



List of Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

Department : Chemistry

Programme Name : M. Sc.

Academic Year : 2024-25

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:

Sr. No.	Course Code	Name of the Course
01.	CYPDTD9	Environmental Chemistry
02.	CYPATC1	Green Water Technology

सहायक/Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
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बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C G.)



Scheme and Syllabus

CBCS- Course structure for M. Sc. (Chemistry)

(To be implemented from Session 2021-2022)

SEMESTER -I								
Course Structure	Course Code	Title	T/L	CCA	ESE	Total Marks	Credit	Final credit
CC-1	CYPATT1	Analytical Chemistry I	T-3	40	60	100	3	5
	CYPALT1	Analytical Chemistry Practical I	L-4	40	60	100	2	
CC-2	CYPATT2	Inorganic Chemistry I	T-3	40	60	100	3	5
	CYPALT2	Inorganic Chemistry Practical I	L-4	40	60	100	2	
CC-3	CYPATT3	Organic Chemistry I	T-3	40	60	100	3	5
	CYPALT3	Organic Chemistry Practical I	L-4	40	60	100	2	
CC-4	CYPATT4	Physical Chemistry I	T-3	40	60	100	3	5
	CYPALT4	Physical Chemistry Practical I	L-4	40	60	100	2	
OE	CYPATO1	Polymer Chemistry	T-3	40	60	100	3	5
	CYPALO1	Polymer Chemistry- Practical I	L-4	40	60	100	2	
VAC/ Certificate Course/ Optional	CYPATC1	Refer the List of Value-Added Course (p. 5)	T-2	40	60	100	2	Additional Credit Course
	CYPALC1		L-2	40	60	100	1	
Total Credit						25		
Semester-II								
CC-5	CYPBTT1	Analytical Chemistry II	T-3	40	60	100	3	5
	CYPBLT1	Analytical Chemistry Practical-II	L-4	40	60	100	2	
CC-6	CYPBTT2	Inorganic Chemistry II	T-3	40	60	100	3	5
	CYPBLT2	Inorganic Chemistry Practical-II	L-4	40	60	100	2	
CC-7	CYPBTT3	Organic Chemistry II	T-3	40	60	100	3	5
	CYPBLT3	Organic Chemistry Practical-II	L-4	40	60	100	2	
CC-8	CYPBTT4	Physical Chemistry II	T-3	40	60	100	3	5
	CYPBLT4	Physical Chemistry Practical-II	L-4	40	60	100	2	
CC-9	CYPBTT5	Molecular Spectroscopy	T – 4+1*	40	60	100	5	5
DSE-1	CYPBTD1	Instrumental Analytical Techniques	T – 4+1*	40	60	100	5	5
	CYPBTD2	Bio-inorganic Chemistry	T – 4+1*	40	60	100	5	
	CYPBTD3	Chemistry of Heterocycles	T – 4+1*	40	60	100	5	
	CYPBTD4	Solid State Chemistry	T – 4+1*	40	60	100	5	
Remarks: Any one course from DSE-1 will be offered to each student by the Department.								
VAC/ Certificate Course/ Optional	CYPATC1	Refer the List of Value-Added Course (p. 5)	T-2	40	60	100	2	Additional Credit Course
	CYPALC1		L-2	40	60	100	1	
Total Credit						30		
Semester-III								
CC-10	CYPCTT1	Computer Applications in Chemistry	T – 4+1*	40	60	100	5	5
RM	CYPCTA1	Research Methodology	T-2	40	60	100	2	2



OE-2	CYPCTO2	Medicinal Chemistry	T-3	40	60	100	3	5
	CYPCLO2	Medicinal Chemistry Practical	L-4	40	60	100	2	
	CYPDTO3	Industrial Chemistry	T-3	40	60	100	3	
	CYPDLO3	Industrial Chemistry Practical	L-4	40	60	100	2	
	Remarks: Any one course each from OE will be offered by the Department.							
DSE-2	CYPCTD1	Principles of Analytical Chemistry	T-3	40	60	100	3	5
	CYPCLD1	Analytical Chemistry Practical III	L-4	40	60	100	2	
	CYPCTD2	Organometallic Chemistry of Transition Metals	T-3	40	60	100	3	
	CYPCLD2	Inorganic Chemistry Practical III	L-4	40	60	100	2	
	CYPCTD3	Stereochemistry, Reactions and Rearrangements	T-3	40	60	100	3	
	CYPCLD3	Organic Chemistry Practical III	L-4	40	60	100	2	
	CYPCTD4	Electrochemistry	T-3	40	60	100	3	
	CYPCLD4	Physical Chemistry Practical III	L-4	40	60	100	2	
Remarks: Any one course from DSE-2 will be offered to each student by the Department.								
DSE-3	CYPCTD5	Chemical Analysis	T-3	40	60	100	3	5
	CYPCLD5	Analytical Chemistry Practical IV	L-4	40	60	100	2	
	CYPCTD6	Inorganic Rings, Chains, and Clusters	T-3	40	60	100	3	
	CYPCLD6	Inorganic Chemistry Practical IV	L-4	40	60	100	2	
	CYPCTD7	Chemistry of Natural Products	T-3	40	60	100	3	
	CYPCLD7	Organic Chemistry Practical IV	L-4	40	60	100	2	
	CYPCTD8	Quantum Chemistry	T-3	40	60	100	3	
	CYPCLD8	Physical Chemistry Practical IV	L-4	40	60	100	2	
Remarks: Any one course from DSE-3 will be offered to each student by the Department								
VAC/ Certificate Course/ Optional	CYPCTC1	Refer the List of Value-Added Course (p.5)	T-2	40	60	100	2	Additional Credit Course
	CYPCLC1		L-2	40	60	100	1	
Total Credit						22		
Semester-IV								
CC-11	CYPDTT6	Biological Chemistry	T-3	40	60	100	3	5
	CYPDTL6	Biological Chemistry Practical	L-4	20	30	50	2	
Remarks: Any one course each from OE-2 will be offered by the Department.								
DSE-4	CYPDTD1	Advanced Separation Techniques	T – 4+1*	40	60	100	5	5
	CYPDTD2	Structural Methods in Inorganic Chemistry	T – 4+1*	40	60	100	5	
	CYPDTD3	Organic Spectroscopy for Structural Elucidation	T – 4+1*	40	60	100	5	
	CYPDTD4	Statistical Mechanics	T – 4+1*	40	60	100	5	
Remarks: Any one course from DSE-4 will be offered to each student by the Department								
	CYPDTD5	Electroanalytical Methods	T – 4+1*	40	60	100	5	
	CYPDTD6	Special Topics in Inorganic Chemistry	T – 4+1*	40	60	100	5	



DSE-5	CYPDTD7	Reagents and Reactions in Organic Synthesis	T – 4+1*	40	60	100	5	5
	CYPDTD8	Chemical Kinetics	T – 4+1*	40	60	100	5	
	Remarks: Any one course from DSE-5 will be offered to each student by the Department							
DSE-6	CYPDTD9	Environmental Chemistry	T – 4+1*	40	60	100	5	5
D	CYPDDD1	Dissertation/field work/ internship/project/ Industry visit	D-12	40	60	100	6	6
VAC/ Certificate Course/ Optional	CYPATC1	Refer the List of Value-Added Course (p. 5)	T-2	40	60	100	2	Additional Credit Course
	CYPALC1		L-2	40	60	100	1	
Total							26	
MOOC's [#]								
Total Credit				Credit: 103				

CC = Core course DSE = Discipline specific Elective OE = Open Elective T= Theory L=Lab
Course Structure:

List of Value-Added Course (Certificate Course)	
1	Lab Safety Management (Prof. G. K. Patra)
2	Green Water Technology (Dr. S. K. Singh & Dr. U. P. Azad)
3	Agrochemicals Formulation (Dr. Charu Arora)
4	Cement Chemistry (Dr. S. S. Thakur & Prof. G. K. Patra)
5	Chemistry of Smart Materials and Technology (Dr. Arti Srivastava & Dr. Neeraj Kumari)
6	Food Adulteration and Testing (Dr. V. K. Rai and Dr. Manorama Singh)

#MOOC's courses may be offered at least one time during entire PG programme for the any of Core Course, Generic elective, Discipline specific elective, AEC course, Skill enhancement course available on MOOC's platform time to time. If any such course related to your subject is not available on MOOC's platform, department may continue with regular courses.

T - 4+1*refer to 4 hours Lecture and 1 hour Tutorial

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DSE-6: CYPDTD9- Environmental Chemistry (Credit-5 Theory 04 + Tutorial 01)

OBJECTIVE AND LEARNING: Environmentally benign chemical reactions are nowadays growing concerns of academics and industries and this study will make students aware with environmental ethics and knowledge needed to pursue their further chemical research work.

1. **Introduction:** Concept and scope of environmental chemistry, Environmental terminology and nomenclatures, Environmental segments, Solar Energy. The natural cycles of environment (Hydrological, Oxygen, Nitrogen, Phosphorous and Sulphur cycles) and their importance.
2. **Particles, ion and radicals in the atmosphere, stratospheric chemistry:** chemistry of ozone layer, role of chemicals in ozone destruction, Temperature inversion and its effects, Chemistry of Smog and its harmful effects. The green-house effect and Global warming,
3. **Basic principles of Sustainable Chemistry:** Eco-Friendly catalysts, synthesis, solvents. Biodegradable polymeric composite sorbents, Eco-friendly protocols for heavy metal water pollutants. Chemistry of soil formation and role of fertilizers and insecticides in soil pollution. Plume and its significance.
4. **Sources and effects, of oxides of sulphur, oxides of nitrogen, oxides of carbon:** Monitoring of air pollutants by Instrumental methods. Control of air pollution by raw material change, process modification, adsorption, absorption and combustion methods.
5. **Classification of Water Pollutants:** Chemical Pollutants; Physical Pollutants; Physiological Pollutants; Thermal Pollution. Unique characteristics of water; Water and the Living Environment; Water and the Non-living Environment; Monitoring of Water Pollutants: Pollution indicators, Dissolved Oxygen; Biological Oxygen Demand; Chemical Oxygen Demand; Waste water: Constituents – Microorganisms; Solids; Inorganic constituents, Organic matter, Water Quality requirements, pH values of Wastes and Receiving water, Suspended solids. El-Nino phenomenon.

OUTCOMES: A student having studied a subject like 'ENVIRONMENTAL CHEMISTRY' will be capable of understanding about the Environment and the chemical sciences involved in it. The students improve their knowledge regarding the different pollutions/ pollutants occurring in the environment. The students also develop their knowledge regarding Toxic substances and their distributions in the environment and their anti-dotes.

Books Recommended:

1. G.W. Vanloon, S.J. Duffer, Environmental Chemistry - A Global Perspective, Oxford University Press (2000).
2. F.W. Fifield and W.P.J. Hairens, Environmental Analytical Chemistry, 2nd Edition (2000), Black Well Science Ltd.
3. Colin Baird, Environmental Chemistry, W.H. Freeman and Company, New York (1995).
4. A.K. De, Environmental Chemistry, 4th Edition (2000), New Age International Private Ltd., New Delhi.

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2. Certificate Course in Green Water Technology

Department: CHEMISTRY

Name of the Course: GREEN WATER TECHNOLOGY

Nature of Course: CERTIFICATE

Mode of Course: Online /Offline /Physical

Number of Seats: 20

Eligibility Criteria for Admission: B. Sc. (ongoing PG students)

Introduction and relevance of course: The green water technology course is designed for students who want a career in the power plants, automobile industries, municipal corporation, pharmaceutical industries, water treatment plants and package water industries. this unique course provides students with specific scientific knowledge and skills indifferent areas acquainting them with green water technology.

Objectives of the course: This course is intended to provide a comprehensive survey of water quality required by the different industries depending upon their usage. The course will emphasize greener trends in water treatment plants and industries. The chemistry and technology of polluted water treatment will be related to their utilization in the respective industries. In this way, it is intended to generate a better understanding of the contributions of green water technology principles. Emphasis will be placed on recognizing and dealing with problem areas associated with the use of different green technologies for water purification. Safety consideration and other concerned matters which can influence the treated water will be include in these discussions.

Learning outcome of the course

Course Outcomes: The students at the completion of the course will be able:

- To understand the quality of potable water.
- To learn and understand the types of water and its usage.
- To get the knowledge of water pollution and its effects on flora and fauna.
- To enable the students, develop skill and excellent knowledge of water testing.
- They can pursue jobs in municipal corporation.

Above all the students can communicate in their family and society about potable water qualities and how it can be checked in order to prevent an Epidemic. After completing the course, students may apply for chemist job in the different industries.

Number of lectures: 02 hrs. per week (2 Credit)



Number of practicals: 02 hrs. per week (1 Credit)

List of experiments: Recognizing soft and hard water, determining hardness of water, eliminating the hardness of water, determining the TDS of water, Osmosis, determination of D.O., B.O.D and C.O.D.

Syllabus:

UNIT - I: Distribution of water on Earth, types of water, water quality as given by W.H.O., Indian standard specifications laid down for potable water. Sampling and testing of various water bodies. Factors affecting quality and stability of particular water bodies. What is natural water.

UNIT - II: Determination of physical and chemical properties of water. What are D.O., B.O.D. and C.O.D. What are soft and hard water. Sources responsible for contaminating water. What are their effects on flora and fauna? Definition of pure water. What is potable water, why water is necessary for life, what is water pollution. How environment is affected by the polluted water.

UNIT III: Study of different water pollutants and their effects on flora and fauna. Water treatment methods. Brief introduction of the following water treatment technologies: Osmosis, Reverse Osmosis, Resins for Cationic and Anionic exchanges, Charcoal filtration, Sorbents of Phyto & Animal origin.

UNIT- IV: Some knowledge on composite materials. What is natural polymer based composite materials. Different methods of using such composite materials in addressing polluted water. How they are environment friendly.

14. Suggestive readings:

1. A Textbook of Engineering Chemistry, Dr S. S. Dara, S. Chand & Company.
2. Engineering Chemistry, Jain & Jain, Dhanpat Rai & Sons.
3. Environmental Pollution, Monitoring and Control, Khopkar. S. M., New Age International Publishers.
4. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Sons.
5. Engineering Chemistry by Dr Subita Rasttan, S. K. Kataria & Sons.
6. Engineering Chemistry by B. K. Sharma, Krishna Prakashan Medis (P) Ltd., Meerut.
7. Engineering Chemistry by Daniel Yesudian, Hi-Tech Publications
8. A Text Book on Engineering Chemistry by Balamram Pani, Galgotia Publications Pvt. Ltd.
9. Analytical Methods for Drinking Water: Advanced in Sampling and Analysis by K. Clive Thompson and Philippe Quevauviller. (2005) Wiley.
10. A Text Book n Water Chemistry: Sampling, Data Analysis and Interpretation by A.G.S. Reddy (2020) Nova.