Annexure – 8b

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
(Re –accredited (3rd cycle) with Grade A+ and CGPA 3.51 by NAAC)

GENERIC ELECTIVE CHEMISTRY

(For I B.Sc., Zoology
(w.e.f. 2022 – 2023 onwards)
CBCS with OBE

COURSE STRUCTURE - SEMESTER WISE

Sem	Part	Course Code	Title of the Course	Teaching hrs. (Per week)	Duration of exam (hrs)	Marks allotted			Credits
						CIA	SE	Total	
I	III	22OUZOGECH1	GEC– Chemistry –I - Inorganic, Organic & Physical Chemistry	4	3	25	75	100	4
			GEC- Practical-1 Salt analysis	2	-	-	-	-	-
II	III	22OUZOGECH2	GEC– Chemistry –II - Organic, Applied & Analytical Chemistry	4	3	25	75	100	4
		22OUZOGECH2P	GEC- Practical-1 Salt analysis	2	3	40	60	100	1
III	III	22OUZOGECH3	GEC– Chemistry –III - Industrial Chemistry	4	3	25	75	100	4
			GEC- Practical- II Volumetric Analysis	2	-	-	-	-	-
IV	III	22OUZOGECH4	GEC– Chemistry –IV - Medicinal, Green & Nano Chemistry	4	3	25	75	100	4
		22OUZOGECH4P	GEC- Practical -II Volumetric Analysis	2	3	40	60	100	1

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Department of Zoology					Class :I B.Sc			
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Generic Elective Course	**22OUZOGECH1**	Chemistry-I-Inorganic, Organic & Physical Chemistry	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain the basic knowledge about hardness of water and to analyze removal techniques
2. To acquire knowledge in elements and periodic variations in properties.
3. To understand the theory, preparation and classification of dyes
4. To analyze and apply the knowledge of electrochemical cells to the sustainable environment
5. To achieve the knowledge on the preparation, properties and significance of colloids.

Unit :1 Water : Hardness of water –Types of Hardness – methods, removal of Temporary hardness – removal of Permanent hardness – Industrial implications of hardness in water- Estimation of hardness by EDTA method – units of hardness of water.

Unit: II Periodic Table : Mendeleef's Periodic table -characteristics of Mendeleef's periodic table - merits and demerits - Modern periodic table -Periodic variations in properties – Atomic radius - Ionisation potential, Electron affinity- metallic and non metallic characters.

Unit: III Dyes: Definition- theory of colour and constitution- chromophore – auxochrome theory - classification: Based on chemical structure, based on their mode of application – preparation and uses: Methyl orange **,** congo red, malachite green.

Unit : IV Electrochemical cells : Definition, voltaic cells - Daniell cell – Measurement of the EMF of a cell – cell reaction – Single electrode potentials – oxidation – reduction potentials – Gas electrodes – hydrogen electrode, chlorine electrode – EMF of cell in terms of Single Electrode Potential – Determination of Single Electrode Potentials with examples – Commercial cells – Leclanche cell and Lead acid storage cell.

Unit: V Colloids: Definition - size of colloidal particles – classification- differences between lyophilic sols and lyophobic sols - preparation of sols-dispersion Method :Bredig's arc method, peptization –properties:Optical property-tyndall effect, kinectic property-brownian movement, electrical property-electrical double layer-application of colloids - colloidal medicines, sewage disposal, purification of water, artificial rain.

Books for Study:

1. Arun Bahl & Bahl B.S. (2016). *Advanced Organic Chemistry*. S.Chand & Company Ltd., New Delhi.
2. Ratinamuthu. K. *Ancillary Chemistry*. R.Arun & Co. Educational Publishers, Madurai.

Books for Reference:

1. Bahl B.S. Tuli G.D. & Arun Bahl. (2004). *Essentials of Physical Chemistry*. S.Chand & Company Ltd., New Delhi.
2. Bhupindu Mehta, Manjal Mehta. (2012). *Organic Chemistry*. PHI Learning Private Limited, New Delhi.
3. Madan R.D. (2008). *Modern Inorganic Chemistry*. S.Chand and Company Ltd. New Delhi.
4. Puri, Sharma, Pathania. (2004). *Principles of Physical Chemistry*. Vishal Publishing Co, Jalandhar.
5. Soni P.L. & Chawla H.M. (2004). *Text Book of Organic Chemistry*. Sultan & Sons, New Delhi.

Web Resources / E.Books:

http://www.bspublications.net/downloads/0523ff2e4a5331_chemistry_ch_01_JNTUK.pdf

https://ncert.nic.in/textbook/pdf/jesc105.pdf

https://dducollegedu.ac.in/Datafiles/cms/ecourse%20content/DYES.pdf

https://alevelchemistry.co.uk/notes/electrochemical-cells/

https://testbook.com/learn/chemistry-colloids/

Pedagogy:

Chalk and Talk, Power Point presentations, Seminar, Group Discussion, Quiz through ICT-Mode

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Rationale for nature of Course:

Knowledge and Skill:

Students can recall the periodic table and its elements, understand basic knowledge about hardness of water, dyes, electrochemical cells and they can learn application of colloids in various field.

Activities to be given:

Lab activity given to students to identify and compare the Colour and Properties of the various substances, Assign them case study about colloidal disposal in current era.

Course learning Outcomes (CLOs):

CLO	**Course Outcomes statements**	**Knowledge According to Bloom's Taxonomy (Upto K level)**
CLO 1	Elaborate the concept of hardness of water	K1 to K3
CLO 2	Identify the Periodic variations and various properties of elements	K1 to K3
CLO 3	Recognize the chemical structure and mode of applications of dyes	K1 to K4
CLO 4	Possess knowledge about electro chemical cells and study about different electrodes.	K1 to K3
CLO 5	Apply the knowledge of colloidal materials and possess the potential on the usage and application of colloidal substance in the life habitat.	K1 to K4

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CLO1	2	2	1	1	2	2
CLO2	2	2	2	1	2	1
CLO3	3	2	2	2	2	3
CLO4	2	3	3	2	3	2
CLO5	3	3	2	2	3	3

1-Basic Level **2- Intermediate Level** **3- Advanced Level**

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LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Hardness of water –Types of Hardness – methods, removal of Temporary hardness – removal of Permanent hardness Industrial implications of hardness in water-Estimation of hardness by EDTA method – units of hardness of water.	10	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs.
II	Mendeleef's Periodic table -characteristics of Mendeleef's periodic table - merits and demerits - Modern periodic law - Periodic variations in properties – Atomic radius - Ionisation potential- metallic and nonmetallic characters.	11	Chalk and Talk, PPT, group discussion, OHP presentations, quiz, on the spot test and Virtual Labs.
III	Definition- theory of colour and constitution- chromophore – auxochrome theory - classification: Based on chemical structure, Classification based on their mode of application – preparation and uses: Methyl orange, bismark brown**,** malachite green.	11	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs
IV	Definition, voltaic cells - Daniell cell – Measurement of the EMF of a cell – cell reaction – Single electrode potentials – oxidation – reduction potentials – Gas electrodes – hydrogen electrode, chlorine electrode – EMF of cell in terms of Single Electrode Potential – Determination of Single Electrode Potentials with examples – Commercial cells – Leclanche cell and Lead storage cell.	14	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs
V	Definition - size of colloidal particles – classification-differences between lyophilic sols and lyophobic sols - preparation of sols-dispersion Method :Bredig's arc method, Peptization –properties: Optical property-tyndall effect, kinectic property-brownian movement, electrical property-electrical double layer-application of colloids - colloidal medicines, sewage disposal, purification of water, artificial rain.	14	Chalk and Talk, PPT, group discussion, OHP presentations, quiz, on the spot test and Virtual Labs.

Course Designer:
Dr.(Mrs).M.Sangeetha

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Department of Zoology					Class: I B.Sc			
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Generic Elective Course	**22OUZOGECH2**	Chemistry-II - Organic, Applied & Analytical Chemistry	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented
✓	✓	

Course Objectives :

1. To learn about hybridisation, reaction intermediates and reagents
2. To become familiar with condensed systems and Heterocyclic compounds.
3. To learn the chemistry of carbohydrates
4. To study the nature of corrosion and corrosion preventing methods.
5. To learn chromatographic techniques.

Unit: I Fundamental Concepts: Tetra valency of carbon- hybridisation: sp^3 (CH_4), sp^2 (C_2H_4) and sp (C_2H_2)-bond fission: homolytic fission, heterolytic fission (one example each). Reaction intermediates: Definition - formation of carbonium ion, carbanion and free radical. Attacking reagents: Definition – nucleophiles and electrophiles (one example)

Unit: II Condensed System & Heterocyclic Compounds:

Condensed system: Introduction, Naphthalene -synthesis and properties (No structural elucidation). Heterocyclic compounds: Preparation and properties of furan, pyridine and quinoline.

Unit: III Carbohydrates: Introduction-Classification – Mono Saccharide: Glucose- preparation, properties and uses -straight chain structure, cyclic structure and Haworth's structure of glucose -conversion of glucose into fructose and vice- versa. Disaccharide – sucrose manufacture, properties -structure only -distinction between glucose, fructose and sucrose.

Unit : IV Corrosion : Definition – Causes of corrosion – Classification of corrosion – Differences between chemical and electrochemical corrosion – Galvanic corrosion – Differential aeration corrosion – Pitting corrosion – Stress corrosion – Factors influencing rate of corrosion – Various methods of preventing corrosion – Application of prevention of corrosion.

Unit: V Chromatographic techniques: Introduction - chromatography terms – Different chromatographic techniques and their applications – Thin layer chromatography, Paper chromatography, Ion- exchange chromatography – chromatography special techniques in current scenario.

Books for Study:

1. Ratinamuthu. *Ancillary chemistry.* R. Arun & Co, Educational publishers, Madurai.
2. Madan R.D. (2016). *Modern Inorganic Chemistry*. S.Chand and company Ltd. New Delhi.

Books for Reference:

1. Bahl B.S & Arun Bahl. (2008). *Advanced Organic Chemistry*. S. Chand & Company, New Delhi.
2. Puri B.R. Sharma L.R. Kalia K.C. (2008). *Principles of Inorganic Chemistry*. Milestone Publishers, Delhi.
3. Soni, P.L. (1998). *Text book of Organic Chemistry*, Sultan Chand and Sons, New Delhi.
4. Jain, M. K. and Sharma, S. C. (2013). *Modern Organic Chemistry*. Vishal Publishing Co, Jalandhar. Delhi, 4th edition.
5. Tewari K.S., Vishnoi N. K. and Mehotra S.N. (2001). *A Text Book of Organic Chemistry 1st Edition*. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Wahid U.Malik, G.D Tuli, Madan. R.D. (2002). *Selected topics in Inorganic Chemistry.* S.Chand & Co, New Delhi.

Web Resources / E.Books:

http://cbitkolar.edu.in/wpcontent/uploads/2020/04/Engineering_Chemistry_18CHE16_MODULE-2-1.pdf

https://www.sctce.ac.in/faculty/facultylogin/Admin/Attachments/Upload/1559024785_1559024785.pdf

https://soe.unipune.ac.in/studymaterial/ashwiniWadegaonkarSelf/222%20Chapter%204.pdf

http://cbitkolar.edu.in/wpcontent/uploads/2020/04/Engineering_Chemistry_18CHE16_MODULE-2-1.pdf

https://www.sathyabama.ac.in/sites/default/files/course-material/202010/note_1456404597.pdf

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Pedagogy:

Chalk and Talk method, Power Point presentations, Seminar, Group Discussion, Quiz through ICT-Mode

Rationale for nature of Course:

Knowledge and Skill:

Students can learn about types of hybridisation, Heterocyclic compounds, the chemistry of carbohydrates, nature of corrosion and corrosion preventing methods, learn and handle some chromatographic techniques.

Activities to be given:

Assign students to submit case study on corrosion disasters and preparing ppt on chromatographic techniques.

Course learning Outcomes (CLOs):

CLO	**Course Outcomes statement**	**Knowledge According to Bloom's Taxonomy (Upto K level)**
CLO 1	Possess fundamental concepts on hybridisation, reaction intermediates and reagents	K1 to K3
CLO 2	Recognize heterocyclic compounds and condensed system	K1 to K3
CLO 3	Attain brief knowledge on carbohydrates, their classification and structure	K1 to K4
CLO 4	Elaborate different forms of corrosion, attain brief knowledge how to control corrosion and can practice in today's environment	K1 to K3
CLO 5	Practice recent chromatography techniques in industries and laboratories by attaining knowledge through theoretical studies in current scenario	K1 to K4

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CLO1	3	2	2	1	2	2
CLO2	2	2	2	1	2	1
CLO3	2	2	3	2	2	2
CLO4	3	3	2	2	3	3
CLO5	3	3	3	3	3	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

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LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Tetra valency of carbon- hybridisation: sp^3 (CH_4), sp^2 (C_2H_4) and sp (C_2H_2)-bond fission: homolytic fission, heterolytic fission (one example each). Reaction intermediates: Definition - formation of carbonium ion, carbanion and free radical. Attacking reagents: Definition – nucleophiles and electrophiles (one example)	12	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs.
II	Condensed system: Introduction, Naphthalene -synthesis and properties (No structural elucidation). Heterocyclic compounds: Preparation and properties of furan, pyridine and quinoline.	11	Chalk and Talk, PPT, group discussion, OHP presentations, quiz, on the spot test and Virtual Labs.
III	Introduction-Classification – Mono Saccharide: Glucose- preparation, properties and uses -straight chain structure, cyclic structure and Haworth's structure of glucose Conversion of glucose into fructose and vice- versa. Disaccharide – sucrose manufacture, properties -structure only -distinction between glucose, fructose and sucrose.	11	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs
IV	Definition – Causes of corrosion – Classification of corrosion – Differences between chemical and electrochemical corrosion – Galvanic corrosion – Differential aeration corrosion.Pitting corrosion – Stress corrosion – Factors influencing rate of corrosion – Various methods of preventing corrosion- Applications of preventing corrosion.	13	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs
V	Introduction - chromatography terms – Different chromatographic techniques and their applications – Thin layer chromatography-Paper chromatography, Ion-exchange chromatography – chromatography special techniques in current scenario.	13	Chalk and Talk, PPT, group discussion, OHP presentations, quiz, on the spot test and Virtual Labs.

Course Designer:
Dr. (Mrs).M.Sangeetha

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Department of Zoology			Class: I B.Sc					
Semester	**Category**	**Course Code**	**Course Title**	**Credits**	**Hours**	**CIA**	**SE**	**Total**
I & II	Generic Elective Course	**22OUZOGECH2P**	Practical – I Salt Analysis	1	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented
✓	✓	

Analyze systematically the given simple salt containing one anion (acid radical) and one cation (basic radical).

Cations: Lead, bismuth, copper, cadmium, iron, aluminum, zinc, manganese, cobalt, nickel, Barium, strontium, calcium, magnesium and ammonium

Anions: Carbonate, sulphate, nitrate, chloride, bromide, fluoride, oxalate, borate and phosphate.

Books for references:

1. Malligarjunan U.M, " Practical Chemistry", Radha publications
2. Ramasamy .R, " Ancillary Chemistry Practical Book -1", Priya publications

Web resources/ e - books

https://www.academia.edu/12554372/Inorganic_Quantitative_Analysis_Lab_Manual_by_Rupam_Raha
http://akimya.pharmacy.ankara.edu.tr/wp-content/uploads/sites/43/2018/08/ANALYTICAL-CHEMISTRY-LAB-MANUAL-1-Qualitative-analysis.pdf

Pedagogy

Chalk and talk, laboratory practices, group discussion.

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LESSON PLAN FOR PRACTICAL (Total hours : 60)

S.no	Description	Hours	Mode
1.	Instruction	2	Demonstration , Chalk and Talk, Discussion
2.	**Demonstration**		
	Analysis of Anions (Acid radical)	4	Demonstration , Chalk and Talk, Discussion
	Analysis of Cations (Basic radical)	4	Demonstration , Chalk and Talk, Discussion
3.	Analysis of Anions	4	Demonstration , Chalk and Talk, Discussion
4.	Analysis of Cations	6	Demonstration , Chalk and Talk, Discussion
5.	Analysis of inorganic salt – I	4	Demonstration , Chalk and Talk, Discussion
6.	Analysis of inorganic salt – II	4	Demonstration , Chalk and Talk, Discussion
7.	Analysis of inorganic salt – III	4	Demonstration , Chalk and Talk, Discussion
8.	Analysis of inorganic salt – IV	4	Demonstration , Chalk and Talk, Discussion
9.	Analysis of inorganic salt – V	4	Demonstration , Chalk and Talk, Discussion
10.	Analysis of inorganic salt – VI	4	Demonstration , Chalk and Talk, Discussion
11.	Analysis of inorganic salt – VII	4	Demonstration , Chalk and Talk, Discussion
12.	Revision	6	
10.	Model test (2)	6	

Course Designer:
Dr.(Mrs).M.Sangeetha

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EVALUATION (PRACTICAL)

Internal (Formative) : 40 marks
External (Summative) : 60 marks
Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

Components	Marks
Acid radical	10
Basic radical	10
Model exam	10
Viva	10
Total	**40**

Question Paper Pattern for External Practical Examination (Major) : 60 Marks

S.No	Components	Marks
1.	Acid radical with procedure	20
2.	Basic radical with procedure	20
3.	Viva	10
4.	Record book	10
	Total	**60**

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.