

<b>Subject: Chemistry</b>		
<b>Programme/Class:</b> B.Sc	<b>Year: First</b>	<b>Semester: I/II</b>
<b>Course Code:</b>	<b>Course Title: Chemical Technology and Society</b>	
<b>Objectives:</b>		
<ul style="list-style-type: none"> <li>This course will help students to connect chemical technology for societal benefits. It would fulfil the gap between academia and industries.</li> </ul>		
<b>Learning Outcomes:</b>		
<b>By the end of the course, the students will be able to:</b>		
<ul style="list-style-type: none"> <li>Understand the use of basic chemistry to chemical engineering</li> <li>Learn and use various chemical technology used in industries</li> <li>Develop scientific solutions for societal needs</li> </ul>		
<b>Credits: 4</b>		<b>Minor Elective</b>
<b>Max. Marks: 75+25</b>		<b>Min. Passing Marks:</b>
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0.</b>		
Unit	Topics	No. of Lectures
<b>I</b>	<b>Chemical Technology</b>  Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology	<b>15</b>
<b>II</b>	<b>Society</b> Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy as a means to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants).	<b>15</b>
<b>III</b>	<b>Sources of energy</b> Coal, petrol and natural gas. Nuclear fusion /	<b>20</b>

	<p>fission, solar, hydrogen, geothermal, tidal and hydel.</p> <p>Properties of Polymers (Physical, thermal, Flow &amp; Mechanical Properties)</p> <p>Brief introduction to preparation, structure, properties and application of the following polymers:</p> <p>polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers.</p> <p>Phenol formaldehyde resins (Bakelite, Novolac), polyurethanes, silicone polymers, polydienes,</p> <p>Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide), polypyrrole, polythiophene].</p>	
<b>IV</b>	<p><b>Natural Polymers</b> Structure, properties and applications of shellac, lignin, starch, nucleic acids and proteins.</p> <p><b>Basics of drug synthesis</b> Application of genetic engineering</p>	<b>10</b>
<p><b>References:</b></p> <p>1. Hill, J.W.; McCreary, T.W.; Kolb, D.K. (2013), <b>Chemistry for changing times</b>, Pearson.</p> <p><b>Teaching Learning Process:</b></p> <ul style="list-style-type: none"> <li>· Lectures using teaching aid (chalk/power point/videos) <ul style="list-style-type: none"> <li>· Group discussion</li> <li>· Presentations</li> </ul> </li> <li>· Advise to students to prepare a report on technological applications <ul style="list-style-type: none"> <li>· Visit to nearby industries</li> </ul> </li> <li>· Invite people of industries for interaction with students</li> </ul> <p><b>Assessment Methods:</b></p> <ul style="list-style-type: none"> <li>· Graded assignments</li> <li>· Conventional class tests</li> <li>· Class seminars by students on course topics with a view to strengthening the content through <ul style="list-style-type: none"> <li>· width and depth</li> <li>· Quizzes</li> </ul> </li> <li>· End semester university examination.</li> </ul>		



<b>Keywords:</b>	
Chemical Technology; Society; Energy; Polymer; Pollutants	
This course can be opted as an minor elective by the students of following subjects: Open for all	
<b>Suggested Continuous Evaluation Methods:</b>	
Continuous Internal Evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows	
Internal Assessment	Marks
Class Interaction	05
Quiz	10
Seminar	10
Course prerequisites: To study this course, a student must have 10+2	

Submitted By: डॉ० अभिमन्यु यादव डॉ० अमित कुमार शर्मा व डॉ० अरविन्द कुमार पाण्डेय



Dr. Aravind Kumar  
28/10/2021



<b>Programme/Class:</b> B.Sc	<b>Year: First</b>	<b>Semester: I/II</b>
<b>Subject: Chemistry</b>		
<b>Course Code:</b>	<b>Course Title: Chemical Technology and Society</b>	
<b>Objectives:</b>		
<ul style="list-style-type: none"> <li>This course will help students to connect chemical technology for societal benefits. It would fulfil the gap between academia and industries.</li> </ul>		
<b>Learning Outcomes:</b>		
<b>By the end of the course, the students will be able to:</b>		
<ul style="list-style-type: none"> <li>Understand the use of basic chemistry to chemical engineering</li> <li>Learn and use various chemical technology used in industries</li> <li>Develop scientific solutions for societal needs</li> </ul>		
<b>Credits: 4</b>	<b>Minor Elective</b>	
<b>Max. Marks: 75+25</b>	<b>Min. Passing Marks:</b>	
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0 .</b>		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>I</b>	<b>Chemical Technology</b>  Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology	<b>15</b>
<b>II</b>	<b>Society</b> Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy as a means to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants).	<b>15</b>
<b>III</b>	<b>Sources of energy</b>	<b>20</b>

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	<p>Coal, petrol and natural gas. Nuclear fusion / fission, solar, hydrogen, geothermal, tidal and hydel.</p> <p>Properties of Polymers (Physical, thermal, Flow &amp; Mechanical Properties)</p> <p>Brief introduction to preparation, structure, properties and application of the following polymers:</p> <p>polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers.</p> <p>Phenol formaldehyde resins (Bakelite, Novolac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide), polypyrrole, polythiophene].</p>	
IV	<p><b>Natural Polymers</b> Structure, properties and applications of shellac, lignin, starch, nucleic acids and proteins.</p> <p><b>Basics of drug synthesis</b> Application of genetic engineering</p>	10
<p><b>References:</b> 1. Hill, J.W.; McCreary, T.W.; Kolb, D.K. (2013), <b>Chemistry for changing times</b>, Pearson.</p> <p><b>Teaching Learning Process:</b></p> <ul style="list-style-type: none"> <li>• Lectures using teaching aid (chalk/power point/videos)</li> <li>• Group discussion</li> <li>• Presentations</li> <li>• Advise to students to prepare a report on technological applications</li> <li>• Visit to nearby industries</li> <li>• Invite people of industries for interaction with students</li> </ul> <p><b>Assessment Methods:</b></p> <ul style="list-style-type: none"> <li>• Graded assignments</li> <li>• Conventional class tests</li> </ul>		

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- Class seminars by students on course topics with a view to strengthening the content through
- width and depth
- Quizzes
- End semester university examination.

**Keywords:**

Chemical Technology; Society; Energy; Polymer; Pollutants

This course can be opted as an minor elective by the students of following subjects: Open for all

**Suggested Continuous Evaluation Methods:**

Continuous Internal Evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows

Internal Assessment	Marks
Class Interaction	05
Quiz	10
Seminar	10

Course prerequisites: To study this course, a student must have 10+2

Submitted By: डॉ० अभिमन्यु यादव डॉ० अमित कुमार शर्मा व डॉ० अरविन्द कुमार पाण्डेय

Saurabh





<b>Programme/Class:</b> B.Sc	<b>Year: First</b>	<b>Semester:</b> I/II
<b>Subject: Chemistry</b>		
<b>Course Code:</b>	<b>Course Title: Inorganic Materials of Industrial Importance</b>	
<b>Objectives:</b> <ul style="list-style-type: none"> <li>This course will help students for use of inorganic materials like Glass, Battery, catalyst, Alloy &amp; its benefits. It would fulfil the gap between academia and industries.</li> </ul> <b>Learning Outcomes:</b> <b>By the end of the course, the students will be able to:</b> <ul style="list-style-type: none"> <li>Understand the use of Inorganic materials in daily life</li> <li>Learn and use various Materials used in industries</li> <li>Develop scientific solutions for societal needs</li> </ul>		
<b>Credits: 4</b>	<b>Minor Elective</b>	
<b>Max. Marks: 75+25</b>	<b>Min. Passing Marks:</b>	
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0 .</b>		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>I</b>	<b>Silicate Industry</b> <b>A. Glass:</b> Glassy state & its properties, classification, manufacturing & processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armored glass, safety glass, borosilicate glass, fluorosilicate, colored glass, photosensitive glass. <b>B. Ceramics:</b> Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes carbon nanotubes and carbon fibers. <b>C. Cements:</b> Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.	<b>16</b>
<b>II</b>	<b>Fertilizers:</b> Different types of fertilizers. Manufacture of the following fertilizers: Urea,	<b>10</b>

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	ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.	
III	<b>Batteries:</b> Primary and secondary batteries, battery components and their role, Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.	08
IV	<b>Alloys:</b> Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.	10
V	<b>Catalysis:</b> General principles and properties of catalysts, homogenous catalysis (catalytic steps and examples) and heterogenous catalysis (catalytic steps and examples) and their industrial applications, Deactivation or regeneration of catalysts. Phase transfer catalysts, application of zeolites as catalysts.	08
VI	<b>Chemical explosives:</b> Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.	08

**Reference Books:**

- E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
- R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
- W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
- P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
- R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
- B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut

**Teaching Learning Process:**

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- Lectures using teaching aid (chalk/power point/videos)
- Group discussion
- Presentations
- Advise to students to prepare a report on technological applications
- Visit to nearby industries
- Invite people of industries for interaction with students

**Assessment Methods:**

- Graded assignments
- Conventional class tests
- Class seminars by students on course topics with a view to strengthening the content through
  - width and depth
  - Quizzes
  - End semester university examination.

**Keywords:**

Glass, Ceramics, Cement, Alloy, Batteries, Fertilizers, Catalysis, Explosive

This course can be opted as an minor elective by the students of following subjects: Open for all

**Suggested Continuous Evaluation Methods:**

Continuous Internal Evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows

Internal Assessment	Marks
Class Interaction	05
Quiz	10
Seminar	10

Course prerequisites: To study this course, a student must have 10+2

Submitted by: डॉ० धीरेन्द्र कुमार, डॉ० ओम प्रकाश व श्री निखिल कुमार सिंह

Shaurabh





<b>Programme/Class: B.Sc.</b>	<b>Year:</b>	<b>Semester:</b>
<b>Subject: Chemistry</b>		
<b>Course Code:</b>	<b>Course Title: Basic aspects of Chemistry</b>	
<b>Objectives:</b>		
<ul style="list-style-type: none"> <li>• This course has been exclusively designed for the sophomores to get fundamental motive of chemistry including molecules and materials, briefing of chemical reactions, laboratory techniques in Chemistry and Chemistry in service of mankind.</li> <li>• The lectures of last unit further explore the importance of Chemistry with some natural and anthropogenic materials which are useful in day to day life of human being.</li> <li>• Students shall achieve a basic as well as edge cutting information of the branches of chemistry.</li> </ul>		
<b>Learning Outcomes:</b>		
By the end of the course, the students will be able to:		
<ul style="list-style-type: none"> <li>• Understand the use of basic chemistry to industrial chemistry.</li> <li>• Learning and use of various chemical technologies used in industries.</li> <li>• Developed scientific solutions for societal needs.</li> </ul>		
<b>Credits: 4</b>	<b>Minor Elective</b>	
<b>Max. Marks: 75 (Theory) + 25 (Practical)</b>	<b>Min. Passing Marks:</b>	
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 3-0-2.</b>		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>I</b>	<b>i. Brief history of the Chemistry.</b> <b>ii. Molecules and Materials:</b> Electronic basis of union of atoms leading to formation of molecules. Modes of atomic union (Ionic and Covalent bonding and their subsequent partial transformation into each other), Types of binding forces. Molecular association leading to formation of materials.	<b>10</b>
<b>II</b>	<b>Chemical reactions:</b> Thermodynamic basis of chemical changes. Enthalpy, Entropy and free energy change during a chemical change. Types of chemical reactions with special reference to redox reactions. The concept of oxidation number, Reducing and oxidizing agents.	<b>10</b>
<b>III</b>	<b>Laboratory techniques in Chemistry:</b> Distillation, fractional distillation, Reflux, Recrystallization, melting point as purity criterion of a crystalline substance. Determination of melting point of a compound, Chromatography and its few applications.	<b>10</b>

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IV	<p><b>Chemistry in service of mankind:</b></p> <p><b>i. Reagents and catalysts:</b> Fehling's, Tollen's, Benedict's, and Nessler's reagents and their applications.</p> <p><b>ii. Natural and man-made catalysts:</b></p> <p>a. Natural catalysts: Enzymes and their types, Co-enzymes, Co-factor and Prosthetic group. Denaturation of enzymes.</p> <p>b. Man-made catalysts: Raney nickel, vanadium peroxide.</p> <p><b>iii. Polymers:</b></p> <p>a. Natural polymers: Carbohydrates, Proteins and natural rubber.</p> <p>b. Synthetic polymers: Synthetic rubber, Nylon, Polyethene, Polytetrafluoroethylene, Polyester, Rayon.</p> <p><b>iv. Metals and Metallurgy:</b> Role of metals in our life with special mention of Iron, Recovery of Iron from its ores, Stainless Steel, Rusting of Iron and its prevention.</p>	20
V	<p><b>Practical:</b> Distillation, fractional distillation, Reflux, Recrystallization. Determination of melting point of a compound, Paper Chromatography.</p>	10

**References:**

1. William R. Robinson, Jerome D. Odom and Henry F. Holtzclaw, Jr., 10th Edition 1998.
2. A.I.T.B.S. Publishers & Distributors (Regd.) J-5/6 Krishna Nagar, Delhi- 110051 (INDIA).
3. Darrell D. Ebbing and Mark S. Wrighton, 5th Edition 1998, A.I.T.B.S. Publishers & Distributors (Regd.) J-5/6 Krishna Nagar, Delhi-110051 (INDIA).
4. Abraham Mazur and Benzamin Harrow, W.B. Sannders Company, Philadelphia 1971, Toppan Company, Ltd. Tokyo, Japan.

**Teaching Learning Process:**

- Lectures using teaching aid (chalk/power point/videos)
- Group discussion
- Presentations
- Advise to students to prepare a report on technological applications
- Visit to nearby industries
- Invite people of industries for interaction with students

**Assessment Methods:**

- Graded assignments
- Conventional class tests
- Class seminars by students on course topics with a view to strengthening the content through

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- width and depth
- Quizzes
- End semester university examination.

**Keywords:**

Atoms, Molecules, Bonding, Chemical thermodynamics and reactions, Bio-molecules and Natural products, Synthetic materials.

This course can be opted as an minor elective by the students of following subjects: Open for all

**Suggested Continuous Evaluation Methods:**

Continuous Internal Evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows

Internal Assessment	Marks
Practical	20
Viva	05

Course prerequisites: To study this course, a student must have 10+2.

Submitted by: डॉ० विनोद कुमार यादव व डॉ० अभिमन्यु यादव

Kaurabh







<b>Programme/Class:</b> B.Sc.	<b>Year:</b>	<b>Semester:</b>
<b>Subject: Chemistry</b>		
<b>Course Code:</b>	<b>Course Title: Basics of Industrial Chemistry</b>	
<b>Objectives:</b>		
<ul style="list-style-type: none"> <li>This course has been exclusively designed for the sophomores to achieve motive of chemistry used for industry civilization.</li> <li>Students shall achieve a basic as well as edge cutting knowledge of the industrial chemistry.</li> </ul>		
<b>Learning Outcomes:</b>		
By the end of the course, the students will be able to:		
<ul style="list-style-type: none"> <li>Understand the use of basic chemistry to industrial chemistry.</li> <li>Learning and use of various chemical technologies used in industries.</li> <li>Developed scientific solutions for societal needs.</li> </ul>		
<b>Credits: 4</b>	<b>Minor Elective</b>	
<b>Max. Marks: 50 (Theory) + 25 (Practical) + 25 (Industrial visit)</b>	<b>Min. Passing Marks: 40</b>	
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 3-0-2.</b>		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>I</b>	<b>i. Brief history and developments of the industrial Chemistry.</b> <b>ii. Industrial Gases:</b> N <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> , CO <sub>2</sub> - manufacture, uses and economics. <b>Petroleum Refining Process:</b> Introduction, distillation, octane number, additives, hydro-treating, cracking, reforming, alkylation and polymerization, separation of natural gas (methane production).	<b>15</b>
<b>II</b>	<b>Pesticides:</b> Introduction to pesticides, manufacture and use of some insecticides such as DDT, organophosphorus insecticides; herbicides- such as heterocyclic nitrogen based organic compounds. <b>Fertilizers:</b> History and economics of fertilizers, Fertilizer materials, direct application fertilizers, mixed fertilizers (nitrogen, phosphorus and potassium sources, ammoniation) liquid vs solids, and controlled release fertilizers.	<b>10</b>
<b>III</b>	<b>Cosmetics and Perfumes:</b> Definition and characteristics, creams, Hairsprays, Hairdyes, Toothpowder and tooth paste, talcum powder, face powder, lipsticks, nail polish, shampoos sun-tan lotions; perfumes and essential oils. <b>Surfactants, Soaps and Detergents:</b> Introduction, cationic and anionic surfactants, straight-chain	<b>10</b>

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	detergent intermediates linear alcohol sulphates (AS), linear alcohol ethoxy sulphates (AES) and linear alkyl benzene sulfonates (LAS), Amphoteric and detergent builders.	
IV	<b>Pulp and Paper Industry:</b> Manufacture of pulp and paper and their uses. <b>Cane Sugar Industry:</b> Manufacture of white crystalline sugar, extraction of the juice, clarification (lime defaction process, by sulphate ion and by carbonation), evaporation, crystallization and refining of sugar, uses of bagasse.	10
V	<b>Practical:</b> 1. Simple laboratory techniques: Distillation, fractional distillation, Reflux, Recrystallization. 2. Determination of melting point of a compound, Paper Chromatography. 3. Preparation of standard solutions: Determine the exact strength of given solution of NaOH or sodium thiosulphate solution. 4. Ore analysis: Estimation of copper in copper ores and in copper sulphate volumetrically. 5. Preparation of dyes, detergents and soaps.	10
VI	<b>Industrial visit:</b> Taking out sophomores to have exposures of industries established in nearby suitable places.	5

**References:**

1. Dr. Ram Prasad: Petroleum refining technology.
2. M. B. Green, G. S. Hartley West: Chemicals for Crop Protection and Pest Management, Pergamon.
3. Kent-Riegels: Industries Chemistry.
4. R.W. Thomas and P. Farago: Industrial Chemistry (HEB).
5. K. Bhogavathi Somdavi: Applied Chemistry, MJP Publications, 2006.
6. C.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut, 2011

**Teaching Learning Process:**

- Lectures using teaching aid (chalk/power point/videos)
- Group discussion
- Presentations
- Advise to students to prepare a report on technological applications
- Visit to nearby industries
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**Assessment Methods:**

- Graded assignments
- Conventional class tests

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- Class seminars by students on course topics with a view to strengthening the content through
- width and depth
- Quizzes
- End semester university examination.

**Keywords:**

Analytical chemistry; Environmental Chemistry, Chromatography, Preservation Refrigeration, Radiations.

This course can be opted as an minor elective by the students of following subjects: Open for all

**Suggested Continuous Evaluation Methods:**

Continuous Internal Evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows

Internal Assessment	Marks
Practical	20
Viva	5

Course prerequisites: To study this course, a student must have 10+2.

Submitted by: श्री अय्युब अहमद व डॉ० सिद्धार्थ बरनवाल

Shaurabh

*MA*

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<b>Programme/Class:</b> B.Sc	<b>Year: First</b>	<b>Semester: I/II</b>
<b>Subject: Chemistry</b>		
<b>Course Code:</b>	<b>Course Title: Chemical Technology and Society</b>	
<b>Objectives:</b>		
<ul style="list-style-type: none"> <li>This course will help students to connect chemical technology for societal benefits. It would fulfil the gap between academia and industries.</li> </ul>		
<b>Learning Outcomes:</b>		
<b>By the end of the course, the students will be able to:</b>		
<ul style="list-style-type: none"> <li>Understand the use of basic chemistry to chemical engineering</li> <li>Learn and use various chemical technology used in industries</li> <li>Develop scientific solutions for societal needs</li> </ul>		
<b>Credits: 4</b>	<b>Minor Elective</b>	
<b>Max. Marks: 75+25</b>	<b>Min. Passing Marks:</b>	
<b>Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0 .</b>		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
<b>I</b>	<b>Chemical Technology</b>  Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology	<b>15</b>
<b>II</b>	<b>Society</b> Exploration of societal and technological issues from a chemical perspective. Chemical and scientific literacy as a means to better understand topics like air and water (and the trace materials found in them that are referred to as pollutants).	<b>15</b>
<b>III</b>	<b>Sources of energy</b>	<b>20</b>



	<b>Separation Methods:</b> Principle and classification of chromatographic methods, General principle and applications of adsorption, partition, ion exchange, thin layer, and paper chromatography and gas chromatography, high-performance liquid chromatography.	
III	<b>Introduction of Food processing</b> Definition and scope of food science and technology, historical development of food processing and preservation, general principles of food preservation.  <b>Preservation:</b> Heating and commercial sterility, principles of the method, types of micro-organisms, bacterial load, sterilization, thermal resistance of the micro-organisms and enzymes, canning and bottling, chemical preservation.	15
IV	<b>Refrigeration</b> and freezing preservation, drying and dehydrations concentration (evaporation).  <b>Radiations:</b> Sources of radiations, effect on microorganisms and different nutrients microwave heating.	10
V	<b>Practical:</b> Paper chromatography, Food preservation.	5
<p><b>References:</b> Analytical Chemistry, G.D. Christian, (2001) JohnWiley &amp; sons, New York. Food Processing Technology by P.J. Fellows, Woodhead publishing ltd. Physical principles of Food Preservation. Vol. II by M. Karel, O.R. Fenema and D.B. Lurd, Maroel, Dekker Inc. New York.</p> <p><b>Teaching Learning Process:</b></p> <ul style="list-style-type: none"> <li>• Lectures using teaching aid (chalk/power point/videos)</li> <li>• Group discussion</li> <li>• Presentations</li> <li>• Advise to students to prepare a report on technological applications</li> <li>• Visit to nearby industries</li> <li>• Invite people of industries for interaction with students</li> </ul> <p><b>Assessment Methods:</b></p> <ul style="list-style-type: none"> <li>• Graded assignments</li> <li>• Conventional class tests</li> </ul>		

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- Class seminars by students on course topics with a view to strengthening the content through width and depth
- Quizzes
- End semester university examination.

**Keywords:**

Chemical reactions, Natural and Synthetic materials, Industrial chemistry, Analytical Chemistry

This course can be opted as an minor elective by the students of following subjects: Open for all

**Suggested Continuous Evaluation Methods:**

Continuous internal evaluation shall be based on allotted assignment and Class Test. The marks shall be as follows

Internal Assessment	Marks
Practical + Viva	10 + 5
Industrial visit	10

Course prerequisites: To study this course, a student must have 10+2.

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