

**Revised Syllabus**

**DEPARTMENT OF CHEMISTRY**  
**COURSE CURRICULUM & MARKING SCHEME**

**B.Sc. I & II Semester**

**INDUSTRIAL CHEMISTRY**

**(Based on Choice Based Credit System)**

**SESSION : 2022-23**



**ESTD : 1958**

**GOVT.V.Y.T.PG AUTONOMOUS COLLEGE,**

**DURG, 491001 (C.G.)**

**(Former Name – Govt. Arts & Science College, Durg)**

**NAAC Accredited Grade A+ with CPE-Phase III (UGC), STAR COLLEGE (DBT)**

Phone : 0788-2212030

Website – [www.govtsciencecollegedurg.ac.in](http://www.govtsciencecollegedurg.ac.in). Email-[autonomousdurg2013@gmail.com](mailto:autonomousdurg2013@gmail.com)

## कार्यालय प्राचार्य

शासकीय विश्वनाथ यादव तामस्कर स्नातकोत्तर स्वशासी महाविद्यालय, दुर्ग (छ.ग.)

फोन नं./फैक्स नं. 0788-2359688, स्वशासी प्रकोष्ठ फोन नं.-0788-2212030

वेबसाइट : www.govtsciencecollegedurg.ac.in

(राष्ट्रीय मूल्यांकन एवं प्रत्यायन परिषद (NAAC) द्वारा A<sup>+</sup> ग्रेड प्रदत्त महाविद्यालय )

क्रमांक / Ref. No. 1583/Auto

दुर्ग / Durg / दिनांक / Date : 11-02-22

### आदेश

स्वशासी योजनांतर्गत विभिन्न विभागों के अध्ययन मंडल का गठन

महाविद्यालय में स्वशासी योजना के अंतर्गत रसायन विज्ञान विभाग के अध्ययन मंडल का गठन निम्नानुसार किया जाता है। अध्ययन मंडल का कार्यकाल आगामी दो वर्षों तक होगा -

### रसायन विज्ञान अध्ययन-मंडल

क्रं.	श्रेणी	मनोनीत सदस्य का नाम
1	अध्यक्ष	संबंधित विभागाध्यक्ष
2	सदस्य	संबंधित विभाग के समस्त सदस्य
3	विषय विशेषज्ञ	1. डॉ. ए. एल. एम. चंदेल, शा. ई. आर. आर. विज्ञान महाविद्यालय, बिलासपुर (छ.ग.) 2. डॉ. सुशीलचंद्र तिवारी, प्राचार्य, शासकीय, कन्या महाविद्यालय दुर्ग (छ.ग.) 3. डॉ. हेमलता मोहबे, पूर्व प्राचार्य राजनांदगांव (छ.ग.) 4. डॉ. अंजू झा, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
4	कुलपति द्वारा मनोनीत सदस्य	डॉ. अरुण मिश्रा, प्राध्यापक एवं विभागाध्यक्ष रसायन विज्ञान, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
5	उद्योग/निगमित क्षेत्र प्रतिनिधि	श्री दिलीप सिंह, म.न. 600, स्ट्रीट 33, स्मृति नगर, भिलाई
6	स्नातकोत्तर कक्षा का मेधावी पूर्व छात्र	डॉ. भावना जैन, रसायन विभाग, शा. वि.या.ता. स्नात. स्वशासी, महाविद्यालय, जिला-दुर्ग (छ.ग.)
7	विशेष पाठ्यक्रम विषय विशेषज्ञ	डॉ. मृगेन्द्र द्विवेदी, जीवरसायन विभाग, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
8	समान संकाय के अन्य विभाग के प्राध्यापक	डॉ. एस.डी. देशमुख, विभागाध्यक्ष भूगर्भ विज्ञान, शा. वि.या. ता. स्नात. स्वशासी, महाविद्यालय, जिला-दुर्ग (छ.ग.)

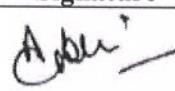

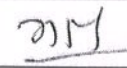
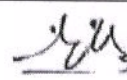
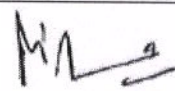
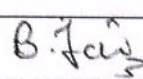

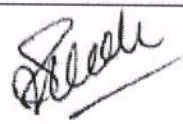

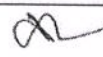
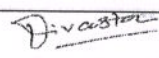


प्राचार्य

शा. वि.या.ता. स्नातकोत्तर स्वशासी महाविद्यालय

Principal  
Govt. V.Y.S.P.G. Autonomous  
College, Durg. (C.G.)

## Syllabus approved by members of Board of study

### Members (Board of study)

S.No.	Category	Nominee Member	Signature
01	Head Department of Chemistry	Dr. Anupama Asthana Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
02	Subject Expert	Dr. Sushil Chandra Tiwari Principal, Govt. Girls College Durg (C.G.)	
03	Subject Expert	Dr. Hemlata Mohobey Former Principal Rajnandgaon	
04	Subject Expert	Dr. Anju Jha Govt. NGP Autonomous College, Raipur (C.G.)	
05	University Nominee	Dr. Arun Mishra Govt. NGP Autonomous College, Raipur (C.G.)	
06	Representative (Industries)	Mr. Dilip Singh Street - 33, Smriti Nagar	
07	Alumni	Dr. Bhavana Jain	
08	Subject Expert (Biochemistry)	Dr. Mrigendra Diwedi Govt. NGP Autonomous College, Raipur (C.G.)	
08	Professor (other Department)	Dr. S. D. Deshmukh (Head Department of Geology) Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
09	Member	Dr. Alka Tiwari	
10	Member	Dr. S. Chatterjee	
11	Member	Dr. Anil Kashyap	
12	Member	Dr. Manju Kaushal	
13	Member	Dr. Ajaya Singh	
14	Member	Dr. Nutan Rathod	
15	Member	Dr. Uama Shrivastava	
16	Member	Dr. V.S. Geete	
17	Member	Dr. Sunitha B. Mathew	
18	Member	Dr. Anupama Kashyap	
19	Member	Dr. Prerna Kathane	
20	Member	Dr. Sunita Sanwaria	

**DEPARTMENT OF CHEMISTRY**  
**GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG**

Approved Revised syllabus for  
**B.Sc. INDUSTRIAL CHEMISTRY** by the members of Board of Studies for  
**Session 2022-2023**

**Scheme and Syllabus for B.Sc. Year 1 (Semester I & II)**

Scheme for B.Sc. Program with Industrial Chemistry - First Year  
(with 3 Subjects A, B\*, C\* Subject A- Industrial Chemistry)

Semester	Discipline Specific Course/ Core Course DSC (Credit-4)	Generic Elective Course GEC (Credit-4)	Skill Enhancement Course SEC (Credit-2)	Ability Enhancement Course AEC (Credit-2)	Value Added Course VAC (Credit-2)	Total Credits
1	<b>Industrial Chemistry -I</b> Industrial Technology, Metallurgy and Surface Chemistry (Th=3, P=1)	Choose any one course other than DSC  (Th=3, P=1)	Choose 1 from pool of SEC  (Th=1, P=1)	Hindi Language (Th-2)	Sports (Th=1, P=1)	22
	Subject B1 (Th=3, P=1)					
	Subject C1(Th=3, P=1)					
2	<b>Industrial Chemistry -II</b> Industrial Operations, Fuels and Aspects of Physical Chemistry (Th=3 P=2)	Choose any one course other than DSC  (Th=3, P=1)	Choose 1 from pool of SEC  (Th=1, P=1)	English Language(T h-2)	Yoga (Th=1, P=1)	22
	SubjectB2 (Th= 3 P=2)					
	Subject C2(Th= 3P=2)					

**Students on exit shall be awarded undergraduate certificate (in the field of Multidisciplinary Study) after securing the requisite 44 credits in semester I and II**

\*Maths/Physics/Botany/Zoology/Microbiology/Zoology/Geology/Biotechnology/Biochemistry/Industrial Chemistry/Anthropology

**LIST OF COURSES OFFERED BY DEPARTMENT OF CHEMISTRY**  
**For students opting B.Sc. with Industrial Chemistry (First Year)**

**Discipline Specific Courses/Core Papers DSC (Credits: 04 each; T= Theory. P = Practical)**

1. CZIC/CMIC 101: Industrial Chemistry -I (T- 3, P- 1)
2. CZIC/CMIC 201: Industrial Chemistry - II (T- 3, P-1)

**Skill Enhancing Courses SEC (Credits:02)**

1. CZIC/CMIC 01: Good lab practices in Chemistry (T- 1, P- 1)
2. CZIC/CMIC 02: Water remediation and conservation studies (T- 1, P- 1)

**For students opting UG without Industrial Chemistry**

**Generic Electives Courses GEC (Credits: 04 each; T= Theory. P = Practical)**

1. CZIC/CMIC 101: Fundamentals of Chemistry - I (T- 3, P- 1)
2. CZIC/CMIC 201: Fundamentals of Chemistry - II (T- 3, P-1)

DEPARTMENT OF CHEMISTRY

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG

Approved Revised syllabus for

B.Sc. INDUSTRIAL CHEMISTRY by the members of Board of Studies for the  
Session 2022-23

Scheme and Syllabus for B.Sc. Year 1 (Semester I & II)

Courses and Marking Scheme for First-year B.Sc. with  
Industrial Chemistry

Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits	Marks	Sem End	IA	
<b>Certificate in Science</b>									
<b>Discipline Specific Courses – DSC (Core Courses)</b>									
1	I	CZIC/CMI C 101	Fundamentals of Chemistry - I	Theory	3	75	60	15	
		CZIC/CMI C 101	Lab Course - 1	Practical	1	25			
	II	CZIC/CMI C 201	Fundamentals of Chemistry - I	Theory	3	75	60	15	
		CZIC/CMI C 201	Lab Course -2	Practical	1	25			
	<b>Skill Enhancement Courses - SEC</b>								
	I	CZIC/CMI C 01	Good lab practices in Chemistry	Theory	1	25	20	05	
				Practical	1	25			
	II	CZIC/CMI C 02	Water remediation and conservation studies	Theory	1	25	20	05	
Practical				1	25				

**Note: Semester End – 80% and Internal Assessment (IA) – 20%** (Weightage of marks internal examinations will be included as per guidelines of Autonomous Examination Cell)

The revised syllabus for B.Sc. (BioChemistry) Semester I & II is hereby approved for the session  
2022-23

**DEPARTMENT OF CHEMISTRY**

**GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG**

**Approved syllabus for B.Sc. INDUSTRIAL CHEMISTRY by the members of  
Board of Studies for the Session**

**2022-23**

**The syllabus with the paper combinations is as under**

**B.Sc. I: (INDUSTRIAL CHEMISTRY) SEMESTER – I**

<b>CORE COURSE</b>	<b>INDUSTRIAL CHEMISTRY - I</b>
<b>TITLE</b>	<b>Industrial Technology, Metallurgy and Surface Chemistry</b>
<b>PAPER CODE</b>	<b>CZIC/CMIC 101</b>
<b>PRACTICAL</b>	<b>LAB COURSE INDUSTRIAL CHEMISTRY-I</b>
<b>PAPER CODE</b>	<b>CZIC/CMIC 01</b>

The syllabus for B.Sc. Industrial Chemistry SEMESTER-I is hereby approved for the session 2022-23. In case any change or modification is prescribed by Central Board of Studies or Higher Education Department, Govt. of Chhattisgarh with respect to content or distribution of marks for undergraduate syllabi, it will be implemented accordingly.

## B.Sc. INDUSTRIAL CHEMISTRY SEMESTER - I

SESSION: 2022-23

### DIRECTIVES FOR STUDENTS OF B.Sc. INDUSTRIAL CHEMISTRY SEMESTER - I

#### EVALUATION PATTERN

- Theory Paper : 60 marks
- Internal ; 15 marks
- Practical [lab course-I] : 25 marks

#### Question Paper Format and Distribution of Marks for

#### B.Sc. (Industrial chemistry) Semester-I

1. The question paper will be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (**No Multiple choice questions, No 'Fill in the blank' type Questions**)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 60 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	3 x 5 = 15
C (Long Answer)	7 x 5 = 35

6. The scheme of marks for **Assignment** should be as follows :

Question Type	MM 75 (Marks x No. of Questions)
A (Very short Answer)	1 x10 = 10
B (Short Answer)	4x5 = 20
C (Long Answer)	9x5= 45
<b>Total</b>	<b>75</b>



## Syllabus and Marking Scheme for First SEMESTER

### (INDUSTRIAL CHEMISTRY)

SESSION: 2022-23

Paper No.	Title of the Paper	Marks Allotted
		Max
I	<b>Industrial Technology, Metallurgy and Surface Chemistry</b>	60
II	<b>INTERNAL</b>	15
II	<b>LAB COURSE INDUSTRIAL CHEMISTRY - I</b>	25
	<b>TOTAL</b>	<b>100</b>

Lab Course		
Duration: 5 Hrs	<b>TWO EXPERIMENTS</b>	<b>15</b>
Total Marks: 25	<b>VIVA</b>	<b>03</b>
	<b>PROJECT/FIELD WORK</b>	<b>04</b>
	<b>SESSIONAL</b>	<b>03</b>

<b>01</b>	<b>Theory paper</b>	<b>-</b>	<b>60</b>
<b>01</b>	<b>Internal</b>	<b>-</b>	<b>15</b>
<b>01</b>	<b>Practical</b>	<b>-</b>	<b>25</b>
	<b>Total Marks</b>	<b>-</b>	<b>100</b>

## **B.Sc.- I Semester (with INDUSTRIAL CHEMISTRY)**

### **Programme Specific Outcome (PSO):**

**Upon completion of B.Sc. Degree Programme (with Industrial Chemistry), the students would be able**

- PSO1: To have knowledge of history, development, fundamentals and uses of various aspects in Industrial Chemistry.
- PSO2: To explain the concepts and application of chemistry in various industries.
- PSO3: To acquaint with the principles/concepts/pre-requisites/management involved in industries.
- PSO4: To understand the various processes of industries through theory, project and industrial visits.
- PSO5: To get familiarized with the safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments.
- PSO6: To carry out experiments, record the observations and present the inference/results.

**DEPARTMENT OF CHEMISTRY**  
**Govt. V. Y. T. PG Autonomous College, Durg (CG)**

**INDUSTRIAL CHEMISTRY**

**B. Sc. Semester I & II**

**SESSION: 2022-23**

**PAPER- I**

**Industrial Chemistry- I**  
**(Industrial Technology, Metallurgy and**  
**Surface Chemistry)**

**Course Outcome (COs):**

**After completion of the course, the students would be able:**

- CO1: To understand about IUPAC nomenclature of organic compound, petroleum and natural gases.
- CO2: To have a detailed idea about coal - types, properties, distillation and chemicals derived from coal.
- CO3: To know about renewable natural resources.
- CO4: To learn about basics of metallurgical operations and the physico-chemical principles of extraction of important metals.
- CO5: To gain insight into industrial importance of inorganic materials - alumina, silica, zeolites, mica, clay and carbon.

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**INDUSTRIAL CHEMISTRY**  
**Semester wise Syllabus B.Sc. - Industrial Chemistry**  
**SESSION: 2022-2023**

**B.Sc. - Industrial Chemistry FIRST YEAR SYLLABUS**  
**SEMESTER- I**

**Industrial Chemistry I : Industrial Technology, Metallurgy and Surface Chemistry**

**Max. Marks – 60**

**UNIT-1 Metallurgical Operations: 12Hrs.**

[A] Basic metallurgical operations: pulverization, calcination, roasting and refining

[B] Physico-chemical principles of extraction of Lead, Silver, Aluminium, Magnesium, Zinc, Chromium

**UNIT-2 Inorganic materials of industrial importance: 10Hrs.**

Their availability, forms, structure and modification. Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.

**UNIT-3 Chemical Technology - 1 12Hrs.**

[A] **Distillation**-Introduction: Batch & continuous distillation, separation of azeotropes, plate columns and packed columns.

[B] **Absorption** - Introduction, Equipments - Packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contractors.

**UNIT-4 Chemical Technology – II 14Hrs.**

[A] **Evaporation**-Introduction, Equipments short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, climbing film (Upward flow) evaporators, wiped (agitated) film evaporators.

[B] **Filtration**- Introduction, filter media and filter aids, equipments – plate and frame, filter Press, notch filter, rotatory drum filter, sparkler filter, candle filter, bag filter, and centrifuge.

[C] **Drying** – Introduction, free moisture, bound moisture, drying curve, Equipments, tray dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

**UNIT-5 Surface Chemistry and Interfacial Phenomena 12Hrs.**

**Emulsions:** Types, Preparation

**Gels:** Classifications, preparations, properties, Applications

**Micelles:** Types of micelles, structure, solubilization, uses

**Aerosols:** Classification, properties

**Surfactants:** Types, Detergent effect

**Adsorption:** Types, Adsorption Isotherm

**Suggested Readings:**

1. Theory of Metallurgical Processes, Volsky, A. & Sergievskaya F.
2. Text-Book of Metallurgy, Baiky, A. R.
3. Inorganic Chemistry, Puri and Sharma.
4. Introduction Chemical Engineering, W.L. Badger, J.J. Banchemo, McGraw Hill.
5. Unit Operations of Chemical Engineering, Vol. I, P. Chattopadhyaya, Khanna Publishers, Delhi
6. Surface Chemistry, J.J. Bikermann, Academic Press.
7. Physical Chemistry of surfaces by A. W. Admson.
8. A Text Book of Engineering Chemistry, S. S. Dara, S Chand & Co. Ltd, New Delhi.

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**INDUSTRIAL CHEMISTRY**  
**SESSION: 2022-2023**  
**B.Sc. - Industrial Chemistry FIRST YEAR SYLLABUS**  
**SEMESTER- I**  
**INDUSTRIAL CHEMISTRY PRACTICAL**

**Duration of Examination: 04Hrs.**

**Description of marks**

	Marks	Max. Marks	Passing Marks
Experiment	15	25	09
Viva	05		
Sessional	05		
Total	25		

**EXPERIMENTS TO BE PERFORMED**

1. Acquaintance with safety measures in a laboratory. Hazards of chemicals
2. Preparation of standard solutions, primary and secondary standards, Determination of  $H_2SO_4$  and  $H_3PO_4$  in a mixture.
3. Calibration of Thermometers
4. Preparation of buffers
5. Chromatography –  
column, paper, thin layer
6. Preparation of colloids.

**Note:** Any two experiments have to be carried out by the students in the Examination. A Minimum of 60% of the experiments has to be conducted by the students

## B.Sc. (INDUSTRIAL CHEMISTRY)

SESSION: 2022-23

### Skill Enhancement Course – 1

#### ICHS 01: GOOD LAB PRACTICES IN CHEMISTRY THEORY AND PRACTICAL

[Credits -02, 30 hrs.]

#### Course outcome:

*After completing the course students will be able to:*

- CO1: Understand general laboratory practices
- CO2: Prepare solutions
- CO3: Handle glasswares and chemicals
- CO4: Explore various research issues and their solutions
- CO5: Apply practical skills in chemistry

- A. Technique and uses of handling glasswares; calibrations, knowledge about common toxic chemicals and safety measures in their handling.
- B. Common calculations in chemistry laboratories. Understanding the details on the label of reagent bottles.  
Inorganic and organic reagents (Baeyer's reagent, nessler's reagent, fehling solution A and B, shiff reagents, Tollen's reagent, Mollish's reagent, Neutral ferric chloride, Nitrating Mixture, Aqua regia, Dimethyl glyoxime, H<sub>2</sub>S gas); chemicals such as acids, bases, indicators, etc. used in chemistry lab for qualitative analysis.
- C. Molarity and normality of common acids and bases. Preparation of solutions – solid and liquids, Molar, molal and normal solutions, Dilutions. Percentage solutions.
- D. **Qualitative test of CO<sub>3</sub><sup>2-</sup>, CH<sub>3</sub>COO<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, Cu<sub>2</sub><sup>+</sup>, Fe<sup>3+</sup>, Ni<sup>2+</sup>, Ba<sup>2+</sup>, Mg<sup>2+</sup>.**  
Qualitative elemental analysis for Nitrogen, Sulphur, Halogen in organic compounds.

### **Reference Books**

1. Seiler, J.P. (2005). Good Laboratory Practices: the why and how. Springer-Verlag Berlin and Heidelberg GmbH & Co. K; 2nd ed.
2. Garner, W.Y., Barge M.S., Ussary. P.J. (1992). Good Laboratory Practice Standards: Application for field and Laboratory studies. Wiley VCH.



**DEPARTMENT OF CHEMISTRY**

**GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG**

**Approved syllabus for B.Sc. INDUSTRIAL CHEMISTRY by the members of  
Board of Studies for the Session**

**2022-23**

**The syllabus with the paper combinations is as under**

**B.Sc. I: (INDUSTRIAL CHEMISTRY) SEMESTER – II**

<b>CORE COURSE</b>	<b>INDUSTRIAL CHEMISTRY - II</b>
<b>TITLE</b>	<b>INDUSTRIAL OPERATIONS, FUELS AND ASPECTS OF PHYSICAL CHEMISTRY</b>
<b>PAPER CODE</b>	<b>[CZIC &amp; CMIC: 201]</b>
<b>PRACTICAL</b>	<b>LAB COURSE INDUSTRIAL CHEMISTRY-II</b>
<b>PAPER CODE</b>	<b>CZIC &amp; CMIC 02</b>

**The syllabus for B.Sc. Industrial Chemistry SEMESTER-II is hereby approved for the session 2022-23. In case any change or modification is prescribed by Central Board of Studies or Higher Education Department, Govt. of Chhattisgarh with respect to content or distribution of marks for undergraduate syllabi, it will be implemented accordingly.**

## B.Sc. – INDUSTRIAL CHEMISTRY SEMESTER - II

2022-23

### DIRECTIVES FOR STUDENTS OF B.Sc. – INDUSTRIAL CHEMISTRY SEMESTER - II

#### EVALUATION PATTERN

- Theory Paper : 60 marks
- Internal ; 15 marks
- Practical [lab course-I] : 25 marks

#### Question Paper Format and Distribution of Marks for

#### B.Sc.- (INDUSTRIAL CHEMISTRY) Semester-II

1. The question paper will be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (No Multiple choice questions, No 'Fill in the blank' type Questions)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 60 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	3 x 5 = 15
C (Long Answer)	7 x 5 = 35

6. The internal examinations will be held for core course.
7. The scheme of marks for **Assignment** should be as follows :

Question Type	MM 75 (Marks x No. of Questions)
A (Very short Answer)	1 x10 = 10
B (Short Answer)	4x5 = 20
C (Long Answer)	9x5= 45
<b>Total</b>	<b>75</b>

**Syllabus and Marking Scheme for SECOND SEMESTER (INDUSTRIAL CHEMISTRY)**

**SESSION: 2022-23**

<b>PAPER NO.</b>	<b>TITLE OF THE PAPER</b>	<b>WEIGHTAGE</b>
<b>I</b>	<b>INDUSTRIAL OPERATIONS, FUELS AND ASPECTS OF PHYSICAL CHEMISTRY</b>	<b>60</b>
<b>II</b>	<b>INTERNAL</b>	<b>15</b>
<b>II</b>	<b>LAB COURSE INDUSTRIAL CHEMISTRY - II</b>	<b>25</b>
	<b>TOTAL</b>	<b>100</b>

<b>Lab Course</b>		
<b>Duration: 5 Hrs</b>	<b>TWO EXPERIMENTS</b>	<b>15</b>
<b>Total Marks: 25</b>	<b>VIVA</b>	<b>03</b>
	<b>PROJECT/FIELD WORK</b>	<b>04</b>
	<b>SESSIONAL</b>	<b>03</b>

<b>01</b>	<b>Theory paper</b>	<b>-</b>	<b>60</b>
<b>01</b>	<b>Internal</b>	<b>-</b>	<b>15</b>
<b>01</b>	<b>Practical</b>	<b>-</b>	<b>25</b>
	<b>Total Marks</b>	<b>-</b>	<b>100</b>

**DEPARTMENT OF CHEMISTRY**  
**Govt. V. Y. T. PG Autonomous College, Durg (CG)**  
**INDUSTRIAL CHEMISTRY**  
**SESSION: 2022-2023**

**Semester wise Syllabus B.Sc. Industrial Chemistry**  
**FIRST YEAR SYLLABUS**  
**SEMESTER- II**

**Industrial Chemistry II: Industrial Operations, Fuels and Aspects of Physical Chemistry**

**Maximum Marks – 60**

**UNIT-1 Fuel Chemistry: 12Hrs.**

[A] **Fuel** - Types of fuels, advantages and disadvantages, combustion of fuels, calorific value

[B] **Petroleum:** Composition of crude petroleum, refining and petroleum products and their applications, fractional distillation of crude oil, natural gas, non petroleum fuels- CNG, LNG, biogas, fuels from biomass and wastes. Cracking, reforming, hydro forming, isomerisation

**UNIT-2 12Hrs.**

[A] **Coal:** Types, structure, properties, distillation of coal, chemicals derived from coal

[B] **Boilers** - Types of boilers and their functioning

**UNIT-3 10Hrs.**

[A] **Fluid Flow:** Fans, blowers, compressors, vacuum pumps, ejector.

[B] **Pumps:** Reciprocating pumps, Gear pumps, centrifugal Pumps.

**UNIT-4 14Hrs.**

[A] **Catalysis:** Introduction, Types, Homogeneous and Heterogeneous, Basic principles, mechanisms, factors affecting the performance.

[B] **Enzyme catalysis** - Rate model, industrially important reactions

**UNIT-5 Energy Balance: Hess's law, Heat capacity of pure gases and gaseous mixture. Enthalpy changes 12Hrs.**

**Suggested Readings:**

1. Introduction of petroleum chemicals, H. Steiner, Pergamen Press.
2. Industrial Chemistry, O. P. Vermani, A. K. Narula, Galgotia Publications Pvt. Ltd., New Delhi.
3. Chemical Process Industries, Vol. I & II, S.C. Bhatia, CBS Publishers, New-Delhi.
4. Engineering Chemistry, P.C. Jain , M. Jain, Dhanpat Rai & Sons Delhi
5. Engineering Chemistry, R. Gopalan, D. Venkappayya. S. Nagarajan, Vikas Publication, New Delhi
6. Engineering Chemistry, B. K. Sharma , Goel Publishing House , Meerut
7. Industrial Chemistry, B. K. Sharma , Goel Publishing House , Meerut
8. Physical Chemistry, Puri & Sharma , Goel Publishing House , Meerut

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**SESSION: 2022-2023**  
**B.Sc. - Industrial Chemistry FIRST YEAR SYLLABUS**  
**SEMESTER- II**  
**INDUSTRIAL CHEMISTRY PRACTICAL**

**Duration of Examination: 05Hrs.**

**Description of marks**

	Marks	Max. Marks	Passing Marks
Experiment	15	25	09
Viva	05		
Sessional	05		
Total	25		

**EXPERIMENTS TO BE PERFORMED:**

1. Simple laboratory techniques crystallization, Fractional Crystallization, Distillation, Fractional Distillation, Boiling Point Diagram.
2. Extraction Processes- Phase diagram, partition coefficient.
3. Depression and elevation in B.P. /M.P. of solids and liquids.
4. Ore analysis dolomite, limestone- calcite, Analysis of alloys such as cupro-nickel.
5. Determination of Physical constants: refractive-index, surface tension, effect of surfactants, on surface tension, viscosity, fluids, polymer solutions effect of additives on viscosity, optical rotation.
6. Study, experiments/ demonstration experiments.
7. Detection of food adulteration.

**Note:** Any two experiments have to be carried out by the students in the Examination. A Minimum of 60% of the experiments has to be conducted by the students.

**B.Sc. (INDUSTRIAL CHEMISTRY)**

**SESSION: 2022-23**

**Skill Enhancement Course – 2**

**ICHS 02: WATER REMEDIATION AND CONSERVATION STUDIES**

**THEORY & PRACTICAL [Credits -02, 30 hrs.]**

**Course outcome:**

*After completing the course students will be able to:*

CO1: Understand about Sources and Effect Water Pollution

CO2: Learn about various control technique

**Water Pollution**

Sources of water pollutants, pollutants, Industrial and human contribution, WHO recommendation about potable water, current scenario of drinking water quality.

**Remediation Techniques**

Remediation, techniques involved such as adsorption, coagulation-filtration, Nalgonada techniques, reverse osmosis, activated charcoal detoxification, mechanisms of detoxification, bio-remediation, need of green chemistry, future scope.

**Water Conservation**

Introduction to water conservation and erosion of soil, forms of water erosion, factors affecting water erosion, types of water erosion, mechanics of water erosion control,

**PRACTICALS**

Water analysis ( pH, Conductivity, hardness, Acidity, Alkalinity etc.)

**Case study/Project**

Case study/Project on water pollution, water conservation and water quality.

**Recommended Books/References:**

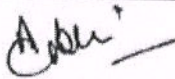

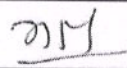
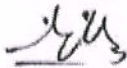
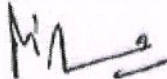
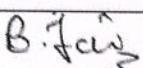

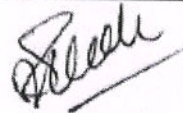

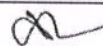
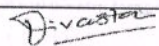

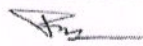
1. CITTENDEN J. C. , TRUSSELL J. R., HAND D. W., HOWE K. J., TCHOBANOGLIOUS G. , Water treatment: Principles and Design MWH publication.
2. DE A. K. Environmental Chemistry, Wiley Eastern
3. CLARSON D., DARA S. S. A text book of Environmental chemistry and pollution control, S Chand Co. Soil and water analytical method
4. EDZWALD J., Water Quality & Treatment: A Handbook on Drinking Water (Water Resources and Environmental Engineering Series)



The syllabus of the Skill Enhancement Courses for B.Sc. (Industrial Chemistry) Semester I & II is hereby approved for the session 2022-23

**Syllabus approved by Board of study**

**Members (Board of study)**

S.No.	Category	Nominee Member	Signature
01	Head Department of Chemistry	Dr. Anupama Asthana Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
02	Subject Expert	Dr. Sushil Chandra Tiwari Principal, Govt. Girls College Durg (C.G.)	
03	Subject Expert	Dr. Hemlata Mohobey Former Principal Rajnandgaon	
04	Subject Expert	Dr. Anju Jha Govt. NGP Autonomous College, Raipur (C.G.)	
05	University Nominee	Dr. Arun Mishra Govt. NGP Autonomous College, Raipur (C.G.)	
06	Representative (Industries)	Mr. Dilip Singh Street - 33, Smriti Nagar	
07	Alumni	Dr. Bhavana Jain	
08	Subject Expert (Biochemistry)	Dr. Mrigendra Diwedi Govt. NGP Autonomous College, Raipur (C.G.)	
08	Professor (other Department)	Dr. S. D. Deshmukh (Head Department of Geology) Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
09	Member	Dr. Alka Tiwari	
10	Member	Dr. S. Chatterjee	
11	Member	Dr. Anil Kashyap	
12	Member	Dr. Manju Kaushal	
13	Member	Dr. Ajaya Singh	
14	Member	Dr. Nutan Rathod	
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17	Member	Dr. Sunitha B. Mathew	
18	Member	Dr. Anupama Kashyap	
19	Member	Dr. Prerna Kathane	
20	Member	Dr. Sunita Sanwaria	