

**Subject Code: 01CH0204**

**Subject Name: Chemical Technology-I**

**B.Tech. Year - II**

**Objective:** To get a first hand understanding of the processes involved in chemical industries for the manufacturing of various Organic & Inorganic materials at a mass scale.

**Credits Earned:** 5 Credits

**Course Outcomes:** After completion of this course, student will be able to:

1. To build a basic knowledge of the process carried out in chemical industry.
2. To review the practical importance and relevance of process takes place in chemical industry.
3. To be able to utilize the technological methods in problem solving in process plant.
4. To study about the salient features of the process.
5. To build a bridge between theoretical and practical concept used in industry.

**Pre-requisite of course:** Basic concepts of Chemistry.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE	Internal (I)	Viva (V)	Term work (TW)	
4	0	2	5	50	20	30	25	25	150

**Contents:**

Unit	Topics	Contact Hours
1	<p><b>Chemical Processing Fundamentals &amp; Water Treatment</b></p> <p>An overview of Indian Chemical Industries, Basic Chemical data, Batch &amp; Continuous processes, Flow Charts</p> <p>Water Treatment Processes: Demineralization, Deionization, Desalination, Reverse Osmosis</p>	6
2	<p><b>Sulphur, Sulphuric Acid &amp; Fertilizers Industry</b></p> <p>Sulphur and its various available sources, Manufacture of Sulphuric Acid by DCDA process, Various Manufacturing technologies, Engineering Problems.</p> <p>Nitrogen Industries: Synthetic Ammonia, Nitric Acid, Urea, Di-ammonium Phosphate, Nitrogenous Fertilizers.</p> <p>Phosphorous industries: Manufacturing of elemental phosphorous, Phosphoric Acid, Super phosphate and Triple super phosphate.</p> <p>Potassium industries: Potassium chloride and potassium sulphate.</p>	12
3	<p><b>Chlor-Alkali Industry</b></p> <p>Electrochemistry of Brine Electrolysis, Manufacture of Sodium Chloride, Soda Ash, Sodium bi-carbonate, Chlorine and Caustic Soda by Membrane cell process. Manufacturing of Soda Ash by Solvay process &amp; Modified Solvay process.</p>	6
4	<p><b>Soaps &amp; Detergents</b></p> <p>Raw materials for soap, detergents and Reaction Chemistry, process for manufacture of fatty acids, soaps and glycerine, Detergents Classification, Builders and additives, Manufacture of detergents like alkyl benzene sulphonate, Sodium alkane sulphonate.</p>	6
5	<p><b>Cement &amp; Glass</b></p> <p>Introduction to Ceramic industries, Raw materials for cement, types of cement, properties of cement, Manufacturing of Cement.</p> <p>Types of glass, Raw materials and manufacture of glass.</p>	6

6	<b>Pulp &amp; Paper Industries</b> Introduction to Paper industries, Kraft Process, Paper making process.	3
7	<b>Industrial Gases &amp; Carbon Compounds</b> Gases: Carbon dioxide, Nitrogen, Oxygen, Hydrogen, Helium, acetylene, sulphur dioxide, carbon monoxide, nitrogen oxide. Carbon compounds: Carbon Black, Activated Carbon, Graphite, Industrial Diamonds.	7
	<b>Total Hours</b>	<b>46</b>

### References:

1. "Shreve's Chemical Process Industries", George T. Austin, McGraw Hill Publication, 5<sup>th</sup> edition
2. "DRYDENS outlines of chemical technology for the 21st century", M Gopalarao & Marshal Sitting, pub East-West Press, 3<sup>rd</sup> edition
3. "General chemical technology", Shukla and Pandey.

### Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	45%	20%	15%	5%	-

### List of Experiments:

1. To prepare hydrated lime from given calcium carbonate powder.
2. To prepare Caustic soda by chemical method.
3. To prepare soap in the laboratory and carry out its cost analysis.
4. To determine saponification value of Oil Sample.
5. To determine the acid value of the given sample of Oil.

6. To prepare m-Nitrobenzene from Nitrobenzene.
7. To Prepare Ammonia from Ammonium salt with a strong base.
8. To study operations of Water Softener.

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Online Web Resources:**

1. <http://nptel.ac.in/courses/103107081/>
2. <http://nptel.ac.in/courses/103106109/>
3. <https://ocw.mit.edu/courses/audio-video-courses/#chemical-engineering>