)**
- > Mesosomes **(0.5 Hour)**
- > Cytoplasm and nuclear material (bacterial chromosome), bacterial plasmids **(2.5 Hours)**
- > Ribosomes of Eubacteria and Archaeobacteria **(2 Hours)**
- > Inclusion bodies (cellular reserve food materials) **(50 minutes)**
- > Bacterial spores and cyst: spore structure, types of spores, sporogenesis and

germination of spore, bacterial cyst (3 Hours)

> Structural differences between eubacteria and archaebacteria (10 minutes)

**Unit 3: Nutrition and Cultivation of Bacteria** Teaching Hours: 11

> Nutritional and chemical requirements of bacteria: carbon, oxygen, nitrogen, sulfur, phosphorus, trace elements, vitamins, growth factors, water (2 Hours)

> Nutritional diversities in bacteria

• Based on source of energy: Phototrophs, Chemotrophs (1 Hour)

• Based on source of electro donor: Lithotrophs, Organotrophs (1.5 Hours)

• Based on source of carbon: Autotrophs, Heterotrophs, Mixotrophs, Obligate parasites (1.5 Hours)

> Culture media: media ingredients, preparation of media, general cultivation media (N.broth and N.agar) (3.5 Hours)

> Cultivation of anaerobic bacteria (1.5 Hours)

**Unit 4: Pure Culture Techniques** Teaching Hours: 11

> Pure culture, mixed culture, selective methods to obtain pure cultures: chemical, physical, and biological methods (3 Hours)

> Isolation methods of pure culture: aseptic technique , streak plate, spread plate and pour plate techniques (2.5 Hours)

> Cultural characteristics: colony characteristics , characteristics of broth cultures (2.5 Hours)

> Maintenance and preservation of pure cultures (2 Hours)

> Culture collection centers and their role (1 Hour)

**REFERENCE**

No.	Name	Author
1.	Microbiology	Pelczar JR., Chan ECS, Krieg NR, 5th Edition (1993), McGraw-Hill Book Company, NY.
2.	Principles of Microbiology	R. M. Atlas, 2nd Edition (Indian Edition) (2015) McGraw Hill Education (India) Private Limited, New Delhi, India
3	Microbiology,	Prescott L, Harley J P, and Klein D A, (2008), Microbiology, 7th edn. Wm C. Brown - McGraw Hill, Dubuque, IA.7th edn.

## URLs/Weblinks for E-content

1. Gram +ve and Gram -ve bacterial cell wall <https://youtu.be/eM-bXU1U00Q>  
<https://youtu.be/roX0inhEdgA>
2. Gram stain <https://youtu.be/pgr-HeVNbOY>  
<https://youtu.be/sxa46xKfIOY>
3. Acid-fast staining <https://youtu.be/s1uWm6rqGpA>
4. Bacterial flagellum <https://youtu.be/B7PMf7bBczQ>  
<https://youtu.be/eKnFlbrLNOw>
5. Bacterial cell membrane <https://youtu.be/Kqa8oNDezdM>
6. Bacterial ribosomes <https://youtu.be/BEmXTs2hF-A>
7. Bacterial spores <https://youtu.be/VbDhV7j5-PQ>  
<https://youtu.be/oGSmpKUIdS8>
8. Nutritional and chemical requirements of bacteria <https://youtu.be/qMNFdmbj20Y>
9. Preparation of nutrient agar <https://youtu.be/56r15QO1qLE>
10. Aseptic technique <https://youtu.be/bRadiLXkqoU>
11. Streak plate method [https://youtu.be/\\_1KP9zOjtXk](https://youtu.be/_1KP9zOjtXk)  
<https://youtu.be/pfrjpyZ-Wuw>
12. Colony characteristics <https://youtu.be/4JZAFUPckUg>  
<https://youtu.be/R0T-nplMCzo>
13. Lyophilization of bacterial culture <https://www.youtube.com/watch?v=tpoWoMtJGac>

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**BSc. Semester-II**  
**MIC -201 Basic Bacteriology**

(Syllabus of Practical portion) (In force from June, 2023)  
(External Evaluation: 60% + Internal Evaluation: 40%)  
(Total Teaching Hours=45, Credit=1.5 )

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**LEARNING OUTCOMES:**

After performing following practicals student will be able to.....

- Know the skill regarding broth, agar slant, agar plate cultivation techniques for bacteria
  - Know the anaerobic bacteria cultivation techniques
  - Understand the different Bacterial cultures preservation technique in laboratory
  - Will get knowledge regarding pigmented bacteria
  - Will get information on different structures of bacterial cell through different structural staining techniques
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1. Preparation of bacteriological media: Nutrient broth and Nutrient agar

**(3.5 Hours)**

2. Cultivation and isolation of bacteria

**(8 Hours)**

a) Broth culture method (1 Hour)

b) Agar plate methods:

Streak plate method (1 Hour)

Pour plate method (1 Hour)

Spread plate method (1 Hour)

[Method: Gram's stain of mixed bacterial culture, isolation of bacteria, colony

(cultural) characteristics, morphological characteristics (Gram's stain)] (3 Hours)

c) Agar slant (slope) method for pure culture (1 Hour)

3. Cultivation of anaerobic bacteria by use of

**(4 Hours)**

a. Robertson's cooked meat media (1.5 Hours)

b. Thioglycollate broth (1.5 Hours)

c. Anaerobic jar (Demonstration) (1 Hour)

4. Preservation of microbial cultures

**(1 Hour)**

a) Periodic sub culturing and storage at refrigeration temperature (0.5 hour)

b) Preservation of bacteria in soil (nitrogen fixers) (0.5 hour)

5. Study of pigmented bacteria

**(2.5 Hours)**

- a. *Staphylococcus aureus* (0.5 Hour)
  - b. *Staphylococcus epidermidis* (0.5 Hour)
  - c. *Micrococcus luteus* (0.5 Hour)
  - d. *Serratia marscescens* (0.5 Hour)
  - e. *Pseudomonas aeruginosa* (0.5 Hour)
6. Differential staining of bacteria: Gram stain method **(2 Hours)**
7. Study of bacterial structure by structural staining **(16 Hours)**
- a. Endospore by Dorner's method (4 Hours)
  - b. Cell wall by Dyar's method (4 Hours)
  - c. Capsule by Hiss's method (4 Hours)
  - d. Granule by Albert's method (4 Hours)
- 8, Use of special staining technique to study bacteria **(3 Hours)**
- a. Spirocheates by Fontana's method (3 Hours)
9. Study of effect of various physical agents on growth of bacteria **(5 Hours)**
- a. Effect of pH (1.5 Hours)
  - b. Effect of temperature (1.5 Hours)
  - c. Effect of osmotic pressure (NaCl and Sucrose) (1.5 Hours)

### Scheme of Practical Examination

No.	Title of the Exercise	Marks
Ex.1	Isolation of bacteria by streak plate method	15
Ex.2	Structural and special staining of bacteria (anyone) a) Endospore staining by Dorner's method b) Cell wall staining by Dyar's method c) Capsule staining by Hiss's method d) Metachromatic granule staining by Albert's method e) <i>Spirochaetes</i> staining by Fontana's method	15
Ex- -3	Spotting	15
Ex-4	Viva voce	10
Ex.5	Journal and slides	05
<b>Total Marks</b>		<b>60</b>

ક્રમ	અભ્યાસક્રમ સમિતિના સભ્યનું નામ		સહી	ક્રમ	અભ્યાસક્રમ સમિતિના સભ્યનું નામ		સહી
1	ડૉ. નીરજ શેઠ	ડીન અને અધ્યક્ષ		5	ડૉ. શ્રીનિવાસ મૂર્તિ	આંતરિક સભ્ય	
2	ડૉ. રાઠેશભાઈ પટેલ	બાહ્ય તજજ્ઞ		6	ડૉ. નિખિલ ભટ્ટ	આંતરિક સભ્ય	
3	ડૉ. એસ. આર. દવે	બાહ્ય તજજ્ઞ		7	શ્રીમતી પ્રિતીબહેન શુક્લ	આંતરિક સભ્ય	
4	ડૉ. દેવ્યાબ્જીબહેન ટીપરે	બાહ્ય તજજ્ઞ		8	શ્રી અરવિંદભાઈ ડુગરેચિયા	આંતરિક સભ્ય	

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**B.Sc. Semester-II**  
**Minor Course: CHEM-201: Inorganic Chemistry**  
**(Syllabus of theoretical portion) (In force from June, 2023)**  
**(External Evaluation: 60% + Internal Evaluation: 40%)**  
**(Total Teaching Hours=45, Credit=03)**

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**Learning Outcomes:**

**After studying this paper student will be able to.....**

- \* know the electronic configuration and occurrence of s-, p-, d- and f-blocks elements
- \* understand the general trends in the chemistry of s-, p- and d-blocks elements
  
- \* describe the trends in physical and chemical properties of group 1, 2, 13 to 18 elements
  
- \* know the allotropes of carbon, phosphorus and sulphur
  
- \* list the important uses of alkali and alkaline earth metals, boron, aluminium, nitrogen, oxygen, ozone, sulphur dioxide and noble gases
  
- \* explain anomalous properties of the first element of each group
  
- \* know oxidation states, Magnetic properties, colour and absorption spectra of d- and f-blocks elements
- \* describe the Lanthanide contraction and Actinide contraction

**Note: Each unit must be given equal weightage in examinations**

**Unit-1(A): s- Block Elements (Alkali and Alkaline earth metals) (10Hours)**

**Group-1: Alkali metals**

- 1(A).1 General introduction, electronic configuration, occurrence **(1 hour)**
- 1(A).2 Anomalous properties of the Lithium **(0.5 hour)**
- 1(A).3 Diagonal Relationship between Lithium and Magnesium **(0.5 hour)**
- 1(A).4 Trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii) **(1 hour)**
- 1(A).5 Trends in chemical reactivity with oxygen, water, hydrogen and halogens **(1 hour)**
- 1(A).6 Biological importance of sodium and potassium **(0.5 hour)**
- 1(A).7 Uses of Alkali metals **(0.5 hour)**

**Group-2: Alkaline earth metal**

- 1(A).8 General introduction, electronic configuration, occurrence **(1 hour)**
- 1(A).9 Anomalous properties of the Beryllium **(0.5 hour)**
- 1(A).10 Diagonal Relationship between Beryllium and Aluminium **(0.5 hour)**
- 1(A).11 Trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii) **(1 hour)**
- 1(A).12 Trends in chemical reactivity with oxygen, water, hydrogen and halogens **(1 hour)**
- 1(A).13 Biological importance of Mg and Ca **(0.5 hour)**
- 1(A).14 Uses of Alkaline earth metals **(0.5 hour)**



**Unit-1(B):d-Block Elements Transition Elements (First, second and third Transition Series) (5 Hours)**

- 1(B).1 General introduction, electronic configuration (1 hour)
- 1(B).2 Physical properties of transition metals (0.5 hour)
- 1(B).3 Variation in Atomic and Ionic Sizes of Transition Metals (1 hour)
- 1(B).4 Ionisation Enthalpies of Transition Metals (0.5 hour)
- 1(B).5 Oxidation states of Transition Metals (0.5 hour)
- 1(B).6 Magnetic Properties of Transition Metals (0.5 hour)
- 1(B).7 Formation of coloured ions (0.5 hour)
- 1(B).8 Catalytic properties of Transition Metals (0.5 hour)

**References**

1. Basic Inorganic Chemistry (Third edition), F. Albert Cotton, Geoffrey Wilkinson and Paul L. Gaus., John Wiley and Sons, Inc., New York., pp.73-124 (1995) .
2. Concise Inorganic Chemistry (Fifth edition), J.D. Lee., Blackwell Science Ltd., Oxford., pp.-72-110(1996) .
3. Atkins, P.W.; Overton, T.L.; Rourke, J.P.; Weller, M.T.; Armstrong, F.A. , Inorganic Chemistry, 5th Edition, W. H. Freeman and Company(2010).

**Unit-2: p-Block Elements (15Hours)**

- 2.1 General Introduction to p-Block Elements (0.5 hour)

**Group 13 elements : Boron Family**

- 2.2 General introduction, electronic configuration, occurrence (0.5 hour)
- 2.3 Anomalous properties of the Boron (0.5 hour)
- 2.4 Trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii, electronegativity) (0.5 hour)
- 2.5 Physical properties and chemical reactivity ( with air, acids, alkalis and halogens) (0.5 hour)
- 2.6 Uses of boron, aluminium and their compounds (0.5 hour)

**Group 14 elements : Carbon Family**

- 2.7 General introduction, electronic configuration, occurrence (0.5 hour)
- 2.8 Anomalous properties of the carbon (0.5 hour)
- 2.9 Trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii, electronegativity) (0.5 hour)
- 2.10 Physical properties and chemical reactivity ( with oxygen, water and halogens) (0.5 hour)
- 2.11 Allotropes of carbon (Diamond, Graphite and Fullerenes ) and Uses of carbon (0.5 hour)

**Group 15 elements : Nitrogen Family**

- 2.12 General introduction, electronic configuration, occurrence (0.5 hour)
- 2.13 Anomalous properties of the Nitrogen (0.5 hour)
- 2.14 Trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii, electronegativity) (0.5 hour)
- 2.15 Physical properties and chemical reactivity ( with hydrogen, oxygen, halogens and metals) (0.5 hour)
- 2.16 Uses of nitrogen and allotropes of Phosphorus (White, Red and Black) (0.5 hour)

### **Group 16 elements : Oxygen Family**

- 2.17 General introduction, electronic configuration, occurrence **(0.5 hour)**
- 2.18 Anomalous properties of the Oxygen **(0.5 hour)**
- 2.19 Trends in the variation of properties (such as ionization enthalpy, electron gain enthalpy, atomic and ionic radii, electronegativity) **(0.5 hour)**
- 2.20 Physical properties and chemical reactivity ( with hydrogen, oxygen and halogens) **(0.5 hour)**
- 2.21 Allotropes of Sulphur (Rhombic, Monoclinic) **(0.5 hour)**
- 2.22 Uses of oxygen, ozone, sulphur dioxide and sulphuric acid **(0.5 hour)**

### **Group 17 elements : Halogen Family**

- 2.23 General introduction, electronic configuration, occurrence **(0.5 hour)**
- 2.24 Anomalous properties of the Fluorine **(0.5 hour)**
- 2.25 Trends in the variation of properties (such as ionization enthalpy, electron gain enthalpy, atomic and ionic radii, electronegativity) **(0.5 hour)**
- 2.26 Physical properties and chemical reactivity ( with hydrogen, oxygen, metals and other halogens) **(0.5 hour)**

### **Group 18 elements : Noble gas Family**

- 2.27 General introduction, electronic configuration, occurrence **(0.5 hour)**
- 2.28 Trends in the variation of properties (such as ionization enthalpy, electron gain enthalpy, atomic and ionic radii) **(0.5 hour)**
- 2.29 Physical properties and chemical reactivity **(0.5 hour)**
- 2.30 Uses of noble gases **(0.5 hour)**

### **References**

1. Basic Inorganic Chemistry (Third edition), F. Albert cotton, Geoffrey Wilkinson and Paul L.Gaus., John Wiley and Sons, Inc., New York., pp.73-124 (1995) .
2. Concise Inorganic Chemistry (Fifth edition), J.D.Lee., Blackwell Science Ltd., Oxford., pp.-72-110(1996) .
3. Shriver, D.D.; Atkins, P.; Langford, C.H., Inorganic Chemistry 2nd Ed., Oxford University Press(1994).

### **Unit-3(A): The lanthanide series**

**(6 Hours)**

- 3(A).1 Electronic configuration **(1 hour)**
- 3(A).2 Oxidation states **(1 hour)**
- 3(A).3 Magnetic properties **(1 hour)**
- 3(A).4 Colour and absorption spectra of lanthanide ions **(1 hour)**
- 3(A).5 Lanthanide contraction **(1 hour)**
- 3(A).6 Separation and purification of lanthanides : Ion exchange and solvent extraction methods **(1 hour)**

### **Unit-3(B): The Actinide series**

**(9 Hours)**

- 3(B).1 Electronic configuration **(1 hour)**
- 3(B).2 Oxidation states **(1 hour)**
- 3(B).3 Magnetic properties **(1 hour)**
- 3(B).4 Colour and absorption spectra of actinide ions **(1 hour)**
- 3(B).5 Actinide contraction **(1 hour)**
- 3(B).6 Nuclear synthesis of trans uranic elements **(1 hour)**

- 3(B).7 Chain reaction (**1 hour**)
- 3(B).8 Importance of uranium (**1 hour**)
- 3(B).9 Comparison with lanthanides (**1 hour**)

#### **References**

1. Basic Inorganic Chemistry (Third edition), F.Albert cotton, Geoffrey Wilkinson and Paul L.Gaus., John Wiley and Sons,Inc.,New York., pp.165-185 (1995) .
2. Concise Inorganic Chemistry (Fifth edition), J.D.Lee., Blackwell Science Ltd.,Oxford., pp.194-236(1996) .

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**B.Sc. Semester-II**  
**Minor Course: CHEM-201: Inorganic Chemistry**  
**(Syllabus of practical portion) (In force from June, 2023)**  
**(External Evaluation: 60% + Internal Evaluation: 40%)**  
**(Total Teaching Hours=45, Credit=1.5)**

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**Learning Outcomes:**

**After performing following practicals student will be able to.....**

- detect the positive and negative ions in inorganic mixture by dry test
- detect the positive and negative ions in inorganic mixture by wet test

**Qualitative analysis of inorganic mixture (45 hours)**

Semi-micro method of analysis of mixture of powders containing four radicals excluding soluble  $\text{PO}_4^{3-}$ , arsenite, arsenate and borate. Mixture may be partly soluble in water and wholly soluble in an acid

Candidate should perform the analysis of following ions

$\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Ag}^+$  and  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{CO}_3^{2-}$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$ ,  $\text{NO}_2^-$

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**GUJARAT VIDYAPITH, AMADAVAD**  
**FACULTY OF SCIENCE AND APPLIED SCIENCE**  
**BIOGAS RESEARCH AND MICROBIOLOGY DEPARTMENT**  
**SEMESTER 2**  
**PHY-201 PHYSICS II**

**(Syllabus of theoretical portion) (In Force from June 2023)**

**Total marks: 100**

**(Internal evaluation: 40 Marks + External evaluation: 60 Marks)**

**Total teaching hours: 45hr, Credit =03+1.5)**

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**Learning outcomes**

On successful completion of the course students will be able to:

- To learn about Phenomenon of light
- To understand the properties of light energy
- Familiarize with general terms in acoustics like intensity, loudness, reverberation etc, and study in detail about production, detection, properties and uses of ultrasonic waves.
- To learn various electronic components and it's testing

<b>UNIT 1</b>	<b>OPTICS</b> <b>Interference</b> <ul style="list-style-type: none"><li>• Principle of super position</li><li>• Interference of light</li><li>• Types of interferences</li></ul> <b>DIFFRACTION</b> <ul style="list-style-type: none"><li>• Diffraction</li><li>• Types of diffraction</li><li>• Difference between diffraction and interferences</li></ul> <b>RESOLVING POWER OF OPTICAL INSTRUMENTS</b> <ul style="list-style-type: none"><li>• Resolution, Resolving power and Rayleigh's criterion</li><li>• Resolving power of Prism</li><li>• Plane diffraction grating- Resolving power of Plane</li></ul>	<b>12hrs</b>
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diffraction grating

- Introduction of optical instruments (Spectrometer, Simple Microscope, Compound Microscope)

**References:** ❖ Optics and atomic Physics by D. P. Kandelval, Himalaya Publishing house  
❖ Optics by Ajoy Ghatak (TMH edition)  
❖ Engineering Physics By R. K. Gaur and S. L. Gupta

## **UNIT 2**

### **SOUND**

**11hrs**

#### **Sound wave:**

- Introduction, Intensity & its level,
- Loudness & pitch
- Radiation efficiency of a sound source
- Newton's formula and Laplace's correction

#### **Ultrasonic:**

- Introduction,
- Piezo electric effect
- Piezo electric oscillator
- Applications of ultrasonic waves

**References:** ❖ Mechanics, Wave motions & Heat by Francis Weston Sears, (Addison Wesley Publication)  
❖ A Text book of oscillations, wave & acoustics by M Ghosh, D. Bhattacharya, S. Chand publication  
❖ Engineering Physics By R. K. Gaur and S. L. Gupta

## **UNIT 3**

### **Microscope:**

**11hrs**

Light Microscope: Types of optical light microscopes, Optical system and the optic principle of the Light Microscope, Working of an optical Light Microscope, Bright Field Microscopy, Phase Contrast Microscopy, Fluorescence Microscope.

**References:** ❖ Engineering Physics By R. K. Gaur and S. L. Gupta

## **UNIT 4**

### **ELECTRONIC COMPONENTS AND ITS MEASUREMENTS**

**11hrs**

- Diodes, its characteristics and measurements
- Resistor, resistance and resistivity
- Capacitor, capacitance
- Inductor, Inductance
- Transformer and its types

- Multimeter
- Regulated D.C. power supply
- Transistors (BJT, UJT)

**References:** ❖ A text book of Oscillation, Wave & Acoustics By M. Ghosh, D. Bhattacharya (S. Chand)

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**BIOGAS RESEARCH AND MICROBIOLOGY DEPARTMENT**  
**SEMESTER 2**  
**PHY-201 PHYSICS II**

**(Syllabus of Practical portion) (In Force from June 2023)**

**Total marks: 100**

**(Internal evaluation: 40 Marks + External evaluation: 60 Marks)**

**Total practical hours: 45hr, Credit =1.5)**

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1. To determine the resolving power of prism.
  2. To determine Cauchy's constant A and B using given formula and also find out with graph.
  3. To determine the wavelength of sodium light using plane diffraction grating.
  4. Find out the refractive index of different liquids using convex lens.
  5. To study nuclear radioactive decay using simulation.
  6. To use a multimeter for measuring (a) resistance, (b) AC & DC voltages (c) DC current (d) capacitance (e) temperature
  7. Regulated D.C. power supply
  8. To determine the value of capacitors.
  9. To study the decay of capacitor.
  10. To determine the value of inductor



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**BSc. Semester-II**  
**ENV -201 Environmental Studies**  
**(Syllabus of Theoretical portion) (In force from June, 2023)**  
**(External Evaluation: 60% + Internal Evaluation: 40%)**  
**(Total Teaching Hours=60, Credit=04)**

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**Unit 1: Multidisciplinary nature of environmental studies** **(10 lectures)**

Definition, scope and importance

Need for public awareness.

**Natural Resources :**

Renewable and non-renewable resources:

Natural resources and associated problems.

- i. Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forest and tribal people.
- ii. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- iii. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- iv. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- v. Land resources: Land as a resource, land degradation
- vi. Role of an individual in conservation of natural resources.
- vii. Equitable use of resources for sustainable lifestyles.

**Unit 2: Ecosystems** **(10 lectures)**

- i. Concept of an ecosystem.
- ii. Structure and function of an ecosystem.
- iii. Producers, consumers and decomposers.
- iv. Energy flow in the ecosystem.
- v. Ecological succession.
- vi. Food chains, food webs and ecological pyramids.
- vii. Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - a. Forest ecosystem
  - b. Grassland ecosystem
  - c. Desert ecosystem

- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

### **Unit 3: Biodiversity and its conservation**

**(08 lectures)**

- i. Introduction – Definition: genetic, species and ecosystem diversity.
- ii. Biogeographical classification of India
- iii. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- iv. Biodiversity at global, National and local levels.
- v. India as a mega-diversity nation
- vi. Hot-spots of biodiversity.
- vii. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- viii. Endangered and endemic species of India
- ix. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **Unit 4 : Environmental Pollution**

**(08 lectures)**

#### Definition

- i. Cause, effects and control measures of:-
  - a. Air pollution
  - b. Water pollution
  - c. Soil pollution
  - d. Marine pollution
  - e. Noise pollution
  - f. Thermal pollution
  - g. Nuclear hazards
- ii. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- iii. Role of an individual in prevention of pollution.
- iv. Pollution case studies.
- v. Disaster management: floods, earthquake, cyclone and landslides.

### **Unit 5 : Social Issues and the Environment**

**(7 lectures)**

- i. From Unsustainable to Sustainable development
- ii. Urban problems related to energy
- iii. Water conservation, rain water harvesting, watershed management
- iv. Environmental ethics: Issues and possible solutions.
  - v. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents
- vi. Wasteland reclamation.

**Environment Protection Act.****(07 lectures)**



- i. Air (Prevention and Control of Pollution) Act.
- ii. Water (Prevention and control of Pollution) Act
- iii. Wildlife Protection Act
- iv. Forest Conservation Act
- v. Issues involved in enforcement of environmental legislation.
- vi. Public awareness.

**Unit 6 : Human Population and the Environment****(10 lectures)**

- i. Population growth, variation among nations.
- ii. Population explosion – Family Welfare Programme.
- iii. Environment and human health.
- iv. Human Rights.
- v. Value Education.
- vi. Role of Information Technology in Environment and human health.



**Textbook**

Environmental Studies, Erach Bharucha, for University Grants Commission

Sr. No.	Name of Expert		Signature
1	Dr. Niraj Seth	Dean and Head	
2	Dr. Kaushik R. Patel	Internal Member	
3	Dr. P. K. Patel	Subject Expert	
4	Dr. Manish Gor	Subject Expert	

## પર્યાવરણ વિજ્ઞાન વિષયની અભ્યાસક્રમ સમિતિનો અહેવાલ

બાયોગેસ સંશોધન અને માઈક્રોબાયોલોજી વિભાગમાં ચાલતા બીએસ.સી. (માઈક્રોબાયોલોજી) અભ્યાસક્રમના સત્ર-2ના પર્યાવરણવિજ્ઞાન વિષયના NEP-2020 અંતર્ગત અભ્યાસક્રમ તૈયાર કરવા તારીખ 25-05-2023ને ગુરુવારના રોજ સવારે 12 કલાકે ઓનલાઈન બેઠકનું આયોજન કર્યું હતું. આ બેઠકમાં ઉપરોક્ત વિષયના અભ્યાસક્રમ વિશે ખૂબ ઉંડાણ પૂર્વક ચર્ચા કરી વિદ્યાર્થીઓ પર્યાવરણ અંગે જાગૃત થાય અને સમાજમાં પર્યાવરણ ક્ષેત્રે જાગૃતિ લાવવામાં ભાગીદાર થાય તે હેતુ સિધ્ધ થાય તે માટે તેને અનુરૂપ અભ્યાસક્રમ તૈયાર કરી તેને અંતિમ સ્વરૂપ આપેલ છે. આ તૈયાર કરેલ અભ્યાસક્રમ જરૂરી મંજૂરી મેળવવા માટે અભ્યાસક્રમ સમિતિ ભલામણ કરે છે.

Sr. No.	Name of Expert		Signature
1	Dr. Niraj Seth	Dean and Head	
2	Dr. Kaushik R. Patel	Internal Member	
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**GUJARAT VIDYAPITH : AHMEDABAD**  
**Faculty of Science and Applied Science, Sadra, Dist: Gandhinagar**  
**Department of Biogas Research and Microbiology**  
**BSc. Semester-II**

**Skill Enhancement (Physico-chemical analysis of soil and water)**  
**(Syllabus of practical portion) (In force from June, 2023)**  
**(External Evaluation: 60% + Internal Evaluation: 40%)**  
**(Total Hours=90, Credit=03)**

**PHYSICO-CHEMICAL ANALYSIS OF WATER AND SOIL**

**Learning Outcomes (Physico-Chemical Analysis of Soil)-**

At the end of the program, the learner should have acquired the listed knowledge and skills like: Collection and preparation of a representative soil sample for analysis, Basics of reagents preparation for soil analysis, follow safety guidelines at the lab, Perform physico-chemical analysis of soil samples, Calculate the amount of nutrients present/required for the soil, Interpretation of results of soil analysis

Sr. No.	Title	Hrs
1	Introduction to analytical chemistry- What is normality and molarity solution.	3
2	Introduction to soil sampling- Importance of soil sampling, sampling units, sampling depth, quartering method of mixing.	3
3	Collection and preparation of soil samples for analysis	3
4	Preparation of soil sample for analysis- sieving and storing, objectives of soil testing	3
5	Determination of pH and EC (Electrical conductivity) in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	3
6	Determination of moisture content in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	6
7	Determination of organic carbon content in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	6
8	Determination of available nitrogen content in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	6
9	Determination of available phosphorus content in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	6
10	Determination of exchangeable potassium content in soil sample- Reagents preparation, weighing and analysis of soil sample, calculation of results, interpretation	6
<b>Total Hrs.</b>		<b>45</b>

**References-**

- A Text Book of Soil Analysis. by Baruah, T.C. and Barthakur, H.P. (1997) UBS Publishers Ltd., New Delhi.
- Methods of Soil Analysis- Part-1 to 3, Published by American Society of Agronomy- Soil Science Society of America
- Manual on Soil, Plant and Water Analysis, by Dhyan Singh, P. K. Chhonkar and B. S. Dwivedi, Westville Publishing House, New Delhi
- Management of Soil Health: Challenges and Opportunities- by R.K. Thakur S.S. Baghel G.D. Sharma P.C. Amule N. Chouhan, Jawaharlal Nehru Krishi Vishwavidyalaya Jabalpur – 482 004 (M.P.)

## Learning Outcomes (Physico-Chemical Analysis of Water)

At the end of the course the student will be able to: Understand the general properties of water, develop awareness about water quality criteria and standards, and their relation to public, health and environment, understand important parameters for measuring water quality, know about the methods for the determination of water quality parameters, learn how to run accurate water quality tests and to determine how the parameters relate to each other, analyze water samples for viable bacterial counts.

Sr No.	Title	Hrs
1.	Introduction to analytical laboratory – Safety, Equipment's and techniques used in Laboratory.	06
2.	To study the physical parameters of water (Temperature, Colour, Odour, Taste, Turbidity, Transparency)	06
3.	To determine Alkalinity of Water	03
4.	To determine the total hardness of the water sample	03
5.	To determine pH and conductance of waste water	03
6.	To determine dissolved oxygen of waste water	06
7.	To determine Acidity of Water	03
8.	To determine TS, TSS, TDS of water	06
9.	To determine salinity of the given water sample	03
10.	To study the viable count of microorganisms in water sample (N. agar)	06
	<b>Total Hrs.</b>	<b>45</b>

### References

1. APHA (American Public Health Association, American water works Association and water pollution control federation). (1980), Standard methods for the examination of water and waste water, Am. Publication Health Association, Washington, DC, USA.
2. NEERI, Manual on water and waste water Analysis, National Environment Engineering Research Institute Nagpur, (3402) (1986).
3. WHO, guideline for drinking water quality Geneva (1984)
4. Food Safety and Standards Authority of India, Manual of Methods of Analysis of Foods and Water.