

DEPARTMENT OF CHEMISTRY

GOVT. DIGVIJAY P. G. AUTONOMOUS COLLEGE, RAJNANDGAON (C.G.)



(III and IV SEMESTER)

(AECC - Environmental Studies)

SYLLABUS

FYUGP Chemistry

(Approved by Board of Study for 2024-25)

COURSE

Sem	Course	Title of the Paper	Theory + Tutorials + Practical (Credit)	Marks (ESE + IA)	Total Marks
I	DSC-1	Inorganic Chemistry - I	3 + 0 + 0	80 + 20	100
	DSC-1Lab	Inorganic Chemistry – I Lab Course	0 + 0 + 1	40 + 10	50
	GE - 1	General Inorganic Chemistry - I	3 + 0 + 0	80 + 20	100
	GE – 1Lab	General Inorganic Chemistry – I Lab Course	0 + 0 + 1	40 + 10	50
	SEC - 1	Basics of Soil and Water Analysis - I	2 + 0 + 0	40 + 10	50
II	DSC-2	Organic Chemistry - I	3 + 0 + 0	80 + 20	100
	DSC-2Lab	Organic Chemistry – I Lab Course	0 + 0 + 1	40 + 10	50
	GE – 2	General Organic Chemistry - I	3 + 0 + 0	80 + 20	100
	GE – 2Lab	General Organic Chemistry – I Lab Course	0 + 0 + 1	40 + 10	50
	SEC - 2	Basics of Soil and Water analysis - II	2 + 0 + 0	40 + 10	50
III	DSC-3	Physical Chemistry - I	3 + 0 + 0	80 + 20	100
	DSC-3Lab	Physical Chemistry – I Lab Course	0 + 0 + 1	40 + 10	50
	DSE - 1	Coordination Chemistry	3 + 0 + 0	80 + 20	100
	DSE – 1Lab	Coordination Chemistry Lab Course	0 + 0 + 1	40 + 10	50
	SEC - 3	Good Laboratory practices and Calibration in Chemistry - I	2 + 0 + 0	40 + 10	50
IV	DSC-4	Organic Chemistry - II	3 + 0 + 0	80 + 20	100
	DSC-4Lab	Organic Chemistry - II Lab Course	0 + 0 + 1	40 + 10	50
	DSE – 2	Electrochemistry	3 + 0 + 0	80 + 20	100
	DSE – 2Lab	Electrochemistry Lab Course	0 + 0 + 1	40 + 10	50
	SEC - 4	Good Laboratory practices and Calibration in Chemistry - II	2 + 0 + 0	40 + 10	50
V	DSC-5	Inorganic Chemistry - II	3 + 0 + 0	80 + 20	100
	DSC-5Lab	Inorganic Chemistry - II Lab Course	0 + 0 + 1	40 + 10	50
	DSE – 3	Heterocyclic Chemistry	3 + 0 + 0	80 + 20	100
	DSE – 3Lab	Heterocyclic Chemistry Lab Course	0 + 0 + 1	40 + 10	50
	GE – 3	General Physical Chemistry - I	3 + 0 + 0	80 + 20	100
	GE – 3Lab	General Physical Chemistry - I Lab Course	0 + 0 + 1	40 + 10	50
	SEC- 5	Green Methods in Chemistry-I	2 + 0 + 0	40 + 10	50
VI	DSC-6	Physical Chemistry - II	3 + 0 + 0	80 + 20	100
	DSC-6Lab	Physical Chemistry - II Lab Course	0 + 0 + 1	40 + 10	50
	DSE – 4	Polymer Chemistry	3 + 0 + 0	80 + 20	100

DSE - 4Lab	Polymer Chemistry Lab Course	0 + 0 + 1	40 + 10	50
GE - 4	Chemistry in Daily Life	3 + 0 + 0	80 + 20	100
GE - 4Lab	Chemistry in Daily Life Lab Course	0 + 0 + 1	40 + 10	50
SEC- 6	Green Methods in Chemistry-II	2 + 0 + 0	40 + 10	50

ESE- End Semester Exam, IA-Internal Assessment

SEM 3 AECC Environmental Studies

2 + 0 + 0

SEM 4 AECC EVS PROJECT

0 + 0 + 2

Approved

Asst. Director

25/5/24
3/20/20

ASPL

ASPL

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year UnderGraduate Programme (FYUGP) Session 2024-25

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Chemistry
Course Type: DSC 3	Course Code:
Course Title:	Physical Chemistry-I
Credit: 4	Lecture: 60
M.M. : 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40%

Title	Physical Chemistry-I
Course Objectives	Students will have a basic knowledge of liquid state, ionic equilibria, concept of acid-base and non-aqueous solvents.
Learning Outcomes	<p>Unit 1- Students will develop an understanding about the Liquid state.</p> <p>Unit 2 - Students will have an insight look about Ionic equilibria.</p> <p>Unit 3- Students will have an insight of concept of acid-base.</p> <p>Unit 4 - Students will understand about different properties & structures of non-aqueous solvents.</p>

Units	Lectures	Topics
I	15	<p>Liquid state:</p> <p>Structure and physical properties of liquids; vapour pressure, surface tension, viscosity, and their dependence on temperature, Effect of addition of various solutes on surface tension, cleansing action of detergents. Structure of water.</p>
II	15	<p>Ionic equilibria:</p> <p>Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and tri-protic acids. Salt hydrolysis, hydrolysis constants, degree of hydrolysis and pH for different salts. Buffer solutions; Henderson equation, buffer capacity, buffer range, buffer action, applications of buffers in analytical chemistry, Solubility and solubility product.</p>
III	15	<p>Concept of Acid-base :</p> <p>Brönsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling</p>

25/5/24

319 dm

BPL

Asw

AS

		solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of indicators; selection of indicators and their limitations. Multistage equilibria in polyelectrolytes.
IV	15	Non-Aqueous Solvents : Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid ammonia and liquid sulphur dioxide, HF, H ₂ SO ₄ , Ionic liquids, Supercritical fluids.

List of Books	<ul style="list-style-type: none"> • G. M. Barrow: Physical Chemistry Tata McGraw-Hill (2007). • G. W. Castellan: Physical Chemistry 4th Edn. Narosa (2004). • C. Kotz, P. M. Treichel & J. R. Townsend: General Chemistry Cengage Lening India Pvt. Ltd., New Delhi (2009). • H. Mahan: University Chemistry 3rd Ed. Narosa (1998). • R. H. Petrucci: General Chemistry 5th Ed. Macmillan Publishing Co. New York (1985). • F.A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley. • F. Shriver and P. W. Atkins: Inorganic Chemistry, Oxford University Press. • Puri, B. R., Sharma, L. R. and Pathania, M. S., Principles of Physical Chemistry, S Chand Publishers (2010) • Gary Wulfsberg: Inorganic Chemistry, Viva Books Pvt. Ltd.
---------------	---

24/5/24
3/2/2007

BL

Abhi

BL

Physical Chemistry-I Lab

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Chemistry
Course type: DSC3LAB	Course Code:
Course Title :	Physical Chemistry-I Lab
MM: 50 (40 + 10)	Minimum Passing Marks: 20

List of Practicals

A. Viscosity & Surface Tension

1. To determine the % compositions of a given mixture (Non interacting system) by viscosity method.
2. To determine the viscosity of amyl alcohol in water at different concentrations & calculate the excess viscosity of these solutions.

B. Acid-Base Titrations

1. Standardization of sodium hydroxide by oxalic acid solution.
2. Determination of strength of HCl solution using sodium hydroxide as intermediate
3. Estimation of carbonate and hydroxide present together in mixture
4. Estimation of carbonate and bicarbonate present together in mixture

List of Books	<ul style="list-style-type: none">• A.I. Vogel: Textbook of Practical Organic Chemistry, Prentice Hall, 5th Edn.• F. G. Mann & B. C. Saunders: Practical Organic Chemistry, Orient Longman, 1960.• B.D. Khosla: Senior Practical Physical Chemistry, R. Chand & Co.• Ahluwalia, V.K. & Agarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.
----------------------	--

25/9/24
31/10/24
RPL
A. K. S.
D. S.

		Departmental members	
Chairperson /H.O.D . <u>25/5/24</u>			
Subject Expert <u>Ashwini</u> (University Nominee)	1.....	8.....	<u>7/8</u>
Subject Expert. <u>Bhavana</u>	2..... <u>Rpl</u>	9.....	<u>DIC</u>
Representative (Industry)	3..... <u>WY</u>	10.....	
Representative <u>Vibha</u> (Alumni)	4.....	11.....	
Representative (Professor Science Faculty Other Dept.)	5.....	12.....	
	6. <u>Madam</u>	13.....	
	7.....	14.....	

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year Under Graduate Programme (Session 2024-25)

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Chemistry
Course Type: DSE	Course Code:
Course Title:	Co-ordination Chemistry
Credit: 4	Lecture: 60
M.M. 100 = (ESE 80 + IA 20)	Minimum Passing Marks: 40%

Title	Co-ordination Chemistry
Course Objectives	Students will have a basic knowledge of transition metals, coordination compounds, metal-ligand bonding in transition metal complexes and magnetic properties of transition metal complexes.
Learning Outcomes	<p>Unit 1- Students will develop an understanding about the transition metal chemistry.</p> <p>Unit 2 - Students will have an insight look about coordination compounds.</p> <p>Unit 3- Students will have an insight comparative study of metal-ligand bonding in transition metal complexes.</p> <p>Unit 4 - Students will understand about magnetic properties of transition metal complexes.</p>

Units	Lectures	Topics
I	15	<p>Transition Metal Chemistry</p> <p>Transition Elements: Position in periodic table, electronic configuration, General Characteristics, viz., atomic and ionic radii, variable oxidation states, ability to form complexes, formation of coloured ions, magnetic moment μ_{so} (spin only) and μ_{eff} and catalytic behaviour. General comparative treatment of 4d and 5d elements with their 3d analogues with respect to ionic radii, oxidation states and magnetic properties.</p>

25/5/24 *Aswini* 3/24/24 *PPL* *Aswini*

II	15	<p>Coordination Compounds</p> <p>IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes. Labile and inert complexes.</p> <p>Valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, Crystal field splitting and stabilization energy, measurement of $10 Dq$ (Δ_o), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of $10 Dq$ (Δ_o, Δ_t). Octahedral vs. tetrahedral coordination.</p>
III	15	<p>Metal-Ligand Bonding in Transition Metal Complexes</p> <p>(A) Limitations of valence bond theory, Limitation of Crystal Field Theory, Application of CFSE, tetragonal distortions from octahedral geometry, Jahn–Teller distortion, square planar geometry. Qualitative aspect of Ligand field and MO Theory.</p> <p>(B) Thermodynamic and kinetic aspects of metal complexes. A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes, Trans- effect, theories of trans effect. Mechanism of substitution reactions of square planar complexes.</p>
IV	15	<p>Magnetic Properties of Transition Metal Complexes</p> <p>Types of magnetic behavior, methods of determining magnetic susceptibility, spin only formula, L-S coupling, correlation of μ_{so} (spin only) and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes. Electronic spectra of Transition Metal Complexes. Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.</p>

List of Books

- Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson and P. L. Gaus, Wiley

- Concise Inorganic Chemistry, J. D. Lee, ELBS
- Concepts of Models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley
- Inorganic Chemistry, D. E. Shriver, P. W. Atkins and C. H. Langford, Oxford
- Inorganic Chemistry, W. W. Porterfield, Addison – Wesley
- Inorganic Chemistry, A. G. Sharp, ELBS
- Inorganic Chemistry, G. L. Miessler and D. A. Tarr, Prentice Hall
- Advanced Inorganic Chemistry, Stayas Prakash
- Advanced Inorganic Chemistry, Agarwal and Agarwal
- Advanced Inorganic Chemistry, Puri, Sharma, S. Naginchand
- Inorganic Chemistry, Madan. S. Chand

Asw

PKL

Rever

3/20/20

JS

Co-ordination Chemistry Lab	
Session: 2024-25	Program: B.Sc.
Semester: <u>III</u>	Subject: Chemistry
Course type: DSE LAB	Course Code:
Course Title :	Co-ordination Chemistry Lab
MM: 50 (40 + 10)	Minimum Passing Marks: 20

List of Practicals

Gravimetric analysis:

- Estimation of nickel (II) using Dimethylglyoxime (DMG).
- Estimation of copper as CuSCN
- Estimation of iron as Fe₂O₃ by precipitating iron as Fe(OH)₃.
- Estimation of Al (III) by precipitating with oxine and weighing as Al(oxine)₃ (aluminium - oxinate).
- Estimation of Barium as BaSO₄

Inorganic Preparations:

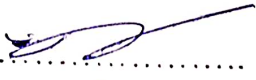
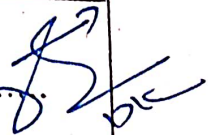

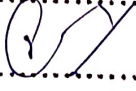
- Tetraamminecopper (II) sulphate, [Cu(NH₃)₄]SO₄.H₂O
- Cis and trans K[Cr(C₂O₄)₂. (H₂O)₂] Potassium dioxalatodiaquachromate(III)
- Tetraamminecarbonatocobalt (III) ion
- Potassium tris(oxalate)ferrate(III)/ Sodium tris(oxalate)ferrate(III)
- Cu(I) thiourea complex. Bis (2,4-pentanedionate) zinc hydrate; Double salts (Chrome alum/ Mohr's salt)

List of Books	<ul style="list-style-type: none"> • Vogels Qualitative Inorganic Analysis, A.I. Vogel, Prentice Hall, 7th Edition. • Vogels Quantitative Chemical Analysis. A.I. Vogel, Prentice Hall, 6th Edition.
----------------------	--

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

		Departmental members	
Chairperson /H.O.D		1.....	8..... 
Subject Expert (University Nominee)	<u>Aslam</u>	2..... 	9.....
Subject Expert	<u>Buwa</u>	3.....	10.....
Representative (Industry)		4..... 	11.....
Representative (Alumni)	<u>Wibho</u>	5.....	12.....
Representative (Professor Science Faculty Other Dept.)		6..... <u>Spedon</u>	13.....
		7.....	14.....

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year Under Graduate Programme (Session 2024-25)

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: III	Subject: Chemistry
Course Type: SEC	Course Code:
Course Title:	Good Laboratory practices and Calibration in Chemistry - I
Credit: 2	Lecture: 30
M.M. 50 = (ESE 40 + IA 10)	Minimum Passing Marks: 40%

Title	Environmental Chemistry
Course Objectives	<ul style="list-style-type: none"> • To develop basic understanding regarding soil testing and sampling in the students. • To introduce them with macro and micro nutrients for soil and water. • To enhance their skills about water analysis.
Learning Outcomes	<ul style="list-style-type: none"> • Students will have a basic knowledge of fundamentals and application of Soil and water analysis. • Students will be able to record and analyze the results of experiments. • Students will be skilled in problem solving, critical thinking and analytical. • Students will become aware of the ethical behavior in issues in this field.

Units	Lectures	Topics
I	5	Common calculation in chemistry laboratories, Understanding the details on the label of reagent bottles.
II	10	Inorganic and organic reagents (Baeyer's reagent, Nessler's, reagent, Fehling solution)
III	10	Soil sampling, sample collection and processing purpose of soil testing and analysis, selection of field, method of soil sample collection, method

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

		of soil sample processing, precaution during soil collection and processing.
IV	5	Soil Testing, pH, Ca, Mg, K. Requirement of nitrogen, sulphur in soil for plants, Requirement of Estimation of nitrogen, Estimation of sulphur.

List of Books	<ul style="list-style-type: none"> • H. Kaur, Instrumental Analysis Techniques, Pragati Publications • B.K. Shrama, Analytical Chemistry, Vishal Publication
----------------------	--

24/5/22
 PA

Sharma Asmi

DL

Chairperson / H.O.D. <u>25/5/2024</u>	Departmental members	
Subject Expert (University Nominee) <u>A. Alhane</u>	1.....	8..... <u>[Signature]</u>
Subject Expert <u>[Signature]</u>	2..... <u>[Signature]</u>	9.....
Representative (Industry)	3..... <u>[Signature]</u>	10.....
Representative (Alumni) <u>[Signature]</u>	4.....	11.....
Representative (Professor Science Faculty Other Dept.)	5.....	12.....
	6..... <u>[Signature]</u>	13.....
	7.....	14.....

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year UnderGraduate Programme (FYUGP) Session 2024-25

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Chemistry
Course Type: DSC4	Course Code:
Course Title:	Organic Chemistry-II
Credit: 4	Lecture: 60
M.M. 100 = (ESE 80+IA 20)	Minimum Passing Marks: 40

Title	Organic Chemistry-II
Course Objectives	Students will have a basic knowledge of aliphatic hydrocarbons, cycloalkanes and conformational analysis, aromatic hydrocarbons and halogenated hydrocarbons.
Learning Outcomes	<p>Unit 1- Students will have an insight of chemistry of aliphatic hydrocarbons.</p> <p>Unit 2 - Students will understand about cycloalkanes and conformational analysis.</p> <p>Unit 3- Students will have a basic idea about aromatic hydrocarbons.</p> <p>Unit 4 - Students will have an insight view about chemistry of halogenated hydrocarbons.</p>

Units	Lectures	Topics
I	15	Chemistry of Halogenated Hydrocarbons: Alkyl halides: Methods of preparation, nucleophilic substitution reactions – SN^1 , SN^2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination. Aryl halides: Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; $SNAr$, Benzyne mechanism. Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.
II	15	Alcohols and Phenols Alcohols: Nomenclature preparation - Bouvaelt-Blank reduction for the preparation of alcohols, properties and relative reactivity of 1° , 2° , 3° alcohol, Dihydric alcohols – Nomenclature, Oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and Pinacol-pinacolon rearrangement. Phenols: Structure, Physical properties and acidic character,

25/5/24

Abhi

BPL

25/5/24

PK

		comparison of acidic strength of alcohol and phenols. Mechanism of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesh reaction and Reimer-Tiemann reaction.
III	15	Aldehydes and Ketones A. Nomenclature, structure and reactivity of the carbonyl group. Mechanism of nucleophilic addition to carbonyl group, Benzoin, aldol, Perkin and Knoevenagel condensation, Wittig reaction, Mannich reaction, Beckmann and Benzil-Benzilic rearrangement B. Oxidation of Aldehyds; Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, Clemmensen reduction, Wold-Kishner reaction, $LiAlH_4$ and $NaBH_4$ reduction
IV	15	Carboxylic Acids A. Nomenclature, Physical properties and chemical properties including acidity of carboxylic acids, effect of substitution on acid strength, Mechanism of decarboxylation B. Carboxylic acid derivatives - Structure of acid chloride, esters, amides and acid anhydrides, Relative stability of acyl derivatives, physical properties, interconversion

List of Books	<ul style="list-style-type: none"> Morrison, R. N. & Boyd, R. N. Organic Chemistry, 6th Edn., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Pine S. H. Organic Chemistry, Fifth Edition, McGraw Hill, (2007) F. A. Carey, Organic Chemistry, Seventh Edition, Tata McGraw Hill (2008). J. Clayden, N. Greeves, S. Warren, Organic Chemistry, 2nd Ed., (2012), Oxford University Press. T. W. Graham Solomon: Organic Chemistry, John Wiley and Sons. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman. E. L. Eliel: Stereochemistry of Carbon Compounds, Tata McGraw Hill. I. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand
---------------	---

28/1/24

ppL

Reaction

Order

28/1/24

Organic Chemistry-II Lab

Session: 2024-25	Program: B.Sc.
Semester:	Subject: Chemistry
Course type: DSC 4 Lab	Course Code:
Course Title :	Organic Chemistry-II
MM: 50 (40 + 10)	Minimum Passing Marks: 20

List of Practicals

A. Qualitative analysis

1. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.
2. Separation of amino acids by paper chromatography.
3. Determination of the concentration of glycine solution by formylation method.
4. Titration curve of glycine.
5. Action of salivary amylase on starch.
6. Effect of temperature on the action of salivary amylase on starch.
7. Differentiation between a reducing/nonreducing sugar.

B. Chromatography

- a. Separation of a mixture of two amino acids by ascending and horizontal paper chromatography
- b. Separation of a mixture of two sugars by ascending paper chromatography
- c. Separation of a mixture of o- and p-nitrophenol or o- and p-aminophenol by thin layer chromatography (TLC).

List of Books	<ul style="list-style-type: none">• A.I. Vogel: Textbook of Practical Organic Chemistry, Prentice Hall, 5th Edn.• F. G. Mann & B. C. Saunders: Practical Organic Chemistry, Orient Longman, 1960.• B.D. Khosla: Senior Practical Physical Chemistry, R. Chand & Co.• Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.
---------------	---

25/5/24

Abhinav

3/20/24

Dr. AC

		Departmental members	
Chairperson /H.O.D .. <u>J. S. / S. / 24</u>		1.....	8..... <u>K</u>
Subject Expert <u>A. Devi</u> (University Nominee)		2..... <u>PL</u>	9.....
Subject Expert. <u>Ravi</u>		3.....	10.....
Representative (Industry)		4..... <u>W</u>	11.....
Representative <u>W. bho</u> (Alumni)		5.....	12.....
Representative (Professor Science Faculty Other Dept.)		6..... <u>specm</u>	13.....
		7.....	14.....

132 180 701
701-701
THE
R
P
E
N
D
E
R
/E

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year Under Graduate Programme (Session 2024-25)

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Chemistry
Course Type: DSE	Course Code:
Course Title:	Electrochemistry
Credit: 4	Lecture: 60
M.M. 100 = (ESE 80 + IA 20)	Minimum Passing Marks: 40%

Title	Physical Chemistry I
Course Objectives	Students will have a basic knowledge of basic principle of laws of electrochemistry, chemical cells and their function, electrodes, potentiometric titrations and their applications.
Learning Outcomes	<p>Unit 1- Students will have an insight of basic principle of laws of electrochemistry.</p> <p>Unit 2 - Students will understand about chemical cells and their function.</p> <p>Unit 3- Students will have a basic idea about electrodes, EMF measurement.</p> <p>Unit 4- Students will have an insight view about potentiometric titrations and their applications.</p>

Units	Lectures	Lectures (15 x 4 = 60)
I	15	Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions. Debye-Hückel-Onsager equation, Wien effect, Debye-Falkenhagen effect, Walden's rules. Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance

25/5/24

Asw, BPL

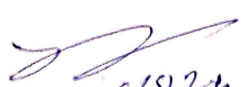
312 dm

J. D. D.

		measurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v) hydrolysis constants of salts.
II	15	Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and industry. Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass and $\text{SbO/Sb}_2\text{O}_3$ electrodes. Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and 89 transference numbers. Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation).
III	15	Electroanalytical methods: Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.
IV	15	Electrical & Magnetic Properties of Atoms and Molecules: Basic ideas of electrostatics, Electrostatics of dielectric media, Clausius-Mosotti equation, Lorenz-Laurentz equation, Dipole moment and molecular polarizabilities and their measurements. Diamagnetism, paramagnetism, magnetic susceptibility and its measurement, molecular interpretation.

List of Books	<ul style="list-style-type: none"> • Atkins, P.W & Paula, J.D. Physical Chemistry, 10th Ed., Oxford University Press (2014). • Castellan, G. W. Physical Chemistry 4th Ed., Narosa (2004). • Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA. UP (2009). • Barrow. G. M., Physical Chemistry 5th Ed., Tata McGraw Hill: New Delhi (2006).
----------------------	---

- Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012).
- Rogers, D. W. Concise Physical Chemistry Wiley (2010).
- Silbey, R. J.; Alberty, R. A. & Bawendi, M. G. Physical Chemistry 4th Ed., John Wiley & Sons, Inc. (2005).


25/11/24

31/12/24



Exam


DCC

Electrochemistry Lab

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Chemistry
Course type: DSE LAB	Course Code:
Course Title :	Electrochemistry Lab
MM: 50 (40 + 10)	Minimum Passing Marks: 20

List of suggested laboratory practicals

Conductance

1. Determination of cell constant.
2. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
3. Perform the following conductometric titrations:
 - i. Strong acid vs. strong base.
 - ii. Weak acid vs. strong base.

Potentiometry

Perform the following potentiometric titrations:

- i. Strong acid vs. strong base.
- ii. Weak acid vs. strong base.
- iii. Potassium dichromate vs. Mohr's salt.

Section D : Oxidation-Reduction Titrimetry

- (i) Estimation of Fe(II) and oxalic acid using standardized KMnO_4 solution.
- (ii) Estimation of oxalic acid and sodium oxalate in a given mixture.
- (iii) Estimation of Fe(II) with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

List of Books	<ul style="list-style-type: none">• A.I. Vogel: Textbook of Practical Organic Chemistry, Prentice Hall, 5th Edn.• F. G. Mann & B. C. Saunders: Practical Organic Chemistry, Orient Longman, 1960.• B.D. Khosla: Senior Practical Physical Chemistry, R. Chand & Co.• Ahluwalia, V.K. & Agarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.
----------------------	--

Abhinav



3/2/2024



Chairperson / H.O.D. <u>25/5/24</u>	Departmental members	
Subject Expert <u>A. B. Khan</u> (University Nominee) <u>25/5/2024</u>		
Subject Expert <u>[Signature]</u>	2..... <u>[Signature]</u>	9.....
Representative (Industry)	3.....	10.....
Representative <u>[Signature]</u> (Alumni)	4..... <u>[Signature]</u>	11.....
Representative (Professor Science Faculty Other Dept.)	5.....	12.....
	6..... <u>[Signature]</u>	13.....
	7.....	14.....

GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE, RAJNANDGAON (C.G.)

Four Year Under Graduate Programme (Session 2024-25)

Major - Chemistry

Session: 2024-25	Program: B.Sc.
Semester: IV	Subject: Chemistry
Course Type: SEC (Project Based)	Course Code:
Course Title:	Good Laboratory practices and Calibration in Chemistry - II
Credit: 2	Lecture: 30
M.M. 50 = (ESE 40 + IA 10)	Minimum Passing Marks: 40%

Marking Scheme :

Project	30 Marks
Internal	10 Marks
Viva	10 Marks
<hr/>	
Total	50 Marks

NOTE : Questions will be asked from all the units in the internal evaluation exam.

Title	Soil and Water Analysis
Course Objectives	<ul style="list-style-type: none">• To develop basic understanding regarding soil testing and sampling in the students.• To introduce them with macro and micro nutrients for soil and water.• To enhance their skills about water analysis.
Learning Outcomes	<ul style="list-style-type: none">• Students will have a basic knowledge of fundamentals and application of Soil and water analysis.• Students will be able to record and analyze the results of experiments.• Students will be skilled in problem solving, critical thinking and analytical.• Students will become aware of the ethical behavior in issues in

this field.

Units	Lectures	Topics
I	10	Absorption spectrum, Emission spectrum, Basic concepts of AAS, Flame photometer, Maintenance of equipments of soil and water testing, pH meter, Flame photometer, AAS, Conductometer, Requirement of micronutrients in soil for plants, Estimation of micronutrients: Cu, Fe, Zn, Mn
II	7	Solution, Solution Preparation, normality, molarity, molality, ppm solution, Acid base titration.
III	7	Definitions of DO, BOD, COD, analysis of Ca, Mg in water, biological quality of drinking water.
IV	6	Chemical quality of water, Hard and soft water, treatment of hard water, estimation of hardness of water through titration method.

List of Books	
	<ul style="list-style-type: none">• A.I. Vogel: Textbook of Practical Organic Chemistry, 5th edition, Prentice-Hall.• H. Kaur, Instrumental Analysis Techniques, Pragati Publications• B.K. Sharma, Analytical Chemistry, Vishal Publication

25/5/24
RSL

3/5/24
Arun

7/5/24
DK

		Departmental members	
Chairperson H.O.D. <u>25/1/2021</u>			
Subject Expert <u>Abdullah</u> (University Nominee) <u>25/1/2021</u>	1.....	8.....	<u>25/1/2021</u>
Subject Expert <u>Reza</u>	2..... <u>Reza</u>	9.....	
Representative..... (Industry)	3.....	10.....	
Representative <u>Wibho</u> (Alumni)	4..... <u>Wibho</u>	11.....	
Representative..... (Professor Science Faculty Other Dept.)	5.....	12.....	
	6..... <u>25/1/2021</u>	13.....	
	7.....	14.....	

Govt. Digvijay Autonomous PG College Rajnandgaon,
Chhattisgarh

Department of Chemistry

Ability Enhancement Compulsory Course (AECC)
Environmental Studies at
Undergraduate Level

Learning Outcome-based Curriculum Framework
(Effective from Academic Year 2024-25)

(For Semester I/II or III/IV)

B.Sc.,
B.A.,
B.Com.,
B.C.A.


25/11/24



Session: 2024-25	Program: B.Sc./B.A./B.Com./BCA
Semester: I or III	Course Type: AECC
Course Title: Environmental Studies	Course Code:
Credit: 2	Lecture: 30
M.M. : 50 (40 + 10)	Minimum Passing Marks: 40%

Environmental Studies	
Title	
Course Objectives	<p>The course will empower the undergraduate students by helping them to:</p> <ol style="list-style-type: none"> i. Gain in-depth knowledge on natural processes and resources that sustain life and govern economy. ii. Understand the consequences of human actions on the web of life, global economy, and quality of human life. iii. Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. iv. Acquire values and attitudes towards understanding complex environmental-economic- social challenges, and active participation in solving current environmental problems and preventing the future ones. v. Adopt sustainability as a practice in life, society, and industry.
Learning Outcomes	<p><i>The course will empower the undergraduate students through:</i></p> <ol style="list-style-type: none"> i. Gaining of in-depth knowledge on natural processes and resources that sustain life and govern economy. ii. Understanding and predicting the consequences of human actions on the web of life, global economy, and quality of human life. iii. Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. iv. Acquisition of values and attitudes towards understanding complex environmental- economic-social challenges, and active participation in solving current environmental problems and preventing the future ones. v. Encouraging adoption of sustainability as a practice in life, society, and industry.

Units	Lectures	Topics
I	8	<p>Introduction to Environmental Studies Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere (पर्यावरण अध्ययन की बहुविध प्रकृति; पर्यावरण के घटक: वायुमंडल, जलमंडल, स्थलमंडल और जीवमंडल)</p> <p>Ecosystems Definition and concept of Ecosystem (पारिस्थितिकी तंत्र की परिभाषा और अवधारणा)</p>
II	7	<p>Natural Resources Land resources: Minerals, soil, Land cover, land use change, land degradation, soil erosion, and desertification; (भूमि संसाधन: खनिज, मिट्टी, भूमि आवरण, भूमि उपयोग परिवर्तन, भूमि क्षरण, मृदा अपरदन और मरुस्थलीकरण)</p> <p>Water resources: Natural and man-made sources; Uses of water; Over exploitation of surface and ground water resources; Floods and drought (जल संसाधन: प्राकृतिक और मानव निर्मित स्रोत; पानी का उपयोग; सतही और भूजल संसाधनों का अत्यधिक दोहन; बाढ़, सूखा।)</p>
III	8	<p>Environmental Pollution Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards. (पर्यावरण प्रदूषण (वायु, पानी, मिट्टी, थर्मल और शोर): कारण, प्रभाव और नियंत्रण; प्राथमिक और माध्यमिक वायु प्रदूषक; वायु और जल गुणवत्ता मानक)</p>
IV	7	<p>Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain; Impacts on human communities. (जलवायु परिवर्तन के कारण, ग्लोबल वार्मिंग, ओजोन परत का हास और अम्लीय वर्षा; मानव समुदायों पर प्रभाव।)</p>

Suggested Readings

1. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 8th Edition. Wiley Publishing, USA. **Chapter 1** (Pages: 1-17); **Chapter 2** (Pages: 22-23); **Chapter 3** (Pages: 40, 41); **Chapter 4** (Pages: 64, 66).
2. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 1** (Page: 3-28).

Ravi

Sachin

Anam

JK

3. Odum, E.P., Odum, H.T., and Andrews, J. (1971). *Fundamentals of Ecology*. Saunders, Philadelphia, USA. **Chapter 1** (Pages: 1-16); **Chapter 2** (Pages: 18-76); **Chapter 10** (Pages: 414-458).
4. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 3** (Pages: 38-52); **Chapter 4** (Pages: 53-62); **Chapter 5** (Pages: 100-103); **Chapter 6** (Pages: 106-128).
5. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 13** (Pages: 307-323); **Chapter 18** (Pages: 420-442); **Chapter 28** (Pages: 747-769).
6. Gadgil, M. and Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press, Berkeley, USA. (pp. 1-245).
7. McCully, P. (1996). *Rivers no more: the environmental effects of dams*, In: *Silenced Rivers: The Ecology and Politics of Large Dams*, Zed Books, New York, USA. **Page. 29-64**.
8. Raven, P.H. Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapters 10, 11, 12, 13** (Pages: 180-263); **Chapter 14** (Pages: 272-275); **Chapter 15** (Pages: 286-289).
9. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 25** (Pages: 623-663).
10. Primack, R.B. (2014). *Essentials of Conservation Biology*. Oxford University Press, USA. Page. 1-536.
11. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 5** (Pages: 97-99); **Chapter 16** (Pages: 299-318).
12. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 24** (Pages: 599-690); **Chapter 26** (Pages: 664-714).
13. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 359-381); **Chapter 21** (Pages: 401-421); **Chapter 23** (Pages: 440-453).
14. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 19, 20, 12** (Pages: 445-535).
15. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. **Chapter 2** (Pages: 23-39); **Chapter 3** (Pages: 41-86).
16. Raven, P.H. Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 370-376); **Chapter 20** (Pages: 385-399).

17. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology: Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 23** (Pages: 555-598); **Chapter 30** (Pages: 801-807).
18. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. **Chapter 10** (Pages: 416-473).
19. Raven, P.H., Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 2** (Pages: 33-36); **Chapter 8** (Pages: 148-162).
20. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 1** (Pages: 23-26); **Chapter 31** (Pages: 826-842).

SPL

Suzohm

Arjun

Chairperson H.O.D. <i>[Signature]</i>	Departmental members	
Subject Expert <i>A. R. Khan</i> (University Nominee) <i>A. Aslam</i>	1.....	8..... <i>[Signature]</i>
Subject Expert. <i>[Signature]</i>	2..... <i>[Signature]</i>	9.....
Representative (Industry)	3.....	10.....
Representative <i>[Signature]</i>	4..... <i>[Signature]</i>	11.....
Representative (Alumni)	5.....	12.....
Representative (Professor Science Faculty Other Dept.)	6..... <i>[Signature]</i>	13.....
	7.....	14.....

Session: 2024-25	Program: B.Sc./B.A./B.Com./BCA
Semester: II or IV	Course Type: AECC
Course Title: Environmental Studies (Project Based)	Course Code:
Credit: 2	Lecture: 30
M.M. : 50 (40 + 10)	Minimum Passing Marks: 40%

Marking Scheme :

Project	30 Marks
Internal	10 Marks
Viva	10 Marks
Total	50 Marks

NOTE : Questions will be asked from all the units in the internal evaluation exam.

टीप : आंतरिक मुल्यांकन में सभी इकाइयों से प्रश्न पूछे जायेंगे

Title	Environmental Studies (Project Based)
Course Objectives	<p>The course will empower the undergraduate students by helping them to:</p> <ol style="list-style-type: none"> Gain in-depth knowledge on natural processes and resources that sustain life and govern economy. Understand the consequences of human actions on the web of life, global economy, and quality of human life. Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. Acquire values and attitudes towards understanding complex environmental economic- social challenges, and active participation in solving current environmental problems and preventing the future ones. Adopt sustainability as a practice in life, society, and industry.
Learning Outcomes	<i>The course will empower the undergraduate students through:</i>

Outcomes	<p>i. Gaining of in-depth knowledge on natural processes and resources that sustain life and govern economy.</p> <p>ii. Understanding and predicting the consequences of human actions on the web of life, global economy, and quality of human life.</p> <p>iii. Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.</p> <p>iv. Acquisition of values and attitudes towards understanding complex environmental- economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.</p> <p>v. Encouraging adoption of sustainability as a practice in life, society, and industry.</p>
-----------------	--

Units	Lectures	Topics
I	8	<p>Solid Waste Management Introduction, waste classification, methods of waste collection, storage, and transportation, treatment and disposal techniques for solid waste: landfill operation and maintenance, composting: advantages and limitations, vermin-composting, autoclaving, incineration, biogas plant, techniques for hazardous waste treatment and safe disposal, nuclear and e-waste management, Government agencies and programs: NCEPC, MOEFCC, CPCB and SPCB's.</p> <p>(ठोस अपशिष्ट प्रबंधन : परिचय, अपशिष्ट वर्गीकरण, अपशिष्ट संग्रहण, भंडारण और परिवहन के तरीके, ठोस अपशिष्ट के लिए उपचार और निपटान तकनीक: लैंडफिल संचालन और रखरखाव, खाद बनाना: फायदे और सीमाएं, वर्मिन-कंपोस्टिंग, ऑटोक्लेविंग, भस्मीकरण, बायोगैस संयंत्र, खतरनाक अपशिष्ट उपचार के लिए तकनीक और सुरक्षित निपटान, परमाणु और ई-अपशिष्ट प्रबंधन, सरकारी एजेंसियां और कार्यक्रम: एनसीईपीसी, एमओईएफसीसी, सीपीसीबी और एसपीसीबी।)</p>
II	7	<p>Effluent treatment Introduction, wastewater treatment, sludge treatment, aerobic and anaerobic treatment processes, waste reuse and recycling, adsorption, filtration, sedimentation, bag filters, electrostatic precipitation, wet scrubbers, absorbers, mist eliminators.</p> <p>(धाराप्रवाह उपचार : परिचय, अपशिष्ट जल उपचार, कीचड़ उपचार, एरोबिक और एनारोबिक उपचार प्रक्रियाएं, अपशिष्ट का पुनः उपयोग और पुनर्चक्रण, सोखना, निस्पंदन, अवसादन, बैग फिल्टर, इलेक्ट्रोस्टैटिक वर्षा, गीला स्क्रबर,</p>

Dr. Anil Kumar

Dr. Anil Kumar

		अवशोषक, धुंध एलिमिनेटर।)
III	8	<p>Industrial safety and management techniques: Industrial safety standards and regulations, material safety datasheet, personal protective equipment (PPE), hierarchy of hazard control, respirators, skin protection, eye protection, hearing protection, protective clothing and ensembles, Fire fighting hazards, terminology, classification of fire and extinguishers, factors which contribute to fire, common causes of industrial fire accidents (औद्योगिक सुरक्षा और प्रबंधन तकनीकें : औद्योगिक सुरक्षा मानक और विनियम, सामग्री सुरक्षा डेटाशीट, व्यक्तिगत सुरक्षा उपकरण (पीपीई), खतरा नियंत्रण का पदानुक्रम, श्वसन यंत्र, श्रम की सुरक्षा, आंशों की सुरक्षा, श्रवण सुरक्षा, सुरक्षात्मक कपड़े और पहनावा, अग्निशमन खतरे, शब्दावली, आग और बुझाने वाले यंत्रों का वर्गीकरण, आग लगने में योगदान देने वाले कारक, औद्योगिक अग्नि दुर्घटनाओं के सामान्य कारण)</p>
IV	7	<p>Human Population and the Environment Population growth, variation among nations Population explosion – Family Welfare Programmes, Environment and human health Human Rights, Value education, HIV/AIDS, Women and child welfare Role of information technology in environment and human health, Case studies (मानव जनसंख्या और पर्यावरण जनसंख्या वृद्धि, राष्ट्रों के बीच भिन्नता जनसंख्या विस्फोट - परिवार कल्याण कार्यक्रम, पर्यावरण और मानव स्वास्थ्य मानवाधिकार, मूल्य शिक्षा, एचआईवी एड्स, महिला एवं बाल कल्याण पर्यावरण और मानव स्वास्थ्य में सूचना प्रौद्योगिकी की भूमिका, केस अध्ययन)</p>

Suggested Readings

- 1 Raven, P.H., Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 8th Edition. Wiley Publishing, USA. **Chapter 1** (Pages: 1-17); **Chapter 2** (Pages: 22-23); **Chapter 3** (Pages: 40, 41); **Chapter 4** (Pages: 64, 66).
- 2 Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 1** (Page: 3-28).
- 3 Odum, E.F., Odum, H.T., and Andrews, J. (1971). *Fundamentals of Ecology*. Saunders, Philadelphia, USA. **Chapter 1** (Pages: 1-16); **Chapter 2** (Pages: 18-76); **Chapter 10** (Pages: 414-458).
- 4 Raven, P.H., Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 3** (Pages: 38-52); **Chapter 4** (Pages: 53-62); **Chapter 5** (Pages: 100-103); **Chapter 6** (Pages: 106-128).

Handwritten signature

Handwritten signature

Handwritten signature
 PLK

5. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 13** (Pages: 307-323); **Chapter 18** (Pages: 420-442); **Chapter 28** (Pages: 747-769).
6. Gadgil, M. and Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press, Berkeley, USA. (pp. 1-245).
7. McCully, P. (1996). *Rivers no more: the environmental effects of dams*, In: *Silenced Rivers: The Ecology and Politics of Large Dams*, Zed Books, New York, USA. **Page. 29-64**.
8. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapters 10, 11, 12, 13** (Pages: 180-263); **Chapter 14** (Pages: 272-275); **Chapter 15** (Pages: 286-289).
9. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 25** (Pages: 623-663).
10. Primack, R.B. (2014). *Essentials of Conservation Biology*, Oxford University Press, USA. Page. 1-536.
11. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 5** (Pages: 97-99); **Chapter 16** (Pages: 299-318).
12. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 24** (Pages: 599-690); **Chapter 26** (Pages: 664-714).
13. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 359-381); **Chapter 21** (Pages: 401-421); **Chapter 23** (Pages: 440-453).
14. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 19, 20, 12** (Pages: 445-535).
15. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. **Chapter 2** (Pages: 23-39); **Chapter 3** (Pages: 41-86).
16. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 370-376); **Chapter 20** (Pages: 385-399).
17. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 23** (Pages: 555-598); **Chapter 30** (Pages: 801-807).

18. Divan, S. and Rosencranz, A. (2002). Environmental Law and Policy in India: Cases, Material & Statutes, 2nd Edition. Oxford University Press, India. **Chapter 10** (Pages: 416-473).
19. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9th Edition. Wiley Publishing, USA. **Chapter 2** (Pages: 33-36); **Chapter 8** (Pages: 148-162).
20. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi. **Chapter 1** (Pages: 23-26); **Chapter 31** (Pages: 826-842).

AECC Environmental Science Project Work

Rules for the project file and project work report of Environmental Science पर्यावरण अध्ययन में प्रोजेक्ट वर्क रिपोर्ट प्रमाण पत्र तथा प्रोजेक्ट फाइल हेतु नियमः

1. Students will do at least 10 hours of field work, whose experience certificate will be verified from the following officer/public representative.
Parshad /Sarpanch/Village Secretary/MLA/MP/District Panchayat President/ Village Panchayat President/
विद्यार्थी कम से कम 10 घंटे का फील्ड करेंगे, जिसका अनुभव प्रमाण पत्र निम्न अधिकारी / जनप्रतिनिध से सत्यापित करवाएंगे
पार्षद/ सरपंच/ग्राम सचिव/ विधायक/सांसद/ जिला पंचायत अध्यक्ष/ ग्राम पंचायत अध्यक्ष/
2. Students can also get the experience certificate of the field work done from the following Gazetted Officers verified -
Assistant Professor/Professor/Principal//District Panchayat CEO/Municipal Corporation Officer/Other Gazetted Officer
विद्यार्थी किये गए फिल्ड वर्क को निम्न राजपत्रित अधिकारियों से भी अनुभव प्रमाण पत्र को सत्यापित करवा सकते हैं-
सहायक प्राध्यापक/प्राध्यापक / प्राचार्य// जिला पंचायत CEO/ नगर निगम अधिकारी/अन्य राजपत्रित अधिकारी
3. It will be mandatory to submit the project work report certificate along with the field project work file.
प्रोजेक्ट वर्क रिपोर्ट प्रमाण पत्र को फील्ड प्रोजेक्ट वर्क फाइल के साथ जमा करना अनिवार्य होगा.
4. While doing field work, you must include color photographs with geographical tags and time.
फील्ड वर्क करते हुए कलर फोटोग्राफ्स जिओग्राफिकल टैग और टाइम के साथ जरूर सम्मिलित करेंगे
5. Field work is to be done on the following tasks-
 - i. Tree plantation
 - ii. Cleanliness campaign in village/locality/city/school/college, which includes cleaning of pond, cleaning of premises, cleaning of bus stand, cleanliness campaign in railway station.
 - iii. Climate change study/global warming
 - iv. Causes, effects and control of water pollution/soil pollution/noise pollution/air pollution
 - v. Study of biodiversity in village/city/town
 - vi. Study of man-made water sources, surface and ground water
 - vii. Study of soil erosion

- viii. Study of water and air quality standards
- ix. Study of soil health parameters
- x. Study of efforts made to increase the ground water level

फील्ड वर्क निम्न कार्यो पर किया जाना है-

- i. वृक्षारोपण
- ii. ग्राम /मोहल्ले/शहर/स्कूल/ कॉलेज में स्वच्छता अभियान, जिसके अंतर्गत तालाब की सफाई, परिसर की सफाई, बस स्टैंड की सफाई, रेलवे स्टेशन में स्वच्छता अभियान
- iii. जलवायु परिवर्तन अध्ययन/ग्लोबल वार्मिंग
- iv. जल प्रदूषण/मृदा प्रदूषण/ध्वनि प्रदूषण/वायु प्रदूषण का कारण , प्रभाव एवं नियंत्रण
- v. ग्राम/शहर/कस्बे में जैव विविधता का अध्ययन
- vi. मानव निर्मित जल स्रोत, सतही एवं भूजल का अध्ययन
- vii. मृदा अपरदन का अध्ययन
- viii. जल एवं वायु की गुणवत्ता मानकों का अध्ययन
- ix. मृदा की गुणवत्ता मानकों का अध्ययन
- x. भू-जलस्तर को बढ़ाने के लिए किये गए प्रयासों का अध्ययन

नोट: - प्रोजेक्ट फाइल पर प्लास्टिक कवर का प्रयोग नहीं करना है।
Do not cover your project file with plastic sheet.









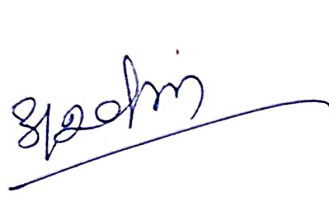
/// प्रोजेक्ट वर्क रिपोर्ट प्रमाण पत्र (प्रारूप)///

प्रमाणित किया जाता है कि.....(विद्यार्थी का नाम), पिता का नाम.....रोल नंबर..... कक्षा.....ने. विषय पर ग्राम/शहर/वार्ड/कस्बेमें फिल्ड वर्क का कार्य सफलतापूर्वक संपन्न किया है।

हम इनके उज्ज्वल भविष्य की कामना करते हैं।

जनप्रतिनिधि/ अधिकारी के हस्ताक्षर

मोहर



		Departmental members	
Chairperson /H.O.D	<i>[Signature]</i>	1.....	8..... <i>[Signature]</i>
Subject Expert (University Nominee)	<i>Arif Khan</i> <i>25/5/2024</i>	2..... <i>[Signature]</i>	9.....
Subject Expert. <i>[Signature]</i>		3.....	10.....
Representative (Industry)		4..... <i>[Signature]</i>	11.....
Representative (Alumni)	<i>[Signature]</i>	5.....	12.....
Representative (Professor Science Faculty Other Dept.)		6..... <i>[Signature]</i>	13.....
		7.....	14.....