



**Maharaja Surajmal Brij University
Bharatpur (Rajasthan)**

Syllabus

Multidisciplinary Course

Subject: Chemistry

Semester-III&IV

Session (2024-25)


डॉ. अरुण कुमार पाण्डेय
उपकुलसचिव
प्रभारी अकादमिक प्रथम

(Syllabus as per NEP-2020 and Choice Based Credit System)

(Academic Year 2024-25 onwards)

PROGRAMME OUTCOMES (POs)

1. **Basic knowledge of chemical science:** Students will get acquainted with the conceptual knowledge of chemical science which will help them to understand the subject and it will be beneficial in long run.
2. **Training to manage unusual and unexpected incidents/disasters:** The Basic knowledge of chemical science will help them to deal with unusual incidents in the neighborhood. Sudden explosion by chemicals and excessive misuse of unwanted substances can be managed with basic knowledge of chemistry as well as environmental pollution may be controlled by the students by spreading awareness in the society about the harmful pollutants viz; plastic, pesticides, harmful smog, unused drugs etc.
3. **Laboratory Experimental Skills:** As we know the fact that trials are an essential part of an exploration in our life therefore the students will gain practical experience by conducting experiments, using laboratory instruments and apparatus.
4. **Knowledge to run small scale industry:**
Student will be able to get self-employment by the set-up of small -scale industries of soap, detergent, sugar, matchbox, cement etc. through a basic understanding of the raw materials and manufacturing processes under the employment programmes of government of India.


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Examination Scheme:

1. **1 credit = 25 marks** for examination/evaluation.
2. **For Regular Students there will be Continuous assessment**, in which sessional work and the terminal examination will contribute to the final grade. Each course in Semester Grade Point Average (SGPA) has two components- Continuous assessment (20% weightage) and (End of Semester Examination) EoSE (80% weightage).
3. **For Regular Students, 75% Attendance is mandatory** for appearing in EoSE.
4. To appear in the EoSE examination of a course/subject student must appear in the mid semester examination and obtain at least a C grade in the course/subject.
5. Credit points in a Course/Subject will be assigned only if, the regular student obtains at least a C (40%) grade in the CA (Continuous Assessment) and EoSE examination of a Course/Subject.
6. **In case of the Non-Collegiate Students there will be no continuous assessment (CA)** and credit points in a Course/Subject will be assigned only if, the Non-Collegiate Student obtains at least a C grade (40%) in the EoSE examination of a Course/Subject.


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PAPER -I

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL (IN- CHEMISTRY)

COURSE CODE: MDC-CHE-20T-1001

Title: States of Matter, Atomic structure, carbon chemistry and some small-scale industries.

Course Objectives:	<p>The objective of this course is to provide a theoretical basic knowledge about states of Matter, atomic and molecular structure and carbon chemistry along with its some important compounds with their properties and applications.</p> <p>The characteristic organic reactions associated with functional groups are included to enrich the knowledge in the chemical science field. A basic awareness of the raw materials and manufacturing processes for small -scale industry products like Matchbox, Cement, Glass and Sugar mill are incorporated to gain industrial knowledge of other faculty students.</p>
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PAPER-I

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL (IN- CHEMISTRY)

COURSE CODE: MDC-CHE-20T-1001

Title: States of Matter, Atomic structure, carbon chemistry and some small-scale industries.

UNIT -I

States of Matter with their properties.


States of Matter, Characteristics of Particles of Matter, Physical and Chemical changes, Evaporation, Mixture, Common methods for Separation and Purification of mixture and Substance (Sublimation, Distillation, fractional Distillation etc.). True Solution, Saturated solution, Suspension and Colloidal solution. Chemical reactions, type of chemical reactions with examples.

liquefaction of gases- critical temperature- different molecular Velocities. Vapour pressure, elementary ideas of surface tension and viscosity of liquids

UNIT -II

Atomic structure:

Atomic orbitals and concept and shapes of s, p and d of atomic orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle, electronic configuration of elements, Electronegativity, Electroaffinity. Symbols of elements, formation of chemical formula for basic compound. Introduction to chemical bonding, Types of chemical bonds with


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Chemical properties of Acid – Base and Salts, neutralization reaction. Testing the pH of various solutions, Acid -Base Indicator. Universal indicator. Buffer solution, Mechanism of Buffer Action and its preparation, testing of Buffer Solutions and its applications in various fields.

15 Lecture

UNIT -III

Surface Chemistry

Introduction to Surface Chemistry, Absorption, Adsorption and Desorption, Factors Affecting Adsorption, Applications of Adsorption. Catalysts, Homogeneous and heterogeneous catalysis. Enzyme catalysis and their biological, environmental, industrial and medical applications with examples.

15 Lecture

UNIT -IV

Common Classes of Drugs and Dyes

Introduction to Drugs and Dyes, Classification of Common Classes of Drugs like Analgesics and antipyretics (aspirin, paracetamol), Antibiotics (penicillin, tetracycline, Antiseptics and disinfectants (chlorhexidine, iodine) and Antihistamines (diphenhydramine, loratadine). Chemical structure, properties and synthesis of Dyes and its applications.

15 Lecture

Suggested Books and References:

1. Organic Chemistry by R. T. Morrison & R. N. Boyd, Prentice Hall.
2. "Industrial Chemistry: A Multi-Volume Reference Work" edited by Klaus Weissermel, Hans-Jürgen Arpe, et al.
3. "Introduction to Industrial Chemistry" by C. A. Heaton.
4. Advanced Practical Organic Chemistry by N K Vishnoi ;Vikas Publishing House PVT LTD
5. Vogel's **Quantitative Inorganic Analysis** Including Elementary Instrumental Analysis, by A. I. Vogel Longman; London and New York. Prentice Hall.ELBS..
6. Advance Practical Inorganic Chemistry by Gurdeep Raj; Goel Publishing House.
7. Basic Concept of Inorganic Chemistry by D.N. Singh; Pearson.
8. An Introduction to Medicinal Chemistry by Vijoy Kundu; Wiely.

Suggested E-resources: All the above suggested books are available as e- books.

Online Lecture Notes and Course Materials:


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Online Lecture Notes and Course Materials:

All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF), web page, etc.

Course Learning Outcomes

By the end of this course, students will be able to understand basic knowledge about states of matter, atomic and molecular structures, carbon chemistry along with some important compounds and their properties, applications etc.

Students will acquire understanding in characteristic organic reactions associated with functional groups (esterification, saponification, oxidation, reduction, hydrolysis etc.)

Students will get basic knowledge of the raw materials and manufacturing processes for small scale industry products like Matchbox, Soap, Detergent, Cement, Glass, Sugar mill etc.

By the end of this course student will achieve the essential knowledge in the field of chemical industry and will be able to run own small-scale industry.


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PAPER-II

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL
(In - CHEMISTRY)

COURSE CODE: MDC-CHE-20T-2001

Title: States of Matter, Atomic structure, carbon chemistry and some small-scale industries.

Course Objectives:	The main objective of this course is to provide a theoretical basic knowledge about periodic classification of elements, Periodic trends of s-(alkali and alkaline earth metals), p- (non-metals), d- (transition metals) and f-block (lanthanides and actinides) elements. Chemical properties of Acid – Base and Salts along with buffer solution preparations and its application parts are included to get knowledge in this field. In Surface
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	<p>chemistry catalysis phenomenon and its applications are included.</p> <p>Common class of drugs are also incorporated to enrich students' knowledge in the field of pharmaceutical.</p> <p>Some common Dyes synthesis are also added to get information in coloration process of textile material.</p>
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PAPER-II

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL (In - CHEMISTRY)

COURSE CODE: MDC-CHE-20T-2001

Title: Periodic classification of elements, Acids and Bases, Surface Chemistry and Drugs and Dyes

UNIT -I

Periodic classification of elements:

Periodic classification of elements, Mendeleev's and Moseley's Periodic table and Periodic trends of s, p, d (transition metals) and f-block (lanthanides and actinides) elements. Metals, Non-metals,

Isotopes, Isobars and radioactive elements and their uses in biochemistry and thermal power plants.

15 Lecture

UNIT -II

Acids and Bases:


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Chemical properties of Acid – Base and Salts, neutralization reaction. Testing the pH of various solutions, Acid -Base Indicator. Universal indicator. Buffer solution, Mechanism of Buffer Action and its preparation, testing of Buffer Solutions and its applications in various fields.

15 Lecture

UNIT -III

Surface Chemistry

Introduction to Surface Chemistry. Absorption, Adsorption and Desorption, Factors Affecting Adsorption, Applications of Adsorption. Catalysts, Homogeneous and heterogeneous catalysis. Enzyme catalysis and their biological, environmental, industrial and medical applications with examples.

15 Lecture

UNIT -IV

Common Classes of Drugs and Dyes

Introduction to Drugs and Dyes, Classification of Common Classes of Drugs like Analgesics and antipyretics (aspirin, paracetamol), Antibiotics (penicillin, tetracycline, Antiseptics and disinfectants (chlorhexidine, iodine) and Antihistamines (diphenhydramine, loratadine). Chemical structure, properties and synthesis of Dyes and its applications.

15 Lecture

Suggested Books and References:

1. Organic Chemistry by R. T. Morrison & R. N. Boyd, Prentice Hall.
2. "Industrial Chemistry: A Multi-Volume Reference Work" edited by Klaus Weissermel, Hans-Jürgen Arpe, et al.
3. "Introduction to Industrial Chemistry" by C. A. Heaton.
4. Advanced Practical Organic Chemistry by N K Vishnoi ;Vikas Publishing House PVT LTD
5. Vogel's Quantitative Inorganic Analysis Including Elementary Instrumental Analysis, by A. I. Vogel Longman; London and New York. Prentice Hall.ELBS:
6. Advance Practical Inorganic Chemistry by Gurdeep Raj; Goel Publishing House.
7. Basic Concept of Inorganic Chemistry by D.N. Singh; Pearson.
8. An Introduction to Medicinal Chemistry by Vijoy Kundu; Wiely.

Suggested E-resources:All the above suggested books are available as e- books.

Online Lecture Notes and Course Materials:

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PAPER III

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL (IN CHEMISTRY)

COURSE CODE: MDC-CHE-20T-3001

Course Objectives:	<p>The main objective of this course is to provide a theoretical basic knowledge about carbohydrates, nucleic acids and essential and non-essential amino acids and their importance in our life.</p> <p>Furthermore, Food Additives with their types and needs as additive are also incorporated to get basic concept of food processing.</p> <p>Moreover, water analysis, soft and hard water, treatment stages and purification methods, purification criteria are also included to enrich knowledge in this field.</p>
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	Fossil fuels as non-renewable energy sources such as coal, coal-products, petroleum and natural gases with their environmental impact and sustainability are included in this course to get awareness in this field.
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PAPER III

MULTIDISCIPLINARY COURSE FOR UNDER GRADUATE LEVEL (IN CHEMISTRY)

COURSE CODE: MDC-CHE-20T-3001

Title: Carbohydrates and Amino Acids, Food Additives, Water analysis and Fossil fuels.

UNIT -I

Carbohydrates, Nucleic acids and Amino Acids

Introduction to Carbohydrates, Monosaccharides, disaccharides, oligosaccharides, polysaccharides. Nucleic acids.

Essential and Non-Essential Amino Acids, Isoelectric Point and Zwitterions, Peptide Bond Formation, Properties and Reactions of Amino Acids.

Reactions Involving Amino Acids (Ninhydrin reaction, Sanger's reagent and Edman degradation).

UNIT -II

Food Additives and their needs

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Food Additives, definition and need, General needs of food additives (preservation, flavor enhancement, texture improvement, appearance) Types of Food additives (Preservatives, Anti-oxidant, Sequestrants, Colourants, Flavorings, Sweeteners, Thickeners and Stabilizers Emulsifiers and Acidulants. Risk analysis of some specific food additives.

UNIT -III

Water analysis and purification:

Water analysis, Hardness of water, Methods for Measuring Hardness, Effects of Hard and Soft Water, Methods of water softening using Boiling, Lime-soda process, Ion-exchange method, Reverse osmosis.

Water purification and its treatment stages in detail. Criteria of water purity [Dissolved Oxygen, BOD, COD].

UNIT -IV

Fossil fuels and their environmental Impact and Sustainability

Fossil fuels, Types of Fossil Fuels (Coal, Coal-tar, Petroleum and Natural gases). Extraction and refining of petroleum and its products. Environmental Impact and Sustainability.

Combustion, Principles of Fire Extinguisher and its types, (Water, Foam, Dry Powder and Soda-acid fire extinguisher), Components and Working Principle.

Suggested Books and References:

1. Fundamental concepts of environmental chemistry by G S Sodhi, NAROSA.
2. Organic Chemistry by R. T. Morrison & R. N. Boyd, Prentice Hall.
3. Synthetic Drugs by G.R. Chatwal, Himalaya publishing House.
4. Medicinal Chemistry by Alka L. Gupta, A Pragati Edition.
5. An Introduction to Medicinal Chemistry by Vijoy Kundu; Wiely.
6. Fuels and Combustion by Samir Sarkar; Orientblackswan.
7. Handbook of water and waste water analysis by Kanwaljet Kaur; Atlantic.
8. Food, Colours and Additives Technology Handbook by Hinadani Panda; Niir Project Consultant Service.


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Suggested E-resources:

All the above suggested books are available as e- books.

Online Lecture Notes and Course Materials:

All prescribed syllabus is available digitally in the form of e-books, Adobe Acrobat documents (PDF), web page ,etc.

Course Learning Outcomes:

With the completion of this course, students will be able to understand concepts related to carbohydrates, RNA, DNA and essential and non-essential amino acids and their importance in our life.

Student will get knowledge about Food Additives and their needs as additive along with risk analysis and the water analysis and water purification, criteria and its treatment stages

Students will achieve knowledge about Fossil fuels such as coal, coal-products, petroleum and natural gases with their environmental impact and sustainability.

By the end of this course, student will be well acquainted with the essential conceptual knowledge in the field of water purification, petroleum refining and will be able to do work in food processing,


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