Three-Year Undergraduate Programme

Bachelor of Science

B.Sc. Industrial Chemistry

Faculty of Applied Sciences

Parul University

Vadodara, Gujarat, India

Faculty of Applied Sciences
Bachelor of Science in Industrial Chemistry

1. **Vision of the Department:**
   Building foundation for excellence and spur development of the Institution as a premier Institution, by igniting and nurturing enthusiasm, interests and passion, in the study of chemistry, in professional courses, as a part of curriculum.

2. **Mission of the Department:**

M1	Awakening the young minds and discover their talents both in theory and in practical chemistry, through dedication to teaching, commitment to students and innovative instructional methods.
M2	Supporting the developmental activities of the College and make the Department vibrant.
M3	Organizing critical contributions in areas of emphasis such as faculty, modern labs, department library and demonstrate a high level of competence in the study of Chemistry.

3. **Program Educational Objectives**
   The statements below indicate the career and professional achievements that the B.Sc. Chemistry curriculum enables graduates to attain.

PEO 1	To apply their knowledge and skills gained in AEC and SEC, and other relevant courses to excel in their chosen professional field, demonstrating competence in chemical practices, laboratory techniques, and the application of physics and chemistry fundamentals.
PEO 2	To contribute to sustainable practices and environmental awareness by effectively applying their understanding of Climate Change and Sustainable Environment principles in their work. They will engage in responsible decision-making to address environmental challenges in their respective industries.
PEO 3	To demonstrate an ability to integrate knowledge from diverse areas such as Basics of Physics, Basics of Organic Chemistry, Basics of Inorganic Chemistry, They will exhibit critical thinking, adaptability, and creativity in solving complex problems, preparing them for a range of professional and academic pursuits.

4. **Program Learning Outcomes**
   Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	**Knowledge**	Utilize foundational scientific principles to address intricate challenges through diverse solutions.
PLO 2	**Problem Analysis**	Evaluate and interpret experimental results, drawing conclusions based on acquired data, while also identifying, formulating, and analyzing scientific problems to arrive at solutions using diverse scientific principles.
PLO 3	**Designing Solutions**	Develop solutions and execute experiments that showcase their comprehension of the methods and processes involved.

PLO 4	**Modern tool usage**	Create, select, and apply appropriate techniques, resources and IT tools in the analysis and synthesis of data within limitations.
PLO 5	**Communication Development**	Skilled at clear communication through both written and oral formats, capable of explaining complex concepts in understandable terms, learners will effectively engage with the scientific community and society on scientific matters.
PLO 6	**Employability**	Considering our learners' diverse career goals, including scientific, technical, and quantitative roles, the institution informs them about relevant job opportunities through the Placement cell, offering skill enhancement and value-added courses in addition to science subjects to give them a competitive advantage in the job market.
PLO 7	**Ethics**	Cultivate a sense of healthy competition among students while also nurturing a strong ethical foundation, including an appreciation for scientific principles and their impact on societal, economic, and environmental issues, understand and practice ethical values in both professional and personal spheres, contributing to a responsible society.
PLO 8	**Environment and Sustainability**	Understand the impact of scientific solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PLO 9	**Soft-Skill Development**	Develop soft skills like leadership, teamwork, and effective communication to excel in various roles and contribute to societal progress, enhancing academic, professional, and personal growth for self-improvement and collective advancement.
PLO 10	**Science and Society**	Apply logical thinking, knowledge, and skills in designing solutions for societal issues, including health, safety, and scientific responsibilities.
PLO 11	**Life-long learning**	Encouraging learners to seek knowledge for personal or professional growth includes promoting volunteering, self-motivation, societal values, and lifelong learning for enhanced competitiveness and employability amidst technological advancements.
PLO 12	**Data Analysis and Interpretation**	Analysing and interpreting scientific data, drawing meaningful conclusions, and communicating results effectively.

5. Program Specific Learning Outcomes

PSO 1	**Chemistry Program**	Graduates of the Chemistry program will demonstrate advanced proficiency in chemical analysis and laboratory practices, including accurate data interpretation, effective use of instrumentation, and application of theoretical knowledge to solve complex chemical problems.

PSO 2	**Environmental Science Program**	Graduates of the Environmental Science program will exhibit a deep understanding of the interplay between human activities, climate change, and sustainable practices. They will be able to propose and implement environmentally responsible solutions to address contemporary environmental challenges.

6. Credit Framework

Semester wise Credit distribution of the programme	
Semester-1	22
Semester-2	22
Semester-3	22
Semester-4	22
Semester-5	22
Semester-6	22
Total Credits:	**132**

Category wise Credit distribution of the programme	
Category	**Credit**
Major Core	88
Multidisciplinary	12
Ability Enhancement Course	10
Skill Enhancement Courses	10
Value added Courses	8
Summer Internship	4
Total Credits:	**132**

7. Program Curriculum

Semester: 1					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
11010501DS01	Basics of Organic Chemistry - I	2	2	-	-
11010501DS02	Lab - 1 : Organic Chemistry Practicals	2	-	4	-
11010501DS03	Basics of Inorganic Chemistry - I	2	2	-	-
11010501DS04	Lab - 2 : Inorganic Chemistry Practicals	2	-	4	-
11010501SE01	Chemical Practices	2	2	-	-
11011701DS01	Basics of Industrial Chemistry	4	4	-	-
11011401VA01	Climate Change & Sustainable Environment	2	2	-	-
	Ability Enhancement Course-I	2	2	-	-
	University Elective Course-I	4	3	2	-
	Total:	**22**	**17**	**10**	**-**

Semester - 1 : Ability Enhancement Course-I					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
00019301AE01	Basic English-I	2	2	-	-
00019301AE02	Basic Hindi-I	2	2	-	-
00019301AE03	Basic Gujarati-I	2	2	-	-

Semester - 1 : University Elective Course-I					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
03010901UE01	Introduction to MATLAB Programming	4	3	2	-
05010101UE01	Office Automation	4	3	2	-
09010101UE01	First Aid and Life Support	4	4	-	-
18010201UE01	Basic Photography	4	2	4	-

Semester: 2					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
00019101SE01	Mathematical Aptitude	2	2	-	-
00019302VA01	IPDC including history and culture of India and IKS-I	2	2	-	-
11010502DS01	Basics of Organic Chemistry-II	2	2	-	-
11010502DS02	Inorganic Chemistry - II	2	2	-	-
11010502DS03	Lab-1 : Organic Practicals	2	-	4	-
11010502DS04	Lab-2 : Inorganic Qualitative Analysis	2	-	4	-
11011702DS01	Fundamentals of Industrial Chemistry - I	2	2	-	-
11011702DS02	Lab-3 : (Fundamentals of Industrial Chemistry - I)	2	-	4	
	Ability Enhancement Course-II	2	2	-	-
	University Elective Course-II	4	3	2	-
	Total:	**22**	**17**	**10**	**-**

Semester - 2 : Ability Enhancement Course-II					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
00019302AE04	Basic English-II	2	2	-	-
00019302AE05	Basic Hindi-II	2	2	-	-
00019302AE06	Basic Gujarati-II	2	2	-	-

Semester - 2 : University Elective Course-II					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**

03010602UE01	Maintenance of Household Apparatus	4	3	2	-
15010402UE01	Human Psychology	4	4	-	-
19010002UE01	Digital Health	4	4	-	-
19010202UE01	Public Health Nutrition	4	3	2	-

Semester: 3					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
11011703DS01	Fundamentals of Industrial Chemistry – II	4	4	-	-
11011703DS02	Lab-1 : Fundamentals of Industrial Chemistry-II	2	-	4	-
11011703DS03	Fluid Transport Mechanism	4	4	-	-
11011703DS04	Lab - 2 : Fluid Transport Mechanism	2	-	4	-
03010503SE01	Artificial Intelligence -AI	2	2	-	-
00019303VA01	IPDC including History and Culture of India and IKS-2	2	2	-	-
	Ability Enhancement Course-III	2	2	-	-
	University Elective Course-III	4	4	-	-
	Total:	**22**	**18**	**8**	**-**

Semester - 3 : Ability Enhancement Course-III					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
00019303AE01	Advanced English - I	2	2	-	-
00019303AE02	Basic German	2	2	-	-
00019303AE03	Basic French	2	2	-	-

Semester - 3 : University Elective Course-III					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
17010103UE01	Intellectual Property	4	4	-	-
06010103UE02	Cyber Security, Tools, Techniques and Counter Measures	4	4	-	-
05010103UE01	Artificial Intelligence Application in People Management	4	4	-	-
21010101UE02	Basics of Event Management	4	4	-	-

Semester: 4					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
11011704DS01	Fundamentals of Industrial Chemistry – III	4	4	-	-
11011704DS02	Lab - 1 : Fundamentals of Industrial Chemistry - III	2	-	4	-

11011704DS03	Industrial Chemical Operations – I	4	4	-	-
11011704DS04	Lab - 2 : Industrial Chemical Operations - I	2	-	4	-
11011704DS05	Industrial Instrumentation and Process Control - I	4	4	-	-
11010504SE01	Computational Chemistry	2	2	-	-
19010204VA01	Positive Mental Health OR Physical Education/Yoga/NCC	2	1	2	-
	Ability Enhancement Course-IV	2	2	-	-
	Total:	**22**	**17**	**10**	**-**

Semester - 4 : Ability Enhancement Course-IV					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
00019304AE01	Advanced English - II	2	2	-	-
00019304AE02	Basic German - II	2	2	-	-
00019304AE03	Basic French - II	2	2	-	-

Semester: 5					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
11011705DS01	Industrial Chemical Operations – II	3	3	-	-
11011705DS02	Lab – 1 : Industrial Chemical Operations - II	2	-	4	-
11011705DS03	Pharmaceutical Organic Chemistry	4	4	-	-
11011705DS04	Lab - 2 : Pharmaceutical Organic Chemistry	2	-	4	-
11011705DS05	Analytical Chemistry – I	3	3	-	-
11011705DS06	Industrial Instrumentation and Process Control - II	4	4	-	-
11011705DS07	Lab - 3 : Industrial Instrumentation and Process Control	2	-	4	-
06010105SE01	Digital Literacy OR Finance for everyone	2	2	-	-
	Total:	**22**	**16**	**12**	**-**

Semester: 6					
Code	**Subject**	**Credit**	**Lect**	**Lab**	**Tut**
11011706DS01	Industrial Chemical Processes	4	4	-	-
11011706DS02	Lab – 1 : Industrial Chemical Processes	2	-	4	-
11011706DS03	Physical Chemistry	4	4	-	-
11011706DS04	Lab - 2 : Physical Chemistry	2	-	4	-

11011706DS05	Analytical Chemistry – II	4	4	-	-
00019306AE01	Professional Ethics & Communication	2	2	-	-
11010506IN01	Internship OR Mini Project	4	-	8	-
	Total:	**22**	**14**	**16**	**-**

8. Detailed Syllabus

Semester: 1

- **Course Name:** Basic English-I
  Course Code: 00019301AE01
  Prerequisite: Basic Knowledge of LSRW. To provide students with soft skills that complement their skills, making them more marketable when entering the workforce.
  Rationale: Knowledge of LSRW is essential for students.

Course Learning Objectives:

CLOBJ1	Remember basic English language terms and concepts.
CLOBJ2	Understand the main ideas and key details of simple English language materials.
CLOBJ3	Apply grammar and vocabulary knowledge to construct simple sentences and paragraphs.
CLOBJ4	Analyse the structure and organization of basic English texts.
CLOBJ5	Evaluate the use of language in different contexts and for different purposes.
CLOBJ6	Create original written and spoken English language content.

Course Learning Outcomes:

CLO1	Define and recognize simple grammatical structures and rules in English sentences.
CLO2	Understanding of basic English grammar concepts through application in context.
CLO3	Apply listening skills to follow and respond appropriately to basic instructions and directions given in English.
CLO4	Analyse language usage and areas for improvement in pronunciation, grammar, and vocabulary.
CLO5	Evaluate new vocabulary and grammatical structures learned in class into their communication to demonstrate language fluency and creativity.
CLO6	Develop the cultural relevance and appropriateness of language use in various contexts, demonstrating an understanding of cultural sensitivity and communication norms.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Listening Skills and Hearing**: Listening Vs Hearing Types	**7%**	**2**

	of listening, Traits of good listener, Barriers of listening		
2	**Listening Practice:** Listening Practice(Audio & Video)	**10%**	**3**
3	**Presentation Skills:** Defining the purpose of presentation Presentation strategies, How to make an effective presentation? Knowing /Analysing audience, Organizing content and preparing an outline Traits of a good speaker	**3%**	**1**
4	**Activity:** Crazy Scientist.	**7%**	**2**
5	**Speaking Practice:** Speaking practice (Elocution)	**24%**	**7**
6	**Reading Skills:** Define reading, Reading Strategies, Techniques of reading, Techniques to read faster	**3%**	**1**
7	**Reading Practice:** Reading Practice (Reading Comprehension)	**13%**	**4**
8	**Writing Skills:** Develop Writing Skills, 7cs of communication, Techniques of writing better, Identifying common errors in writing	**10%**	**3**
9	**Paragraph Writing :** Introduction of Paragraph Writing, Central components of paragraph development, Techniques for paragraph development	**3%**	**1**
10	**Writing Practice:** Note making, Picture Description, Dialogue Writing, Paragraph Writing Completion of story from given points	**20%**	**6**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Understanding and Using English Grammar, By Betty Azar & Stacy Hagen | Pearson Education
2. Business Correspondence and Report Writing, By SHARMA, R. AND MOHAN, K.
3. Communication Skills, By Kumar S And Lata P | New Delhi Oxford University Press
4. Technical Communication : Principles And Practice, By Sangeetha Sharma, Meenakshi Raman | Oxford University Press
5. Practical English Usage, By MICHAEL SWAN
6. A Remedial English Grammar for Foreign Student, By F.T. WOOD
7. On Writing Well, By William Zinsser | Harper Paperbacks,2006 | 30th anniversary edition
8. Oxford Practice Grammar, By John Eastwood | Oxford University Press

- **Course Name:** Basic Hindi-I

  Course Code: 00019301AE02

  Prerequisite: Basic communication skills in Hindi

  Rationale: Basic comprehensive skills Hindi

Course Learning Objectives:

CLOBJ1	Remember key terms related to the Hindi language, such as grammar rules,

	vocabulary, and sentence structure.
CLOBJ2	Understand the main ideas and themes of Hindi literary works or cultural texts.
CLOBJ3	Apply knowledge of Hindi vocabulary to communicate in everyday situations, such as greetings, shopping, and asking for directions.
CLOBJ4	Analyse the structure and style of Hindi literature, including poetry, short stories, or essays.
CLOBJ5	Evaluate the appropriateness of Hindi language translations or interpretations.
CLOBJ6	Create original content in Hindi, such as stories, poems, or dialogues..

Course Learning Outcomes:

CLO1	Identify the sounds and symbols of the Hindi alphabet.
CLO2	Understand simple spoken and written Hindi passages on familiar topics.
CLO3	Apply their knowledge of Hindi in everyday situations, such as greetings, introductions, and basic conversations.
CLO4	Analyse the structure and content of simple Hindi texts, such as stories, poems, or dialogues.
CLO5	Create original content in Hindi, such as short stories, poems, or dialogues.
CLO6	Evaluate the effectiveness of different language learning strategies for acquiring Hindi proficiency.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Hindi Alphabets:** Hindi Alphabets Relate with English Alphabets, vowel, consonant.	**13%**	**4**
2	**Hindi Phonetics:** Hindi Phonetics, Joint words kha, sva etc	**13%**	**4**
3	**Word Formation:** Two/three letter word formation	**13%**	**4**
4	**Hindi Grammar:** Noun, Pronoun, Verb, Adverb, Adjective.	**34%**	**10**
5	**Hindi Vocabulary:** Number from 1 to 50, Days of week, Colors	**27%**	**8**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Text book of Hindi standard 1-5

- **Course Name:** Basic Gujarati-I
  Course Code: 00019301AE03
  Prerequisite: Basic communication skills in Gujarati
  Rationale: Basic comprehensive skills in Gujarati.

Course Learning Objectives:

CLOBJ1	Remember key terms related to the Gujarati language, such as grammar rules, vocabulary, and sentence structure.
CLOBJ2	Understand the main ideas and themes of Gujarati literary works or cultural texts.
CLOBJ3	Apply knowledge of Gujarati vocabulary to communicate in everyday situations, such as greetings, shopping, and asking for directions.
CLOBJ4	Analyse the structure and style of Gujarati literature, including poetry, short stories, or essays.
CLOBJ5	Evaluate the appropriateness of Gujarati language translations or interpretations.
CLOBJ6	Create original content in Gujarati, such as stories, poems, or dialogues.

Course Learning Outcomes:

CLO1	Remember key terms related to the Gujarati language, such as grammar rules, vocabulary, and sentence structure.
CLO2	Understand the main ideas and themes of Gujarati literary works or cultural texts.
CLO3	Apply knowledge of Gujarati vocabulary to communicate in everyday situations, such as greetings, shopping, and asking for directions.
CLO4	Analyse the structure and style of Gujarati literature, including poetry, short stories, or essays.
CLO5	Evaluate the appropriateness of Gujarati language translations or interpretations.
CLO6	Create original content in Gujarati, such as stories, poems, or dialogues.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Gujarati Alphabets:** Gujarati Alphabets relate with English Alphabets, vowel, consonant.	**13%**	**4**
2	**Gujarati Phonetics:** Gujarati Phonetics, Joint words kha, sva etc	**13%**	**4**
3	**Word Formation:** Two/three letter word formation	**13%**	**4**

4	**Gujarati Grammar:** Noun, Pronoun, Verb, Adverb, Adjective.	**34%**	**10**
5	**Gujarati Vocabulary:** Number from 1 to 50, Days of week, Colors	**27%**	**8**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Text book of Gujarati standard 1-5

- **Course Name:** Introduction to MATLAB Programming
  Course Code: 03010901UE01
  Prerequisite: Fundamental Knowledge of Mathematics.
  Rationale: An Introduction to MATLAB Programming" course is essential because MATLAB is widely used in scientific and engineering fields for data analysis, simulations, and algorithm development. Its user-friendly interface and high-level language allow beginners to quickly grasp fundamental programming concepts and focus on problem-solving. The course equips learners with valuable skills for data visualization, numerical computing, and rapid prototyping, enhancing their capabilities and employability in diverse domains.

Course Learning Objectives:

CLOBJ1	Remember foundational understanding of MATLAB syntax, data types, and basic programming concepts such as variables, arrays, and control structures.
CLOBJ2	Explain the principles of problem-solving using MATLAB, including algorithm development, debugging techniques, and code documentation.
CLOBJ3	Apply MATLAB programming skills to solve a variety of computational problems, including mathematical calculations, data analysis, and visualization tasks.
CLOBJ4	Analyse and debug MATLAB code to identify errors, optimize performance, and improve code efficiency.
CLOBJ5	Evaluate the effectiveness of different MATLAB programming techniques and strategies in solving specific types of problems, considering factors such as code readability, scalability, and computational efficiency.
CLOBJ6	Develop their understanding of MATLAB programming concepts to design and implement their own algorithms and functions to solve complex problems.

Course Learning Outcomes:

CLO1	Memorize the MATLAB environment with confidence, effectively utilizing its features and tools for programming and data analysis.
CLO2	Understand matrices and arrays, perform basic operations, and visualize data using 2D and 3D plots for effective data exploration and representation.
CLO3	Compare programming concepts like control statements, loops, and logical operations to write structured MATLAB code for problem-solving.
CLO4	Analyse & distinguish and use user-defined functions, promoting code reusability and modular design in MATLAB programs.

CLO5	Evaluate Work with file input/output, enabling data exchange with external sources, and utilize the Symbolic Math Toolbox for performing symbolic computation.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Getting Started with MATLAB:** Introduction to MATLAB, history, features, and uses, MATLAB desktop, basic commands, variables, and data types, performing arithmetic operations and using functions.	13%	10
2	**Working with Matrices and Arrays:** Creating Matrices and Arrays, Array Operations and Indexing, Logical Operations and Relational Operators	18%	8
3	**Data Visualization in MATLAB:** Visualizing data using 2D plots and 3D Plot, Customizing Plots, Enhancing plots with titles, labels, and formatting.	18%	8
4	**Programming with MATLAB:** Conditional Statements (if-else), loops (for and while), Vectorization and Logical operation	18%	6
5	**Working with Files and Symbolic Math:** Reading from and writing to files, data import/export, performing symbolic computations using Symbolic Math Toolbox	18%	7
6	**Reading Skills:** Define reading, Reading Strategies, Techniques of reading, Techniques to read faster	3%	6
	Total	100%	45

Text Book and Reference Book:

1. MATLAB : PROGRAMMING FOR ENGINEERS (TextBook), By Chapman, Stephen J ., | Thomson Asia Pvt Ltd
2. Mastering Matlab, A Comprehensive tutorial and reference, By Duane Hanselman and Bruce Littletied
3. Getting Started with MATLAB-7 (TextBook), By Rudra Pratap | OXFORD University Press

- **Course Name:** Office Automation
  Course Code: 0501001UE01
  Prerequisite: Basic computer literacy.
  Rationale: The objective of this course is to familiarize students with concepts of fundamentals of Microsoft Office, Excel, PowerPoint and Outlook for working of computer and its application.

Course Learning Objectives:

CLOBJ1	Remember what office automation entails, including the use of technology to streamline office tasks, improve efficiency, and enhance productivity.
CLOBJ2	Understand the advantages of office automation, such as increased accuracy, reduced manual labour, faster processing times, and improved communication and collaboration.
CLOBJ3	Apply the role of office automation tools and technologies in contemporary workplaces, including their impact on workflow optimization, remote work, and digital transformation.
CLOBJ4	Organize office automation systems to integrate with various business processes, including document management, workflow automation, customer relationship management, and enterprise resource planning.
CLOBJ5	Evaluate the challenges and considerations associated with implementing office automation solutions, such as cost, compatibility, data security, and employee training.
CLOBJ6	Develop Strategies for Successful Implementation: Students will develop strategies for successful implementation of office automation initiatives, including assessing organizational needs, selecting appropriate technologies, managing change, and evaluating outcomes.

Course Learning Outcomes:

CLO1	Demonstrate understanding of the concept of office automation, including its components, functions, and applications in modern workplaces.
CLO2	Understand the importance and benefits of office automation, recognizing its role in enhancing efficiency, productivity, and communication in organizations.
CLO3	Analyse the challenges and considerations associated with office automation implementation, such as technological limitations, organizational culture, and security concerns.
CLO4	Apply their knowledge of office automation to analyze and evaluate its integration with business processes, identifying opportunities for automation and efficiency improvements.
CLO5	Evaluate the effectiveness of office automation solutions in addressing organizational needs and improving workflow processes, considering factors such as cost-effectiveness, user satisfaction, and return on investment.
CLO6	Synthesize their understanding of office automation concepts to develop strategies for successful implementation, including assessing organizational needs, selecting appropriate technologies, and managing change.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Office Automation:** Overview of Office Automation, Importance and Benefits of Office Automation, Role in Modern Work Environments, Integration with Business Processes, Challenges and Considerations.	8%	6
2	**Introduction of Computer:** Overview of Computer, Computer Input and Output devices, Operating System, hardware and Software Introduction to Ram ,Rom ,CPU and more devices.	8%	6
3	**Microsoft Word:** Introduction to MS Word, Getting Familiar with the Interface, Creating a New Document, Basic Text Formatting, Bold, Italic, Underline), Aligning Text (Left, Center, Right),Saving and Opening Documents,Navigate Through a Document, Insert hyperlinks, Search for text, Replace, Create bookmarks, Move to a specific location or object in a document, Apply document themes, Apply document style sets, Insert headers and footers, Insert page numbers, Format page background elements, Create a numbered or bulleted list, Change bullet characters or number formats for a list level, Define a custom bullet character or number format.	25%	9
4	**Microsoft Excel:** Introduction to MS Excel Create a workbook, Search for data within a workbook, Change worksheet tab color, Rename a worksheet, Insert and delete columns or rows, Change workbook themes, Adjust row height and column width, Insert headers and footers, Hide or unhide worksheets, data validation, Duplicate Values, Apply styles to tables, Filter records, Sort data by multiple columns, Change sort order, Remove duplicate records, Perform calculations by using the SUM function, MIN and MAX functions, COUNT function, AVERAGE function, Create a new chart, Resize charts, Save a workbook as a template, Manage workbook versions, Protect a worksheet	25%	8
5	**Microsoft PowerPoint:** Create a Presentation, Insert and Format Slides, Modify Slides, Handouts, and Notes, Configure a Presentation for Print, Configure and Present a Slide Show, Insert and Format Text, Insert and Format Shapes and Text Boxes, Insert and Format Images, Order and Group Objects, Insert and Format Tables, Insert and Format Charts, Insert and Format SmartArt graphics, Apply Slide Transitions, Animate Slide Content. Set Timing for Transitions and Animations.	17%	8

6	**Microsoft Outlook**: Create messages, Create and send messages Configure message, Format messages, Format text Apply, themes and styles, Apply styles, Create hyperlinks, Insert images, Manage schedules, Insert memorized content, Insert signatures, Configure calendar settings ,Work with multiple calendars Share calendar information, Create appointments and events Create meetings Manage calendar items, Create tasks Manage tasks Create and manage notes, Create journal entries, Create and manage contacts Create and modify contact records Store contact records Share contact records and address books.	**17%**	**8**
	Total	**100%**	**45**

Text Book and Reference Book:

1. Digital Logic and Computer Design (TextBook), By Morris Mano | PHI
2. Introduction to Information Technology, By ITL Education Solution Limited | Pearson Education | 2012
3. MS OFFICE 2007, By Vikas Gupta | Wiley
4. Computer Fundamentals, By Anita Goel | Pearson Education | 2011
5. Digital Fundamentals, By Thomas L Floyd | Pearson

- **Course Name:** First Aid & Life Support
  Course Code: 09010101UE01
  Prerequisite: Basic computer literacy. Shall have the basic knowledge about anatomy and physiology of human body.
  Rationale: Will gain basic knowledge about first aid & life sciences.

Course Learning Objectives:

CLOBJ1	Remember the primary objectives of first aid, including preserving life, preventing worsening conditions, and promoting recovery.
CLOBJ2	Explain the legal framework surrounding first aid, including Good Samaritan laws and the duty of care, and understand their responsibilities and limitations as first
CLOBJ3	Apply skills in identifying and responding to emergencies, including performing a top-to-toe assessment, maintaining hygiene, and following an overview flow chart for providing appropriate first aid.
CLOBJ4	Organize and manage injuries such as fractures, wounds, and bleeding, including understanding basic anatomy, recognizing different types of fractures, and applying appropriate
CLOBJ5	Access knowledge of respiratory emergencies, including recognizing signs of difficulty breathing and performing CPR, as well as understanding the types of burns and providing appropriate care for burn injuries.
CLOBJ6	Develop competence in lifesaving procedures such as CPR, managing head trauma and strokes, and providing first aid for gastrointestinal issues such as diarrhoea, food poisoning, and diabetes.

Course Learning Outcomes:

CLO1	Identify and prioritize different types of injuries and illnesses.
CLO2	Understand the importance of first aid in emergency situations
CLO3	Demonstrate the ability to assess the scene of an emergency.
CLO4	Analyse the importance of infection control in wound care
CLO5	Evaluate signs and symptoms of shock and how to provide first aid for different types of burns and how to assess and provide first.
CLO6	Develop CPR techniques for adults, children, and infants and use of automated external defibrillators (AEDs) and how to use them.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to first aid:** Aims of first aid The first aider First aid and the law Indian good Samaritan protection guidelines Duty of giving care Consent of the person in need Privacy Negligence Dealing with an emergency Top-to-toe assessment Hygiene and hand washing First aid overview flow chart	7%	4
2	**Assessment of patients with fractures, wounds, and bleeding:** Brief Anatomy of the skeletal system Fractures (injuries to bones) Injuries and fractures to the head, neck and spine Injuries and fractures to the cheekbone, nose and lower jaw Fracture of the cheekbone or nose Fractures of the lower jaw Injuries to the shoulder, ribs or breastbone Injuries or fractures of the shoulder Injuries and fractures of the collarbone Rib injuries and fractures Fractures of the breastbone Injuries to the arm, elbow, wrist, hand or Injuries and fractures of the arm(upper arm, forearm, wrist) Injuries and fractures of hand or fingers Injuries to the pelvis, lower limbs, knee, ankle or feet Injuries and fractures of the pelvis Injuries and fractures of the leg (thigh or lower leg) or ankle	10%	6

	Fracture of the knee cap (patella) Injuries and fractures of foot or toes Dislocations (injuries to joints) Strains and sprains (injuries to ligaments, muscles and tendons)		
3	**Respiratory emergencies:** Respiration The respiratory system No breathing or difficult breathing When to refer the casualty to a healthcare facility Drowning Remove the victim out of the water Strangulation and hanging Choking Swelling within the throat Suffocation by smoke or gases Asthm	**10%**	**6**
4	**Care of burns:** The skin Burn wounds First, second and third degree burns Type of burns by origin Danger of burn Dry burns and scalds (burns from flames, hot surfaces, steam, Care of minor burns (small first and second degree burns) Specific burn locations Electrical burns and electrocution by electricity or lightning Chemical burns Sunburns, snow/welders eyes, heat exhaustion and heat stroke Heat exhaustion Heatstroke Frostbites Prevention of burns Fever Hypothermia	**8%**	**5**
5	**Lifesaving procedures in emergency & shock:** The heart and the blood circulation, Heart and blood circulation, Blood pressure, Pulse, The blood, Chest discomfort, Bleeding, First aid for bleeding (in general), Resuscitation (basic CPR), Resuscitation of a person who is not breathing or not breathing normally, Resuscitation of baby/child (less than one year old)	**8%**	**5**
6	**Head trauma & stroke:** The nervous system, The central nervous system, The peripheral nervous system (PNS), Unconsciousness, Head injuries, Concussion, Cerebral compression, Skull fractures, Stroke, Fits – convulsions - seizures	**10%**	**6**
7	**Gastrointestinal tract, diarrhea, food poisoning and diabetes**: Review of anatomy and physiology of gastrointestinal tract, Diarrhoea, Prevent dehydration, Food poisoning, Diabetes, Type 1 diabetes, Type 2 diabetes, Gestational diabetes (diabetes during pregnancy), Diagnosis, Hyperglycaemia, Symptoms of hyperglycaemic coma or diabetic coma, Hypoglycaemia	**10%**	**6**
8	**Senses, foreign bodies in eye, ear, nose or skin and swallowed foreign Objects:** Review of anatomy and physiology of the special senses, Foreign body in the eye, Foreign body in the ear, Foreign body in the nose, Foreign body in the skin, Swallowed foreign objects	**10%**	**6**
9	**Urinary system, reproductive system and emergency childbirth**: Review of anatomy and physiology of Urinary & Reproductive system, Male reproductive system, Female reproductive system, Pregnancy, Stages of labour and giving birth, Aftercare of the mother, Medical conditions and pregnancy, Diabetes, High blood pressure, Infections, Prevention of sexually transmitte diseases (STD), Sexually transmitted infections, Reducing the risk of STDS/STIS, Emergency childbirth	**10%**	**6**

10	**Psychological first aid:** Definition of psychological first aid, Traumatic crisis, (psychological) shock phase, Reaction phase, Processing phase, Reorientation phase, Behave calmly, Listening to the affected person, Physical contact, Providing psychological first aid to all	**7%**	**4**
11	**Specific emergency situations and disaster management:** Emergencies at school, Emergencies at work, Road and traffic accidents, Emergencies in rural area, Disasters and multiple casualty accidents Emergency triage	**10%**	**6**
	Total	**100%**	**60**

Text Book and Reference Book:

1. First aid handbook: Fast and effective emergency care (TextBook), By Dr. Pipa Keech | 3rd
2. Until Medical Help Arrives: First aid Book (TextBook), By Dr. H. V. Sardesai | 1 st Edition, Pub. Year 2022
3. First aid manual, (TextBook), By UK's Leading First aid providers | 11th edition:, Pub. Year 2021

- **Course Name:** Basic Photography
  Course Code: 18010201UE01
  Prerequisite: Understanding of Basic Computer Skills, Media Literacy, reative Vision and Passion to learn
  Rationale: Taking a basic photography course can be incredibly helpful for anyone looking to improve their photography skills. Not only will you learn about the technical aspects of photography, but you'll also gain a greater appreciation for the art form and discover your own unique style.

Course Learning Objectives:

CLOBJ1	Remember different focal lengths and their aesthetic uses, enabling them to choose appropriate lenses based on specific photographic needs
CLOBJ2	Understanding of digital camera mechanisms, including aperture, shutter speed, ISO, and their significance in photography.
CLOBJ3	Implement knowledge and skills related to marketing and promoting their photography work, including strategies for selling, exhibiting, participating in competitions, and understanding current marketing trends in the photography industry.
CLOBJ4	Analyse about metadata and its role in photography, particularly in manipulating technical information using RAW technology and software like Photoshop to enhance image quality.
CLOBJ5	Access various techniques and methods to express their creative vision through photography, experimenting with different styles and approaches in the digital realm.
CLOBJ6	Develop skills in composing visually appealing photographs by understanding the principles of composition and arranging visual elements within the frame effectively.

Course Learning Outcomes:

CLO1	Identify some component of photography and Improved technical skills: Basic photography classes will teach you the fundamentals of camera operation, exposure, and lighting.
CLO2	To understand how to use your camera to its full potential and create images that is properly exposed and well-lit.
CLO3	To Apply the ability to use natural and artificial light effectively to enhance the visual impact of their photographs
CLO4	Analyse By learning about composition, colour, and perspective, you'll be able to create images that are not only technically proficient but also visually compelling.
CLO5	Assess proficiency in operating and adjusting camera settings to achieve proper exposure.
CLO6	Create vision and explore different styles of photography.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	4	4	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Digital Camera Mechanism :** A basic photography course will help you understand the features of a Digital camera Mechanism, such as aperture, shutter speed, ISO, and how to use them effectively to create the kind of photos you want. **Characteristic of Lens:** Different focal length has different aesthetical use. According to need we'll choose our Lens. **Aesthetic of Composition:** In terms of Visual Experience composition is a very important element. It Is the arrangement of visual elements within the frame of the photograph.	33%	10
2	**Experience the Metadata**: Metadata is actually the technical information about the photograph, Using RAW technology we can manipulate the metadata through 'Photoshop'. **Experiment on Expression:** An Image is actually the expression of the photographer. How does he/she sees a particular thing or incident. In Digital era we can do various experiment on our expression and enhance the expression. **Business and Marketing for Photographers:** This is the most crucial part of the field, through the curriculum we'll learn how to sell or exhibit our photograph, how to take part in various competition and	33%	10

	learn about the present marketing strategy.		
3	**Documentary Photography:** Apart from the fiction, there is parallel world of documentary Photography. Great photographers like Kevin Carter, Danish Siddiqui has devoted there life in Documentary Photography and Photo Journalism. Students need to go out and Practically grab some images from daily livelihood of the society. **Photographers Study:** Students need to study great photographers and their work both from fiction and non- fiction genre	**33%**	**10**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Basic Photography, By Michael Langford | Focal Press
2. Digital Photography complete course: Everything you need to know in 20 weeks, By Patel, N. | DK Publishers, USA, Pub. Year 2021
3. Handbook of Photography, By James A. Folts & Ronaldo P. Lovel

- **Course Name:** Climate change & Sustainable Environment
  Course Code: 11011401VA01
  Prerequisite: Shall have the basic knowledge about environmental studies.
  Rationale: Will understand the basic interface between climate change and sustainability.

Course Learning Objectives:

CLOBJ1	Remember national and state policies related to climate change and sustainable development, as well as the roles of various stakeholders such as governments, NGOs, businesses, and communities in achieving SDGs.
CLOBJ2	Understanding of the components and dynamics of the global climate system, including the atmosphere, hydrosphere, biosphere, and lithosphere, and how they interact to shape Earth's climate.
CLOBJ3	Apply the Sustainable Development Goals (SDGs) outlined by the United Nations, understanding their significance in addressing climate change and promoting sustainable development worldwide.
CLOBJ4	Analyse the causes and consequences of climate change, including global warming, ozone layer depletion, acid rain, and the greenhouse effect, through case studies of nuclear accidents, chemical disasters, and climatic episodes.
CLOBJ5	Evaluate approaches to mitigating climate change, including energy conservation, the use of renewable energies (water, solar, wind, tidal, geothermal), water conservation techniques such as rainwater harvesting, and the importance of
CLOBJ6	Develop the concept of sustainable human development, considering the intersection of environmental, social, and economic factors, and understanding how various religions, cultural practices, and ethical frameworks contribute to environmental conservation and sustainable development efforts.

Course Learning Outcomes:

CLO1	Remember scientific principles behind climate change, including the greenhouse effect, and its implications for global ecosystems.

CLO2	Explain the differences between government and governance and the various ideas and meanings attached to the goal of sustainable development.
CLO3	Apply high-quality written and verbal communication skill.
CLO4	Analyse policy-making processes in regard to sustainability issues.
CLO5	Recommended the complexity and operations of governance systems and processes on international, national, and local levels.
CLO6	Creative work effectively in a team and in tutorial or workshop situations.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Climate Change:** Global Climate System Climate Change: Causes and Consequences: Global warming, ozone layer depletion, acid rain, and greenhouse effect case studies: nuclear accidents, chemical disasters, and climatic episodes	33%	10
2	**Sustainable Development:** Sustainable Development Goals: An overview Climate Change and Sustainable Development: National and State Policies Achieving Sustainable Development Goals: Role of Various Stakeholders Building Partnership for Climate Change and Sustainable Development	34%	10
3	**Sustainable Approach to Climate Change:** Energy Conservation: Use of Renewable energies: Water, Solar, Wind, Tidal, Geothermal Water conservation techniques: Rain Water Harvesting. Environmental Ethics & Public Awareness: Role of various religions and cultural practices in environmental conservation Sustainable Human Development.	33%	10
	Total	100%	30

Text Book and Reference Book:

1. Climate Change and Sustainable Development: Prospects for Developing Countries, By Anil Markandya, Kirsten Halsnæs
2. Climate Change and Sustainable Development Global Prospective, By R.K.Mishra, P.s.Janki Krishna & CH. Laskhmi Kuma
3. This Changes Everything: Capitalism vs The Climate, By Naomi Klein
4. The Uninhabitable Earth: Life After Warming (TextBook), By David Wallace-Wells

- **Course Name:** Basics of Inorganic Chemistry - I
  Course Code: 11010501DS03

Prerequisite: A basic understanding of high school-level chemistry
Rationale: Foundational understanding of the principles and properties of inorganic compounds

Course Learning Objectives:

CLOBJ1	Introduce students to the foundational principles of inorganic chemistry, including atomic structure, bonding, and periodic trends.
CLOBJ2	Familiarize students with the nomenclature of inorganic compounds, including ionic, covalent, and coordination compounds.
CLOBJ3	Explore the properties and reactivity of main group elements, transition metals, and their compounds.
CLOBJ4	Investigate the principles of coordination chemistry, including coordination number, ligands, and complex formation.
CLOBJ5	Understand the structure and properties of inorganic solids, including crystal lattices and types of solids.
CLOBJ6	Examine theories of acids and bases, including Lewis and Bronsted-Lowry concepts, and their applications in inorganic chemistry.

Course Learning Outcomes:

CLO1	Explain fundamental concepts of inorganic chemistry, including atomic structure and periodicity.
CLO2	Accurately name and write formulas for a variety of inorganic compounds.
CLO3	Predict the reactivity and properties of different elements and their compounds based on their position in the periodic table.
CLO4	Describe the formation and properties of coordination compounds, including their applications.
CLO5	Analyse the structures and properties of inorganic solids, including crystal structures and types.
CLO6	Apply the concepts of acids and bases to predict the behaviour of inorganic compounds in various chemical reactions.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	T	P	C	MSE	CE	P	Theory	P	Total
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weigh tage	Teaching Hours
1	**Concepts of atom and wave mechanics** Dual nature of electron: de-Broglie's equation, Heisenberg's Uncertainty Principle, Aufbau Principle, Pauli's Exclusion Principle and Hund's Rule for electron configuration. Quantum mechanical model of the atom, Schrodinger wave equation; H atom; Radial and angular wave functions: quantum numbers and concept of orbitals; Slater rule, Problems	33%	15

2	**Periodic properties** S-block elements Significance of periodicity in chemistry, Periodicity in atomic properties and its causes, explanation of general trends of periodic properties: atomic and ionic radii, ionization potential, electronegativity and electron affinity, Metallic and Nonmetallic Character, Reactivity, Oxidation States, Acid-Base Behavior. General characteristics and significance of group 1 and group 2 elements, Electronic configuration and atomic properties, Occurrence, extraction, and production of alkali metals, Reactions and halides, oxides, hydroxides, and carbonates compounds of alkali metals and alkaline earth metals, Applications of alkali metal and alkaline earth metals compounds in everyday life	**33%**	**5**
3	**Chemical bonding-1:** Explanation of following chemical bonds such as 1. Ionic bond, 2. Covalent bond, 3. Co-ordinate covalent bond, 4. Metallic bond and 5. Hydrogen bond Valence bond theory: Valence bond theory and its limitations, directional characteristics of covalent bond, shapes of simple inorganic molecules and ions, valence shall electron pair repulsion (VSEPR) theory to NH3, H3O+, SF4, CIF3, ICl-2 and H2O.	**33%**	**10**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Inorganic Chemistry By Puri and Sharma
2. Inorganic Chemistry By P. L. Soni and Katyal | Sultan Chand and Sons, New Delhi
3. Concise Inorganic Chemistry By J. D. Lee
4. Advanced Inorganic Chemistry By Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan, | S Chand & Co Ltd | Volume-II
5. Principles of Inorganic Chemistry by B. R. Puri, L. R. Sharma; K. C. Kalia | S Chand and

- **Course Name:** Chemical Practices
  Course Code: 11010501SE01
  Prerequisite: A fundamental understanding of basic chemistry concepts
  Rationale: Understanding and implementing safety protocols in chemical laboratories

Course Learning Objectives:

CLOBJ1	Understand fundamental safety protocols in a chemistry laboratory, including the proper usage of Personal Protective Equipment (PPE), knowledge of first aid procedures, and familiarity with the use of fire extinguishers.
CLOBJ2	Explain safe storage and handling practices for chemicals and glassware, including proper labelling, storage conditions, and awareness of compatibility issues.
CLOBJ3	Apply qualitative analysis of organic compounds, specifically detecting special elements (N, S, and halogens) using the Lassaigne test.

CLOBJ4	Analyse the effect of temperature on the solubility of NaCl in water, emphasizing the application of principles learned in the laboratory.
CLOBJ5	Assess and respond to potential hazards in the laboratory environment.
CLOBJ6	Perform pH determination using various methods such as litmus paper, pH strips, and pH meter for water samples.

Course Learning Outcomes:

CLO1	Remember the basic requirements and ethical considerations in a chemistry lab, including the use of Personal Protective Equipment (PPE), knowledge of first aid procedures, and the use of fire extinguishers.
CLO2	Explain types and coding of different glassware and chemicals used in the laboratory, as well as safe storage and handling practices.
CLO3	Apply knowledge of safe storage and handling principles to ensure the proper handling of chemicals and glassware in the laboratory setting.
CLO4	Analyze water samples using different methods (litmus paper, pH strip, pH meter) to determine pH levels, showcasing the ability to choose and apply appropriate analytical techniques.
CLO5	Evaluate the results of qualitative analysis of organic compounds, melting point determination, boiling point determination, and solubility experiments, assessing the accuracy and precision of the obtained data.
CLO6	Synthesize knowledge and skills to prepare and standardize solutions, calibrate pH/conductive meters, and conduct experiments to understand and analyze accuracy, precision, and errors in temperature, weighing, and volume measurements.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction of Chemical** Introduction, basics of atom & molecules; History and introduction of periodic table; Periodicity: Periodic law, arrangement of elements in the periodic table period, group diagonal relationship in the periodic table; Classification of Chemicals; Type and role of Indicators; Preparation and dilution of standard solutions- molarity, molality, normality, formality and mole fraction with definition and example.	33%	10
2	**Unit II: Handling and storage of Chemicals and glassware** Introduction & coding of different glassware; Handling of glassware and chemicals; systematic storage of glassware and Chemicals; Introduction of safety; Hazardous & it's	40%	12

	prevention, Basic safety terminology; hazardous properties of chemicals and their health effects; Routes of entry & its toxic effects; Introduction of personal protective equipment (PPE); Material safety Data Sheet (MSDS); Sampling and Labeling of Chemicals.		
3	**Basics of Laboratory Instrument** Introduction of Basics chemistry laboratory instrument; Calibration/ Validation of laboratory instrument; Main Concepts in Statistics- Mean, Median, Mode, Standard deviation, Variance; Error, Accuracy & precision; defection and interference; Qualitative and quantitative analysis of chemical.	**27%**	**8**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Fundamental of Industrial Safety and Health by K.U. Mistry | Siddharth Prakashan
2. Organic Chemistry by Morrison and Boyd. Pearson education
3. Organic chemistry by I.L. Finar, Volume-I & II. Longmans
4. A text book of organic chemistry – Arun Bahl, B.S. Bahl. S. Chand
5. Organic Chemistry by Solomons and Fryhle

- **Course Name:** Basics of Organic Chemistry - I
  Course Code: 11010501DS01
  Prerequisite: Students must have knowledge about fundamentals of organic chemistry
  Rationale: Understanding Life Processes, Medicine and Pharmaceuticals, Biochemistry and Molecular Biology, Materials Science, Chemical Industry, Food Chemistry, Research and Innovation

Course Learning Objectives:

CLOBJ1	Remember the fundamental molecular structures of organic compounds.
CLOBJ2	Understand and predict the outcome of common organic reactions.
CLOBJ3	Apply knowledge of isomerism to predict and describe the properties of organic compounds.
CLOBJ4	Analyse and describe reaction mechanisms, including electron-pushing arrows and the flow of electron pairs during reactions.
CLOBJ5	Evaluate principles of stereochemistry
CLOBJ6	Develop thorough understanding the principles of stereochemistry, including chirality and enantiomers.

Course Learning Outcomes:

CLO1	Remember basic Principles, of organic chemistry
CLO2	Understanding of the fundamental principles of organic chemistry, including molecular structure, bonding, and the classification of organic compounds.
CLO3	Apply IUPAC nomenclature rules to name a variety of organic compounds systematically.
CLO4	Analyse difference between different types of isomers and predict their properties based on structural considerations.

CLO5	Identify and classify common functional groups in organic molecules, and explain their impact on chemical reactivity
CLO6	Develop through knowledge of chemical bonds and reaction mechanism.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**IUPAC Nomenclature:** Introduction IUPAC nomenclature of alkanes, alkenes, alkynes haloalkanes, alcohol, ether, aldenydes, ketones, carboxylic acids, nitro compounds, nitrites including cyclic analogues and also aromatic compounds, naphthalene, anthrones and phenanthrones.	20%	6
2	**Reactive Intermediates and Mechanism of organic reaction:** Introduction of reactive intermediate Types of reagents: nucleophiles and electrophiles, reaction intermediates, carbocations, carbanions, free radicals, carbenes, nitrenes and benzynes, types of organic reaction: addition, elimination, substitution and rearrangement reaction, Alkyl haides: methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions.	50%	15
3	**Structure and bonding:** Introduction, Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes.	30%	9
	Total	100%	30

Text Book and Reference Book:

1. Organic chemistry by I.L. Finar, Volume-I & II. Longmans
2. Organic Chemistry by Morrison and Boyd. Pearson education
3. A text book of organic chemistry – Arun Bahl, B.S. Bahl. S. Chand (TextBook)
4. Organic Chemistry (Vol. I) By S M Mukherji, S P Singh and R P Kapoor Organic Chemistry

- **Course Name:** Basics of Industrial Chemistry-I
  Course Code: 11011702DS02

Prerequisite: students are expected to have a basic understanding of chemistry fundamentals, including concepts such as atomic structure, chemical bonding, chemical reactions, and stoichiometry

Rationale: knowledge of chemical processes used in industries, such as manufacturing, pharmaceuticals, petrochemicals, and environmental sectors. The course aims to equip students with the essential skills and knowledge required for careers in industrial chemistry or related fields, where they can contribute to research, development, production, and management of chemical processes in various industries.

Course Learning Objectives:

CLOBJ1	Introduce students to the basic principles and terminology of industrial chemistry.
CLOBJ2	Explore the major chemical processes used in industry, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the characteristics of raw materials and products commonly used in industrial applications.
CLOBJ4	Understand the principles of process design and the factors that influence the efficiency and sustainability of industrial processes.
CLOBJ5	Emphasize the importance of safety protocols and environmental regulations in industrial chemistry.
CLOBJ6	Introduce methods for ensuring product quality and compliance with industry standards.

Course Learning Outcomes:

CLO1	Describe the fundamental concepts and terminology related to industrial chemistry.
CLO2	Identify and explain key chemical processes used in various industrial applications.
CLO3	Analyse the properties and uses of raw materials in the context of industrial chemistry.
CLO4	Propose designs for chemical processes that maximize efficiency and sustainability.
CLO5	Recognize and apply safety protocols and environmental regulations relevant to industrial operations.
CLO6	Evaluate current trends and innovations in industrial chemistry, including sustainable and green practices.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction of Chemicals** Introduction, Scope, classification of Different Chemicals, Difference between Inorganic or organic chemical industries, Acids: Synthesis, Properties and uses of Nitric acid, Sulphuric acid, Hydrochloric acid, Industrial Gases: Synthesis,	**33%**	**15**

	Properties and uses of Hydrogen, Nitrogen, Oxygen, Carbon dioxide, helium, chlorine and Sulphur dioxide. Industrial solvents: Synthesis, properties and uses of Chloroform, Acetone, Ethyl acetate, ethanol, Dimethyl Formamide(DMF),Dimethyl sulfoxide (DMSO), Tetrahydrofuran (THF), Diethyl ether. Alkaline Chemicals :NaOH,Na2CO3,KOH,NaHSO3		
2	**Introduction of Material Sciences** Introduction, Classification of engineering materials, properties of materials, Process Basic concept of energy and mass balance during chemical reactions, Engineering requirements of materials, Level of structures, Structure–properties relationship in materials.	**25%**	**09**
3	**Product Development** Raw Materials to Intermediate to Fine Products, Different phases of matter, its properties and correlation with industrial applications, An introduction into the scope of different types of equipment needed in chemical technology during process development including reactor, pump, mill, extruders, column, etc.	**27%**	**08**
4	**Different types of Industries and their overview and major products** Petrochemical industry, Pharmaceutical Industry, Textile Industry, Paints and Pigment Industry, Ceramic and Clay Industry, Rubber Industry, Sugar industry, fertilizer, Paper and pulp industry, Detergent Industry, Food Industry, Glass Industry, Metal and Alloy Industry, Waste Industry, Polymer and Plastic Industry.	**15**	**06**
	Total	**100%**	**60**

Text Book and Reference Book:

1. Industrial Chemistry By B. K. Sharma, | Krishna Prakashan Pvt Ltd, Pub. Year 2011. Riegel's Handbook of Industrial Chemistry By J. A. Kent, | CBS Publishers, New York.
2. Engineering Chemistry By JAIN & JAIN | Dhanpat Rai and Sons

- **Course Name:** Lab - 2 (Inorganic Chemistry Practicals)
  Course Code: 11010501DS04
  Prerequisite: Proficiency in basic laboratory skills
  Rationale: The course emphasizes the application of titration techniques to real-world scenarios

Course Learning Objectives:

CLOBJ1	Develop the ability to determine the concentration of weak acids against strong bases (e.g., HCl and NaOH) and weak bases against strong acids (e.g., H2SO4) using titration techniques.
CLOBJ2	Understand mechanism of titration and role of indicator in titration.
CLOBJ3	Apply iodometric methods to estimate the amount of Cu+2 and Fe+3 ions in solutions containing CuSO4.5H2O and FeCl3.6H2O, respectively.

CLOBJ4	Analyze mixtures of acids and bases, determining the concentrations of both weak and strong components in the mixture
CLOBJ5	Learn the techniques of complexometric titration to estimate the hardness of water by determining the concentrations of Ca+2 and Mg+2 ions.
CLOBJ6	Develop the ability to determine the amounts of Ca+2, Mg+2, Zn+2, and ZnSO4 through complexometric titration, understanding the principles of chelation with EDTA.

Course Learning Outcomes:

CLO1	Remember principles of titration and recognize the procedures involved in determining the concentration of weak bases against strong acids (HCl, H2SO4) and weak acids against strong bases (NaOH).
CLO2	Understanding of the chemical reactions involved in the titration experiments, including the neutralization reactions between acids and bases.
CLO3	Apply titration techniques to determine the concentrations of both weak and strong acids and bases in various experimental setups, showcasing practical application skills.
CLO4	Analyze mixtures of acids and bases, distinguishing and quantifying the concentrations of individual components, such as weak acid with strong acid and weak base with strong base.
CLO5	Evaluate the accuracy and precision of the results obtained in the estimation of metal ions (Cu+2, Fe+3, Zn+2, Pb+2) using iodometric and complexometric titrations.
CLO6	Synthesize knowledge and skills in complexometric titration to determine the amounts of Ca+2 and Mg+2 ions in a given sample and to estimate chloride ions using Mohr's and Fajan's methods.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**4**	**2**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Exp. No.	**Name of the Experiment**
1	To determine the concentration of weak base against HCl
2	To determine the concentration of weak base against H2SO4
3	To determine the concentration of weak acid against NaOH
4	To determine the concentration of weak acid and strong acid from the mixture of the acids
5	To determine the concentration of weak base and strong base from the mixture of the bases
6	To estimate the amount of Cu+2 and CuSO4.5H2O in the given solution iodometrically.
7	To estimate the amount of Fe+3 and FeCl3.6H2O in given solution using internal and external Indicators

Exp. No.	Name of the Experiment
8	To determine amount of Ca+2 and Mg+2 in given sample using complexometric titration.
9	To estimate amount of chloride ions in given sample of Mohr's and Fajan's method.
10	To determine amount of Zn+2 and ZnSO4 by complexometric titration
11	Determination of the concentration of a metal ion by titration with EDTA
12	To determine the concentration of NaOH and Na2CO3 solution in mixture by using 0.05 M H2SO4 solution
13	To determine the concentration of FeSO4 (NH4)2 SO46H2O and K2Cr2O7 solutions using 0.02 M KMnO4 solution by using diphenylamine as an internal indicator.
14	To estimate the amount of Pb+2 in the given solution iodometrically.

Text Book and Reference Book:

1. Advanced Practical Physics for Students by B.L. Flint & H.T. Worsnop | Asia Publishing House.
2. Advanced Level Physics Practicals by Michael Nelson and Jon M. Ogborn | Heinemann Educational Publishers.
3. Text Book of Practical Physics (TextBook) By, Indu Prakash and Ramakrishna Kitab Mahal, New Delhi. |, 11th Edition, 2011,

- **Course Name:** Lab - 1 (Organic Chemistry Practicals)
  Course Code: 11010501DS03
  Prerequisite: Proficiency in basic laboratory techniques and safety procedures
  Rationale: Understanding and implementing safety protocols in chemical laboratories

Course Learning Objectives:

CLOBJ1	Understand fundamental safety protocols in a chemistry laboratory, including the proper usage of Personal Protective Equipment (PPE), knowledge of first aid procedures, and familiarity with the use of fire extinguishers.
CLOBJ2	Explain safe storage and handling practices for chemicals and glassware, including proper labelling, storage conditions, and awareness of compatibility issues.
CLOBJ3	Apply qualitative analysis of organic compounds, specifically detecting special elements (N, S, and halogens) using the Lassaigne test.
CLOBJ4	Analyse the effect of temperature on the solubility of NaCl in water, emphasizing the application of principles learned in the laboratory.
CLOBJ5	Assess and respond to potential hazards in the laboratory environment.
CLOBJ6	Perform pH determination using various methods such as litmus paper, pH strips, and pH meter for water samples.

Course Learning Outcomes:

CLO1	Remember the basic requirements and ethical considerations in a chemistry lab, including the use of Personal Protective Equipment (PPE), knowledge of first aid procedures, and the use of fire extinguishers.
CLO2	Explain types and coding of different glassware and chemicals used in the laboratory, as well as safe storage and handling practices.
CLO3	Apply knowledge of safe storage and handling principles to ensure the proper handling of chemicals and glassware in the laboratory setting.

CLO4	Analyze water samples using different methods (litmus paper, pH strip, pH meter) to determine pH levels, showcasing the ability to choose and apply appropriate analytical techniques.
CLO5	Evaluate the results of qualitative analysis of organic compounds, melting point determination, boiling point determination, and solubility experiments, assessing the accuracy and precision of the obtained data.
CLO6	Synthesize knowledge and skills to prepare and standardize solutions, calibrate pH/conductive meters, and conduct experiments to understand and analyze accuracy, precision, and errors in temperature, weighing, and volume measurements.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Exp. No.	Name of the Experiment
1	Basic requirement and ethics of chemistry lab (PPE's, First Aid, Fire Extinguisher, etc.)
2	Type and coding of different glassware and chemicals
3	Safe storage and handling of chemicals & glassware
4	Safe storage and handling of chemicals & glassware
5	Determine the pH by litmus paper, pH strip, and pH meter of water samples.
6	Qualitative Analysis of Organic Compounds: Detection of special elements (N, S and halogens) by lassaigne test
7	Determination of Melting Point of an Organic Compound-Benzoic Acid by using Thiele's tube
8	Determination of Boiling Points by Capillary Method- Acetone
9	Demonstration of basics of Bunsen Burner [perform & prepare glass capillary for melting point experiment]
10	Determination the effect of temperature on solubility of NaCl in water.
11	Prepare and standardization of 1 N NaOH, 0.5 M HCl, 1 N Oxalic Acid concentrated solution
12	Calibration of pH meter/conductive meter by different standard solution
13	Experiment on accuracy, precision & error on temperature, weighing and volume measurement.
14	Understand the Material Safety Data Sheet (MSDS) through live demonstration
15	Soil Analysis- Determination of Moisture contain, pH, organic carbon of soil samples

Text Book and Reference Book:

1. Advanced Practical Chemistry & Resource Pack By Thompson & Atteshlis, John Murray, 1990.Organic chemistry by I.L. Finar, Volume-I & II. Longmans
2. A Level Practical Chemistry, Students' Guide & Teachers' Guide, (0-521-37899-0 & 0-521-38696-9), Brian Ratcliff Cambridge, 1990.
3. Chemical Demonstrations: A, Handbook of Teachers of Chemistry, Volumes 1 & 2, (0-299-08890-1 & 0-299-10130-4), B Z Shakhashiri U of Wisconsin 1985.
4. Organic Chemistry Through Experiment (0-7135-2190-2) Waddington & Finlay Bell & Hyman 1977
5. Vogel, Arthur I. (Arthur Israel). Vogel's Textbook of Quantitative Chemical Analysis. Harlow, Essex, England : New York :Longman Scientific & Technical ; Wiley, 1989.

Semester: 2

- **Course Name:** Basic English-II
  Course Code: 00019302AE04
  Prerequisite: Basic Knowledge of Communication
  Rationale: Knowledge of Communication is essential for students

Course Learning Objectives:

CLOBJ1	Understand the definition of communication and recognize its significance in various contexts.
CLOBJ2	Explain the process of communication and its components.
CLOBJ3	Identify the levels and flow of communication within different organizational structures.
CLOBJ4	Recognize common barriers to effective communication and develop strategies to overcome them.
CLOBJ5	Define non-verbal communication and distinguish between its various forms, including kinesics, proxemics, paralinguistic, and chromatics.
CLOBJ6	Perform error analysis in written and spoken communication, focusing on tense usage, voice variations, and reported speech.

Course Learning Outcomes:

CLO1	Define communication and articulate its importance in various personal, professional, and societal contexts.
CLO2	Understanding of the process of communication, including its different levels and the flow of information within different communication structures.
CLO3	Solve barriers to effective communication and apply strategies to overcome these barriers in real-life scenarios.
CLO4	Analyse error analysis in written and spoken communication, focusing on tense usage, voice variations, and reported speech to identify areas for improvement.
CLO5	Evaluate own communication skills through activities such as reading comprehension, vocabulary building, idioms, phrases, synonyms, antonyms, theatrics (role-play), extempore speaking, application writing, and letter writing, focusing on elements, layouts, inquiries, complaints, and adjustments.
CLO6	Develop and apply effective communication skills, including non-verbal communication techniques such as kinesics, proxemics, paralinguistic, and chromatics, to convey messages accurately and appropriately in various situations.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
2	-	-	2	-	100	-	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	Definition of Communication & Importance of Communication, Definition and process of	7%	2

	communication		
2	Levels of Communication, Flow of Communication	**7%**	**2**
3	Barriers to effective Communication, Features of effective Communication	**7%**	**2**
4	Define non-verbal communication, Kinesics	**3%**	**1**
5	Proxemics, Paralinguistic, Chronemics	**3%**	**1**
6	Error Analysis (Tenses, voices & reported speech)	**7%**	**2**
7	Reading Comprehension	**3%**	**1**
8	Vocabulary Building, Idioms, Phrases, Synonyms, Antonyms	**7%**	**2**
9	Theatrics (Role Play)	**16%**	**5**
10	Extempore	**16%**	**5**
11	Application writing	**10%**	**3**
12	Letter writing (Elements, Layouts, Inquiry, Complain, & Adjustment,)	**14%**	**4**
	Total	**100%**	**30**

- **Course Name:** Basic Hindi-II

  Course Code: 00019302AE05
  Prerequisite: Knowledge of Hindi-I
  Rationale: Basic comprehensive skills and Hindi-I

Course Learning Objectives:

CLOBJ1	Remember key terms related to the Hindi language, such as grammar rules, vocabulary, and sentence structure.
CLOBJ2	Understand the main ideas and themes of Hindi literary works or cultural texts.
CLOBJ3	Apply knowledge of Hindi vocabulary to communicate in everyday situations, such as greetings, shopping, and asking for directions.
CLOBJ4	Analyse the structure and style of Hindi literature, including poetry, short stories, or essays.
CLOBJ5	Evaluate the appropriateness of Hindi language translations or interpretations.
CLOBJ6	Create original content in Hindi, such as stories, poems, or dialogues.

Course Learning Outcomes:

CLO1	Identify the sounds and symbols of the Hindi alphabet.
CLO2	Understand simple spoken and written Hindi passages on familiar topics.
CLO3	Apply their knowledge of Hindi in everyday situations, such as greetings, introductions, and basic conversations.
CLO4	Analyse the structure and content of simple Hindi texts, such as stories, poems, or dialogues.
CLO5	Evaluate the effectiveness of different language learning strategies for acquiring Hindi proficiency
CLO6	Create original content in Hindi, such as short stories, poems, or dialogues

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	

2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Advanced vocabulary:** Number 51 onwards, Telling tine, Greetings	**13%**	**4**
2	**Listening skills:** Short story, Short Conversation.	**20%**	**6**
3	**(Speaking Skills):** Self-Introduction, Day to Day Conversation, Elocution	**27%**	**8**
4	**Reading skills** Reading Comprehension, Short Story, Newspaper.	**20%**	**6**
5	**Writing skills:** Self-Introduction, Short message	**20%**	**6**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Hindi for Beginners published By Up To School Worksheets
2. Hindi Abhyaas Pustika Published By Seema Verma | Trishala Learning System
3. NCERT Workbook of Hindi for Grade-2
4. Rachnatmak Vyakaran by Suresh Pant and Himani Joshi | Pearson.
5. Matra Gyan Wonder House Books
6. Amoli Hindi Vyakaran by Dr. Nirmal Dal

- **Course Name:** Basic Gujarati-2

Course Code: 00019302AE06

Prerequisite: Knowledge of Gujarati-I

Rationale: Basic comprehensive skills and Gujarati-I

Course Learning Objectives:

CLOBJ1	Remember key terms related to the Gujarati language, such as grammar rules, vocabulary, and sentence structure.
CLOBJ2	Understand the main ideas and themes of Gujarati literary works or cultural texts.
CLOBJ3	Apply knowledge of Gujarati vocabulary to communicate in everyday situations, such as greetings, shopping, and asking for directions.
CLOBJ4	Analyse the structure and style of Gujarati literature, including poetry, short stories, or essays.
CLOBJ5	Evaluate the appropriateness of Gujarati language translations or interpretations.
CLOBJ6	Create original content in Gujarati, such as stories, poems, or dialogues.

Course Learning Outcomes:

CLO1	Identify the sounds and symbols of the Gujarati alphabet.
CLO2	Understand simple spoken and written Gujarati passages on familiar topics.
CLO3	Apply their knowledge of Gujarati in everyday situations, such as greetings, introductions, and basic conversations.

CLO4	Analyse the structure and content of simple Gujarati texts, such as stories, poems, or dialogues.
CLO5	Evaluate the effectiveness of different language learning strategies for acquiring Gujarati proficiency.
CLO6	Create original content in Gujarati, such as short stories, poems, or dialogues.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	-	100	-	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Advanced vocabulary:** Number 51 onwards, Telling tine, Greetings	13%	4
2	**Listening skills:** Short story, Short Conversation.	20%	6
3	**(Speaking Skills):** Self-Introduction, Day to Day Conversation, Elocution	27%	8
4	**Reading skills** Reading Comprehension, Short Story, Newspaper.	20%	6
5	**Writing skills:** Self-introduction, Short message	20%	6
	Total	100%	30

Text Book and Reference Book:

1. Text Technical Communication : Principles And Practice By Sangeetha Sharma, Meenakshi Raman | Oxford University Press
2. All in One (English-Gujarati) Manoj Publications
3. Gujarati Barakhadi by Sonika Agrawal Published by Notion Press
4. Varna Lekhan By Gujarati Books

- **Course Name:** Mathematical Aptitude

Course Code: 00019101SE01

Prerequisite: Basic numeracy skill

Rationale: Mathematical aptitude refers to the ability to reason, think critically, and apply mathematical principles to solve problems and make sense of the world around us.

Course Learning Objectives:

CLOBJ1	Understand and apply fundamental concepts of arithmetic, including numbers, highest common factor (HCF), lowest common multiple (LCM), square roots, and cube roots, to solve numerical problems efficiently and accurately.
CLOBJ2	Develop proficiency in solving problems involving ratio and proportion, including

	applications in comparison, scaling, mixing, and distribution scenarios, to analyze and solve real-world quantitative problems effectively.
CLOBJ3	Practise solving problems related to permutations and combinations, including applications in counting arrangements, selections, and probability calculations, to analyze and solve combinatorial problems across various domains.
CLOBJ4	Analyse concepts of percentage, average, and partnership, including shortcut techniques for calculating averages and distributing profits or expenses among partners, to analyse financial data and make informed decisions.
CLOBJ5	Evaluate proficiency in solving problems related to time, work, distance, boats, streams, mixtures, logarithms, progressions (arithmetic mean, geometric mean, harmonic mean), and series, to solve practical problems involving time management, resource allocation, and sequence analysis.
CLOBJ6	Develop the ability to solve problems related to interest (simple interest and compound interest), depreciation rates, profit-loss calculations, discounts, equations (linear and quadratic), and probability, to analyze financial transactions, investment decisions, and risk assessment scenarios effectively

Course Learning Outcomes:

CLO1	Remember and differentiate between numbers, including integers, fractions, decimals, and real numbers.
CLO2	Understand & analyse data presented in various forms, including tables, charts, and graphs, to extract meaningful information related to percentages, averages, and proportions.
CLO3	Apply knowledge of logarithms, exponential functions, and interest rates to solve problems related to financial calculations, including compound interest, depreciation, and annuity investments.
CLO4	Analyse and interpret data sets, including grouped and ungrouped data, to calculate measures of central tendency (mean) and dispersion (standard deviation) and draw meaningful conclusions about data distributions.
CLO5	Evaluate and critique data interpretation methods, including the accuracy and effectiveness of tabulation, bar graphs, pie charts, and line charts in conveying information and making comparisons.
CLO6	Synthesize information from multiple sources to solve problems related to mensuration, including calculating areas, perimeters, volumes, and surface areas of geometric shapes and solids.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	Numbers, HCF & LCM, Square Root & Cube Root, Ratio & Proportion, Permutations & Combinations, Percentage, Average-Shortcut averages, Partnership, Time -work & distance, Boats & streams, Mixtures, Logarithm	**40**	**12**

2	Progression (AM, GM, HM), Series, Interest (S.I. & C.I.) and depreciation rate, Profit-Loss & Discount, Equations (Linear & Quadratic), Probability	**40**	**12**
3	Mensuration I (Area & Perimeter), Mensuration II(Volume & Surface area), Grouped Data, Ungrouped Data (Mean and Standard Deviation) Data interpretation: (Tabulation, Bar Graph, Pie Chart, Line Chart).	**20**	**6**
	Total	**100%**	**30**

- **Course Name:** IPDC including history and culture of India and IKS-I

  Course Code: 00019302VA01

  Prerequisite: Basic knowledge of Social Science subject

  Rationale: IPDC aims to prepare students for the modern challenges they face in their daily lives. Promoting fortitude in the face of failures, Unity amongst family discord, Self-discipline amidst Distractions... and many more priceless lessons. The course focuses on morality and character development at the core of student growth, to enable students to become self-aware, sincere, and successful in their many roles - as an ambitious student, reliable employee, caring family member, and considerate citizen.

Course Learning Objectives:

CLOBJ1	Remember key event, figures and date in history of India
CLOBJ2	Understand diversity of Indian culture, including language, religions and customs.
CLOBJ3	Apply principles of Indian philosophy to analyse complementary issues.
CLOBJ4	Analyse influence of Indian philosophy various aspects of life such as ethics politics and art.
CLOBJ5	Evaluate impact of globalization on Indian culture and philosophy.
CLOBJ6	Create innovative solutions on cultural diversity based on principles of India

Course Learning Outcomes:

CLO1	Remember key events, figures and periods in history of India
CLO2	Describe basic tenets and principles of prominent Indian philosophy schools
CLO3	Apply concepts of Indian philosophy and culture to analyse contemporary issues and phenomenon
CLO4	Compare and Contrast different philosophical schools within Indian traditions
CLO5	Evaluate relevance of Indian knowledge system in modern world.
CLO6	Develop strategy for integrating Indian knowledge system into contemporary educational framework.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction and Remaking Yourself: Restructuring Yourself: Students learn how self-improvement enables them to secure a bright future for themselves. They will learn 6 powerful thought-processes that can develop their intellectual, physical, emotional, and spiritual quotients	**7**	**2**
2	Remaking Yourself: Power of Habit: Students will undergo a study of how habits work, the habits of successful professionals, and the practical techniques that can be used to develop good habits in their life.	**7**	**2**
3	Learning from Legends: Tendulkar & Tata: Students will learn from the inspirational lives of India's two legends, Sachin Tendulkar and Ratan Tata. They will implement these lessons through relatable case studies.	**7**	**2**
4	From House to Home: Listening & Understanding: Active listening is an essential part of academic progress and communications. Students will learn to listen with their eyes, ears, mind, and heart	**7**	**2**
5	Facing Failures: Welcoming Challenges: This lecture enables students to revisit the way in which they approach challenges. Through the study of successful figures such as Disney, Lincoln and Bachchan, students will learn to face difficulties through a positive perspective.	**7**	**2**
6	Facing Failures: Significance of Failures: Failure is a student's daily source of fear, negativity, and depression. Students will be given the constructive skills to understand failure as formative learning experiences.	**7**	**2**
7	My India My Pride: Glorious Past - Part 1: India's ancient Rishis, scholars, and intellectuals have made tremendous contributions to the world, they developed an advanced, sophisticated culture and civilization which began thousands of years ago. Students will learn the importance of studying India's glorious past so that they could develop a strong passion and pride for our nation.	**7**	**2**
8	My India My Pride: Glorious Past - Part 2: Our ancient concepts can be used to seek revolutionary ideas and to generate inspiration. Students will develop a deeper interest in India's Glorious Past – by appreciating the need to read about it, research it, write about it, and share it.	**7**	**2**
9	Learning from Legends: A.P.J. Abdul Kalam: Dr Kalam's inspirational life displayed legendary qualities which apply to students (1) Dare to Dream (2) Work Hard (3) Get Good Guidance (4) Humility (5) Use Your Talents for the Benefit of Others	**7**	**2**
10	Soft Skills Networking & Leadership: Students are taught the means of building a professional network and	**7**	**2**

	developing a leadership attitude.		
11	Soft Skills Project Management: Students will learn the secrets of project management through the Akshardham case study. They will then practice these skills through an activity relevant to student life	**6**	**2**
12	Remaking Yourself: Handling Social Media: Students will learn how social media can become addictive and they will imbibe simple methods to take back control.	**6**	**2**
13	Facing Failures Power of Faith: Students will learn about the : power and necessity of faith in our daily lives.	**6**	**2**
14	From House to Home Bonding the Family: Students will understand the importance of strong family relationships. They will learn how to overcome the generation gap and connect with their family more.	**6**	**2**
15	Selfless Service Seva: Students will learn that performing seva is beneficial to one's health, wellbeing, and happiness. It also benefits and inspires others.	**6**	**2**
	Total	**100%**	**30**

Reference Books:

1. Integrated Personality Development Course (TextBook) - By Bochasanwasi Akshar Purushottam Swaminarayan Sansth

- **Course Name:** Public Health Nutrition

Course Code: 19010202UE01
Prerequisite: Basic knowledge of Nutrition and Public Health
Rationale: Public health nutrition is the field of study that is concerned with promotion. of good health through prevention of nutrition–related illnesses or deficiencies in the population, and the government policies and programmed that are aimed at solving these problems. This course aims to provide an overview of public health nutrition, nutritional problems of public health significance and programmed to tackle nutritional problems.

Course Learning Objectives:

CLOBJ1	Remember major nutritional deficiency and their consequences in different populations
CLOBJ2	Understand relationship between diet, lifestyle and risk of chronic diseases.
CLOBJ3	Apply nutritional assessment methods to evaluate nutritional status of individuals and communities.
CLOBJ4	Analyse effectiveness of public health and nutrition programs and policies.
CLOBJ5	Evaluate outcomes of nutrition interventions on population health.
CLOBJ6	Develop educational materials on nutrition for diverse populations.

Course Learning Outcomes:

CLO1	Remember the global and national burden of nutritional deficiencies
CLO2	Understand dietary habits and relate these to individual, social, cultural and economic factors

CLO3	Apply public health nutrition problems in high-income and low-income countries respectively, and discuss long term and short-term countermeasures
CLO4	analyse role and impact of different policy documents, international agreements and regulations of importance for public health nutrition activities on a national and international level
CLO5	Evaluate & compile scientific material in the field of public health nutrition
CLO6	Apply nutritional health in daily life.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to public health nutrition** : History of the development of nutrition science Understanding the role of food and nutrients for health Nutrition Transition: Demographic, economic transition, poverty alleviation, food consumption patterns Determinants of nutritional status of individual & populations The need and adequacy of nutrients including the nutritional adequacy of various physiological groups according to the life cycle (from preconception to the elderly) Nutritional status assessment –MUAC, Weight for age, Height for age, Weight for height, BMI Definitions of various nutrition and health indicators	30	12
2	**Major nutrition deficiencies as public health challenge Undernutrition:** Global and Indian prevalence of undernutrition, risk factors consequences Major nutritional Problems – etiology, prevalence, clinical manifestations, preventive and therapeutic measures for: Macro and micro nutrient deficiencies. Other nutritional problems- etiology, prevalence, clinical manifestations, preventive and therapeutic measures for: lathyrism, dropsy, aflatoxicosis, alcoholism and fluorosis. Nutrition and Non-communicable diseases – Overweight, obesity and chronic degenerative diseases	30	12
3	**National nutrition programmes and policies:** Programmes and policies on nutrition and health (National and Global) 3.2. United Nations (UN) Decade of Action on Nutrition (2016 - 2025) 3.3. Overview of Sustainable Development Goals (SDGs) - keeping Nutrition at centre stage	10	5
4	**Food and nutrition security:** Factors affecting food security, indicators and systems	10	5

	(Global & national) 4.2. Identification and measurement of food insecurity (FIA, ISMAP) 4.3. Food production, access, distribution, availability, losses and consumption 4.4. Socio-cultural aspects of dietary patterns and their implications for nutrition and health		
5	**Approaches and Strategies for improving nutritional status and health:** Programmatic approaches, their advantages and demerits, feasibility, and available resources Health-based interventions, food-based interventions including: Fortification and genetic improvement of foods, supplementary feeding, nutrition education for behaviour change. Case studies: Community-based preventive and management programmes; screening approaches, etc.	**7**	**2**
	Total	**100%**	**45**

Reference Books:

1. Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri Kumud Khanna, Nutrition and Dietetics, 2014 (TextBook).
2. Michael J. Gibney, Barrie M. Margetts, John M. Kearney, Lenore Arab, Public Health Nutrition, Wiley India Pvt. Ltd (TextBook)
3. Park Textbook of Preventive and Social Medicine, K Park, 21 st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS (TextBook)

- **Course Name:** Maintenance of Household Apparatus

Course Code: 03010602UE01

Prerequisite: Knowledge of Physics and Mathematics up to 12th science level.

Rationale: This course provides maintenance details of household appliances essential to prolong their lifespan, ensure their function efficiently, and prevent costly repairs or replacements

Course Learning Objectives:

CLOBJ1	Remember common household apparatus and their functions.
CLOBJ2	Explain Principles behind the operation of household apparatus
CLOBJ3	Demonstrate proper maintenance techniques for different household apparatus.
CLOBJ4	Evaluate performance of household apparatus to identify area for improvement.
CLOBJ5	Assess effectiveness of maintenance procedures on the performance of household apparatus.
CLOBJ6	Develop comprehensive maintenance plans for specific household apparatus.

Course Learning Outcomes:

CLO1	Remember concepts, perform calculations, and identify practical applications and assess electrical loads and power ratings of household appliances.
CLO2	Understanding of electrical circuits including the ability to apply concepts, perform calculations, and identify practical applications and assess electrical loads and power ratings of household appliances.
CLO3	Apply multi-meter to measure various electrical quantities accurately, and apply

	measurement techniques to assess power consumption and energy efficiency of electrical appliances.
CLO4	Analyse a comprehensive understanding of earthing and grounding systems in residential buildings, recognizing the significance of grounding for electrical safety, and showcasing practical skills.
CLO5	Interpret various electrical wiring systems employed in households, encompassing staircase and Godown wiring, and competence in hands-on wiring connections while prioritizing safety measures.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Understanding Electrical Circuits Series and parallel circuits**: Concepts, calculations, and applications. Electrical loads and power ratings of household appliances. Safety considerations and working with electrical circuits and appliances.	18	8
2	**Electrical Measurements:** Measurement of voltage, current, and resistance using multimeters. Measurement of power consumption and energy efficiency of electrical appliances. Understanding power factor and its significance in household appliances. Comparison between AC and DC circuit. Understand the difference between various measuring instruments between AC and DC circuit.	18	8
3	**Earthling and Grounding:** Detailed study of earthing and grounding systems in residential buildings. Pipe earthing and plate earthing of the electrical system. Importance of grounding for electrical safety and protection of appliances. Practical demonstration and installation of earthing systems	18	8
4	**Types of Wiring:** Study of different types of electrical wiring systems used in households. Staircase wiring, Godown wiring. Wiring for lighting circuits, power outlets, and specialized appliances. Hands-on practice on wiring connections and safety measures.	13	6
5	**Maintenance of Household Appliances:** Understanding the common components of household appliances. Techniques for cleaning and maintaining refrigerators, ovens, microwaves, and dishwashers. Practice- preventive maintenance, regular cleaning, oiling, greasing of household gadgets like fans, coolers, water pump motors etc. Practice- Replacement of damaged switches, MCB, fan- capacitor, regulator, and lighting points i.e. holder, choke, starters, water coolers, and their pump & motor. Practice- Maintenance of	20	9

	electrical equipment's like- iron, toaster, induction-plate & cooker,ups ,gyser and inverter. Practice: Basic maintenance of AC. Practice: Basic maintenance of Refrigerator. Troubleshooting common problems in appliances and basic repairs. Concept of smart technology.		
6	**Safety and Precautions:** Fire safety and prevention measures for electrical appliances. Identifying potential electrical hazards and safety measures. Safe handling of electrical shocks and emergency response procedures	**13**	**6**
	Total	**100%**	**45**

Reference Books:

1. Electricity and Basic Electronics By Stephen R. Matt | Goodheart-Willcox Co Inc.,U.S | Revised edition, Pub. Year 1982
2. Home Maintenance For Dummies By J Carey | John Wiley & Sons Inc | 2nd, Pub. Year 2009
3. Electrical Wiring Residential (TextBook) By Ray C. Mullin and Phil Simmons | Delmar Cengage Learning | 17th edition, Pub. Year 2011

- **Course Name:** Human Psychology

Course Code: 15010402UE01

Prerequisite: Shall have the basic knowledge of human biology and English language

Rationale: Students will have basic understanding of different concepts of Psychology and various mental processes.

Course Learning Objectives:

CLOBJ1	Define fundamental concepts and theories in psychology, including behavior, cognition, emotion, and personality.
CLOBJ2	Critically evaluate various research methodologies used in psychology, including experiments, surveys, and observational studies.
CLOBJ3	Explain the biological bases of behavior, including the roles of genetics, neuroanatomy, and neurochemistry.
CLOBJ4	Analyze cognitive processes such as perception, memory, learning, and decision-making.
CLOBJ5	Understand the stages of human development and the psychological changes that occur across the lifespan.
CLOBJ6	Develop critical thinking skills to analyze psychological research and apply theoretical concepts to real-world situations.

Course Learning Outcomes:

CLO1	Differentiate between scientific and non-scientific information about human behavior and mental processes
CLO2	Describe the role of nature and nurture in the development of human beings
CLO3	Explain psychological processes involved in sensation, perception and thinking
CLO4	Describe models of personality and its approaches
CLO5	Analyze the factors affecting psychological concepts pertaining to sexuality and gender

CLO6	Apply the principles of psychology for the modification of their personality

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Unit I Human Development:** Meaning, Difference between Growth, Development, Maturation and Evolution Factors Influencing Development Overview of Developmental stages Prenatal stage Infancy Childhood Challenges of Adolescence Adulthood Old Age	17	10
2	**Unit II Sensation, Attention & Perception:** Sensation: Definition, types Attention: Definition, Types Perception: Figure-Ground perception, perceptual constancies: shape, size, brightness; Depth perception: monocular and binocular cues; illusions	17	10
3	**Unit III Thinking:** Nature and Processes Problem Solving Reasoning Decision Making Developing Creative Thinking Barriers to Creative Thinking Strategies for Creative Thinking	17	10
4	**Unit IV Intelligence:** Theories of Intelligence, Multiple Intelligence theory, Triarchic Theory of Intelligence, PASS Model of Intelligence, Individual Differences in Intelligence Emotional Intelligence.	17	10
5	**Unit V Personality:** Concept of Self and Personality Major Approaches of Personality Trait & Type Approaches Five-Factor Model Psychodynamic Approach Behavioural Approach Humanistic Approach Refrigerator. Troubleshooting common problems in appliances and basic repairs. Concept of smart technology.	16	10
6	**Unit VI Sexuality and Gender:** Physical and psychological side of psychology Gender theories Human sexual behavior Sexual dysfunction and problems	16	10
	Total	100%	60

Reference Books:

1. Introduction to psychology By Baron R | McGraw Hill Publishing House, New Delhi
2. Psychology By Ciccarelli, S. K. & Meyer, G. E. (2008), | Pearson Education
3. Introduction to Psychology By Clifford.T Morgan | Tata Mcgraw Hill

- **Course Name:** Digital Health

  Course Code: 19010002UE01

  Prerequisite: Basic Knowledge of Healthcare Systems, Medical Science, Information Technology Literacy, Healthcare Terminology, Regulatory and Ethical Considerations..

  Rationale: Emergence of Digital Health Technologies, Data-Driven Decision Making, Interdisciplinary Nature & Improved Patient Outcomes.

Course Learning Objectives:

CLOBJ1	Remember the Interdisciplinary Nature of Digital Health: Identify the diverse disciplines and stakeholders involved in digital health, including healthcare providers, technologists, policymakers, researchers, and patients.
CLOBJ2	Understand the historical development and key milestones in the field of digital health, including the adoption of electronic health records (EHRs), emergence of telemedicine, and advancements in wearable technologies.
CLOBJ3	Apply the functionalities and significance of health information technologies such as Electronic Health Records (EHRs), Health Information Exchange (HIE), and interoperability standards in facilitating data exchange and continuity of care.
CLOBJ4	Analyse the capabilities and potential applications of wearable technologies and remote monitoring devices in healthcare, including monitoring vital signs, tracking physical activity, and managing chronic conditions.
CLOBJ5	Evaluate the effectiveness, scalability, and regulatory considerations of telemedicine and health applications for chronic disease management and remote patient monitoring.
CLOBJ6	Create awarness related to data privacy, patient consent, data security, and equity in access to digital health technologies, and their implications for research, development, and implementation.

Course Learning Outcomes:

CLO1	Remember the interdisciplinary nature of digital health, recognizing the contributions of various stakeholders and disciplines such as medicine, technology, policy, and entrepreneurship.
CLO2	Understand functionalities and significance of health information technologies, including Electronic Health Records (EHRs), Health Information Exchange (HIE), and interoperability standards, in facilitating data exchange and healthcare delivery.
CLO3	Apply knowledge of wearable technologies and remote monitoring devices to analyse their potential applications in healthcare, including disease management, preventive care, and patient engagement.
CLO4	Analyse the impact of health analytics and big data in healthcare, including their role in improving clinical decision-making, population health management, and personalized medicine.
CLO5	Evaluate the future trends and emerging technologies in digital health, including Internet of Things (IoT) applications, block chain in healthcare, and other transformative technologies, in terms of their potential impact, scalability, and ethical considerations..
CLO6	Synthesize knowledge of artificial intelligence (AI) and machine learning applications in healthcare to propose innovative solutions for diagnostics, treatment optimization, and predictive analytics.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Foundations of Digital Health Overview of Digital Health Evolution and milestones in Digital Health Interdisciplinary nature of Digital Health Key stakeholders and their roles Health Information Technologies: Electronic Health Records (EHR), Health Information Exchange (HIE), Standards, and Interoperability	25%	15
2	Patient-Centric Technologies Wearable Technologies and Remote Monitoring Telemedicine and telehealth Mobile Health (mHealth) Applications Chronic disease management using mobile technologies Regulatory considerations for mobile health apps	25%	15
3	Data Analytics and Artificial Intelligence in Healthcare Health Analytics and Big Data Role of data analytics in healthcare Big data applications in health Artificial Intelligence in Healthcare Machine learning applications in diagnostics and treatment	25%	15
4	Innovation, Ethics, and Future Trends Digital Health Start-ups and Innovations Case studies of successful digital health innovations Entrepreneurship in digital health Regulatory and Ethical Considerations Regulatory frameworks for digital health products Ethical considerations in digital health research and development Future Trends and Emerging Technologies Internet of Things (IoT) in healthcare Block chain applications in healthcare Emerging technologies shaping the future of digital health	25%	15
	Total	100%	60

Text Book and Reference Book:

1. Digital Health: A Framework for Healthcare Transformation"By Marion J. Ball, Patricia C. Dykes, and Kathryn H. Bowles | Springer
2. Introduction to Digital Health By Jörg F. Debatin, Nassir Navab, Christoph Seebauer | Springer
3. The Fourth Industrial Revolution By Klaus Schwab | Crown Business
4. Healthcare Information Technology Exam Guide for CompTIA Healthcare IT Technician and HIT Pro Certifications By Kathleen A. McCormick | McGraw-Hill Education

5. Digital Health: Scaling Healthcare to the World By Homero Rivas, Paul Cerrato, and John Mattison | CRC Press

- **Course Name:** Fundamentals of Industrial Chemistry-I

  Course Code: 11011702DS01

  Prerequisite: Understanding the various stages of the paper and pulp manufacturing process, including pulping, bleaching, and papermaking, is crucial

  Rationale: 1. Chemistry and chemical engineering are fundamental as they underpin the processes involved in converting raw materials into paper and pulp. 2. A background in chemistry and biochemistry is essential to comprehend the chemical transformations during sugar production. 3. Materials science, chemistry, and physics are crucial for understanding the unique properties of glass and the processes involved in its production.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.
CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.
CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Paper and Pulp Industries:** Introduction, Manufacturing, Types of pulp, manufacturing, calendaring and uses of paper, Ecological problems of Indian pulp and paper industries. **Detergents:** Introduction and classification of detergents, detergent, Physico-chemical Properties, Biodegradability, eco-friendly, applications, manufacturing of shampoos	50%	15
2	**Sugar Industry:** Introduction, Raw Materials, Manufacturing Process of sugar from sugar cane, properties of sugar, recovery of sugar from molasses.	25%	8
3	**Glass Industry:** Introduction, Raw Materials, intermediate glass making oxides, Manufacture of ordinary glass, melting, Shaping, Annealing, Applications, varieties of glass, Special glasses. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, colored glass, photosensitive, etc.	25%	12
	Total	100%	30

Text Book and Reference Book:

1. Industrial Chemistry By B. K. Sharma, | Krishna Prakashan Pvt Ltd, Pub. Year 2011. Riegel's Handbook of Industrial Chemistry By J. A. Kent, | CBS Publishers, New York.
2. Engineering Chemistry By JAIN & JAIN | Dhanpat Rai and Sons

- **Course Name:** Basics of Organic Chemistry-II
  Course Code: 11010502DS01
  Prerequisite: A fundamental understanding of general chemistry concepts such as atomic structure, chemical bonding, and chemical reactions is essential.
  Rationale: Organic chemistry serves as the foundation for understanding the structure, properties, and reactions of carbon-containing compounds, which are ubiquitous in biological systems and many industrial processes.

Course Learning Objectives:

CLOBJ1	Remember and differentiate between various functional groups including carboxylic acids, aldehydes, ketones, haloalkanes, esters, ethers, alcohols.
CLOBJ2	Understand the principles of redox reactions in organic chemistry, delineating oxidation and reduction processes.
CLOBJ3	Apply proficiency in utilizing common reducing agents (e.g., hydrogen gas, metal

	hydrides, and catalytic hydrogenation) and oxidizing agents (e.g., potassium permanganate, chromic acid, Jones reagent) in specific organic transformations.
CLOBJ4	Analyse the unique properties of alkynes, including acidity and formation of acetylides, and understand their preparation methods and reactions, including hydrogenation, halogenation, and hydration
CLOBJ5	Evaluate the properties, nomenclature, and preparation techniques of alkenes, including geometric isomerism, electrophilic addition reactions, and reactions involving hydrohalogenation, hydration, oxymercuration-demercurations, hydroboration, and ozonolysis.
CLOBJ6	Develop structures using preparation methods (e.g., hydrogenation of alkenes and alkynes, reduction of alkyl halides), and reactions such as combustion, halogenation, and Corey House synthesis.

Course Learning Outcomes:

CLO1	Remember the structures and properties of carboxylic acids, aldehydes, ketones, haloalkanes, esters, ethers, alcohols, phenols, epoxides, and nitrogen-based functional groups.
CLO2	Understand the significance of redox reactions in organic chemistry and their role in synthesizing organic compounds.
CLO3	Apply knowledge of reduction reactions to predict and carry out organic synthesis using common reducing agents.
CLO4	Analyze the mechanisms and outcomes of reactions involving alkanes, alkenes, and alkynes, including combustion, halogenation, dehydration, and hydrohalogenation.
CLO5	Evaluate the effectiveness of different reducing and oxidizing agents in specific organic transformations.
CLO6	Design synthetic pathways for the preparation of alkanes, alkenes, and alkynes using appropriate reagents and reaction conditions.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Functional group** Introduction, Comprehensive discussion of carboxylic acid, aldehydes, ketones, halo alkane, Esters, Ether, Alcohol, phenol, epoxide and nitrogen based functional groups.	**25%**	**7**
2	**Reducing and Oxidizing agents** Explanation of redox reactions and their significance in organic chemistry, Introduction to reduction reactions and their importance in organic synthesis, common reducing agents: hydrogen gas (H_2), metal hydrides ($LiAlH_4$, $NaBH_4$), and catalytic hydrogenation, Introduction to oxidation reactions and their role in organic synthesis, common oxidizing agents:	**25%**	**8**

	potassium permanganate (KMnO4), chromic acid (H_2CrO_4), and Jones reagent (CrO_3-H_2SO_4), Use of reducing agents and oxidizing agents in specific transformations		
3	**Basics of Laboratory Instrument** Alkane: Introduction, Preparation of alkanes: Hydrogenation of alkenes and alkynes, Reduction of alkyl halides (Metal and mineral acids, Grignard reagent) Corey House synthesis. Reactions: Combustion and Halogenation, Free radical mechanism (orientation, reactivity, transition state and reaction intermediates, stability and relative energy of free radicals). **Alkenes:** Introduction, Geometric isomerism and Nomenclature, Preparation of alkenes from halides, Dehydration of alcohols and Dehalogenation of vicinal dihalides, Saytzeff's rule. Electrophilic addition reactions and Orientation: Mechanism of addition of H_2, X_2, HX, H_2SO_4, H_2O and X_2/H_2O, Addition of alkene, Oxymercuration-demercurations, Hydroboration, Hydroxylation(syn. And anti), Structure, Reactivity and Stability of Allyl and Vinyl radicals, Ozonolysis and its use in structure determination.	**50 %**	**15**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Organic Chemistry by Morrison and Boyd. Pearson education (TextBook)
2. Organic chemistry by I.L. Finar, Volume-I & II. Longmans
3. A text book of organic chemistry – Arun Bahl, B.S. Bahl. S. Chand
4. Organic Chemistry by Solomons and Fryhle

- **Course Name:** Lab-2 (Inorganic Quantitative Analysis)

Course Code: 11010502DS04

Prerequisite: A solid foundation in analytical chemistry principles, including titration techniques, spectrophotometry, and calibration methods, is essential for accurate quantification of inorganic compounds.

Rationale: Inorganic quantitative analysis facilitates precise measurement of elemental composition and concentration in samples, crucial for quality control in industries such as pharmaceuticals, environmental monitoring, and materials science.

Course Learning Objectives:

CLOBJ1	Remember cations present in a given solution through systematic qualitative analysis techniques, including precipitation, complexation, and flame tests.
CLOBJ2	Understanding of the underlying chemical reactions involved in inorganic qualitative analysis, including precipitation reactions, complexation reactions, and redox reactions.
CLOBJ3	Apply anions in a solution using qualitative analysis methods such as precipitation reactions, selective precipitation, and acid-base reactions
CLOBJ4	Analyze separation techniques such as filtration, precipitation, and extraction to isolate and separate ions in complex mixtures, facilitating the identification of individual ions through subsequent qualitative analysis steps

CLOBJ5	Evaluate experimental data obtained from qualitative analysis experiments to deduce the presence of specific ions in a sample, considering factors such as solubility, color changes, and formation of precipitates.
CLOBJ6	Develop practical laboratory skills necessary for conducting inorganic qualitative analysis experiments, including proper technique in handling reagents, interpreting results, and recording observations.

Course Learning Outcomes:

CLO1	Remember the principles and techniques of inorganic qualitative analysis. Remember the characteristic properties and reactions of common cations and anions.
CLO2	Understand the theoretical basis of inorganic qualitative analysis, including precipitation, complexation, and redox reactions.
CLO3	Apply knowledge of inorganic qualitative analysis techniques to identify unknown cations and anions in solution.
CLO4	Analyse experimental data from qualitative analysis experiments to identify the presence of specific cations and anions in a given sample.
CLO5	Evaluate the reliability and accuracy of qualitative analysis results obtained through experimental procedures.
CLO6	Create experimental procedures for the qualitative analysis of unknown inorganic samples, including detailed steps for separation and identification of ions.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**4**	**2**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Exp. No.	**Name of the Experiment**
1	Inorganic qualitative Analysis: $CuCO_3$
2	Inorganic qualitative Analysis: KI
3	Inorganic qualitative Analysis: $SrSO_4$
4	Inorganic qualitative Analysis: $CdCl_2$
5	Inorganic qualitative Analysis: $CoSO_4$
6	Inorganic qualitative Analysis: $FeSO_4$
7	Inorganic qualitative Analysis:$K_2Cr_2O_7$
8	Inorganic qualitative Analysis: K_2CrO_4
9	Inorganic qualitative Analysis: $BaCl_2$
10	Inorganic qualitative Analysis: $AlPO_4$
11	Inorganic qualitative Analysis:Na_3PO_4
12	Inorganic qualitative Analysis:NH_4SO_4
13	Inorganic qualitative Analysis: $NiCO_3$
14	Inorganic qualitative Analysis: $ZnSO_4$
15	Inorganic qualitative Analysis: $MnCl_2$

Text Book and Reference Book:

1. Vogel's Text Book of Quantitative Chemical Analysis, G. H. Jeffery, J. Basset, J. Mendham

- **Course Name:** Lab-1 (Organic Practicals)
  Course Code: 11010502DS03
  Prerequisite: Familiarity with organic chemistry nomenclature, functional groups, and reaction mechanisms is necessary to identify and analyze organic compounds accurately.
  Rationale: Organic spotting enables the rapid identification and characterization of organic compounds, aiding in chemical analysis, synthesis, and quality control in various fields such as pharmaceuticals, forensics, and environmental science.

Course Learning Objectives:

CLOBJ1	Remember elemental analysis techniques such as combustion analysis, gravimetric analysis, and spectroscopic methods to determine the elemental composition of organic compounds accurately.
CLOBJ2	Understand functional groups within organic molecules using spectroscopic methods (e.g., IR spectroscopy, NMR spectroscopy) and chemical tests.
CLOBJ3	Apply knowledge of metallurgical processes to explain the extraction of metals from ores.
CLOBJ4	Analyse the factors influencing the occurrence and distribution of minerals and ores.
CLOBJ5	Evaluate the historical significance of metallurgical advancements in shaping human civilization.
CLOBJ6	Develop sense of elemental analysis techniques, functional groups.

Course Learning Outcomes:

CLO1	Remember principles and techniques used in elemental analysis and functional group identification.
CLO2	Understand the significance of elemental analysis in determining the composition of organic compounds.
CLO3	Apply knowledge of elemental analysis techniques to determine the elemental composition of given organic compounds.
CLO4	Analyse spectral data from IR and NMR spectroscopy to identify specific functional groups present in organic compounds.
CLO5	Evaluate the reliability and accuracy of spectroscopic data in identifying functional groups and determining compound structures.
CLO6	Create strategies for the systematic analysis and identification of unknown organic compounds using a combination of elemental analysis and spectroscopic methods.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
-	**-**	**4**	**2**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Exp. No.	Name of the Experiment
1	Determination of elements, functional group analysis and identification of given organic compound: Benzoic acid
2	Determination of elements, functional group analysis and identification of given organic compound: beta-naphthol
3	Determination of elements, functional group analysis and identification of given organic compound: oxalic acid
4	Determination of elements, functional group analysis and identification of given organic compound: Urea
5	Determination of elements, functional group analysis and identification of given organic compound: Glucose
6	Determination of elements, functional group analysis and identification of given organic compound: Thiourea
7	Determination of elements, functional group analysis and identification of given organic compound: chlorobenzene
8	Determination of elements, functional group analysis and identification of given organic compound: Naphthalene
9	Determination of elements, functional group analysis and identification of given organic compound: Acetone
10	Determination of elements, functional group analysis and identification of given organic compound: Ethyl acetate
11	Determination of elements, functional group analysis and identification of given organic compound: Aniline
12	Determination of elements, functional group analysis and identification of given organic compound: Dinitrobenzene
13	Determination of elements, functional group analysis and identification of given organic compound:Benzaldehyde
14	Determination of elements, functional group analysis and identification of given organic compound: Acetophenone
15	Determination of elements, functional group analysis and identification of given organic compound: succinic acid

- **Course Name:** Basics of Inorganic Chemistry - II
  Course Code: 11010502DS02
  Prerequisite: Proficiency in general chemistry principles, including atomic structure, chemical bonding, and stoichiometry, is necessary to grasp the complexities of inorganic compounds.
  Rationale: Inorganic chemistry elucidates the behavior and properties of non-carbon-containing compounds, vital for understanding materials science, environmental processes, and various industrial applications.

Course Learning Objectives:

CLOBJ1	Remember basic principles of molecular orbital theory, including the formation of molecular orbitals through linear combination of atomic orbitals (LCAO method).
CLOBJ2	Understand the basic principles of crystal field theory and its application in

	explaining the properties of transition metal complexes.
CLOBJ3	Apply the molecular orbital method to predict the electronic structure and bonding in homo-nuclear diatomic molecules such as N2, O2, H2, He2, Li2, Be2, B2, H2+, He2+, O2-, O2-2, and F2.
CLOBJ4	Analyse and interpret molecular orbital diagrams for various diatomic molecules, elucidating their bonding and electronic configurations.
CLOBJ5	Evaluate rules for the linear combination of atomic orbitals, including s-s, s-p, and p-p orbital combinations
CLOBJ6	Apply crystal field theory to predict the electronic configurations, magnetic properties, and colors of transition metal complexes.

Course Learning Outcomes:

CLO1	Remember the rules for linear combination of atomic orbitals (LCAO method) and various orbital combinations (s-s, s-p, p-p) involved in molecular orbital theory.
CLO2	Explain the concept of molecular orbital theory and its application in predicting the electronic structure of homo-nuclear diatomic molecules.
CLO3	Analyse examples of molecular orbital treatment for different diatomic molecules to understand their bonding and electronic configurations.
CLO4	Apply the molecular orbital method to predict the electronic configurations of specific homo-nuclear diatomic molecules, such as N2, O2, and H2.
CLO5	Evaluate the effectiveness of molecular orbital theory in predicting the properties and behaviours of homo-nuclear diatomic molecules.
CLO6	Design molecular orbital diagrams for various homo-nuclear diatomic molecules, illustrating their bonding and electronic configurations.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Chemical bonding**: Basic Principle of Molecular orbital theory, Molecular Orbital Method, LCAO Mehtod, s-s Combination of Orbital, s-p Combination of Orbitals, p-p Combination of Orbitals, Rules for Linear Combination of Atomic Orbitals, Examples of Molecular Orbital Treatment, for Homo Nuclear Diatomic Molecules N_2,O_2, H_2, He2, Li_2, Be2, B2, H2+, He2+, O2-, O2-2 and F2. Introduction of Crystal Field Theory (CFT)	**40 %**	**12**
2	**p and d block elements:** General electronic configuration of p block elements, trends in atomic size, ionization energy, electron affinity, electronegativity, and chemical reactivity, Occurrence, preparation, and uses of important	**30%**	**9**

	p-block elements and compounds, General electronic configuration of d block elements, Properties of transition metals: metallic character, ionization energy, atomic and ionic radii, magnetic properties, and melting/boiling points		
3	**Metallurgy:** Definition, scope, and significance of metallurgy, Historical overview of metallurgical advancements, Introduction to minerals and ores, Classification of minerals and their occurrence, Ore formation processes, Crushing, grinding, and screening of ores, Concentration techniques: gravity separation, flotation, magnetic separation	**30%**	**9**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Advanced Inorganic Chemistry By Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan, | S Chand & Co Ltd | Volume-II
2. Inorganic Chemistry By Puri and Sharma
3. Concise Inorganic Chemistry by By J. D. Lee

- **Course Name:** Lab-3 (Fundamentals of Industrial Chemistry-I)

  Course Code: 11011702DS02

  Prerequisite: Understanding the various stages of the paper and pulp manufacturing process, including pulping, bleaching, and papermaking, is crucial

  Rationale: 1. Chemistry and chemical engineering are fundamental as they underpin the processes involved in converting raw materials into paper and pulp. 2. A background in chemistry and biochemistry is essential to comprehend the chemical transformations during sugar production. 3. Materials science, chemistry, and physics are crucial for understanding the unique properties of glass and the processes involved in its production.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.
CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.

CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Exp. No.	Name of the Experiment
1	To study preparation of detergent by using different samples of oil.
2	To study preparation of detergent by using different samples of oil.
3	To determine the critical micelle concentration (cmc) of aqueous SDS solution at room temperature.
4	To determine Krafft temperature (T k) of 1% CTAB aqueous solution.
5	Extract juice from sugarcane and check percentage of sugar in the solution.
6	Preparation of Borax.
8	Preparation of Amber Glass.
9	Purification of sugar by Lime Process.
10	Purification of Benzoic acid by crystallization.
11	To determine rate of crystallization of aqueous sugar solution at different concentrations.
12	To prepare pulp from wood at laboratory scale.
13	To preparation of paper at laboratory scale.
14	To remove ink from waste paper
15	Preparation of color paper (from Pulp) by using different dye solution.

Text Book and Reference Book:

1. Industrial Chemistry By B. K. Sharma, | Krishna Prakashan Pvt Ltd, Pub. Year 2011. Riegel's Handbook of Industrial Chemistry By J. A. Kent, | CBS Publishers, New York.
2. Engineering Chemistry By JAIN & JAIN | Dhanpat Rai and Sons

Semester: 3

- **Course Name:** Advanced English – 1 (AEC-3)
  Course Code: 00019303AE01
  Prerequisite: Basic Knowledge of Commercial Communication and provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce. To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.
  Rationale: Advanced Communication Skills of English Language.

Course Learning Objectives:

CLOBJ1	Develop a robust and nuanced vocabulary for effective communication in both written and spoken contexts.
CLOBJ2	Analyse and interpret a variety of complex texts, including literature, academic articles, and media, with a focus on theme, style, and argumentation.
CLOBJ3	Deliver clear, articulate, and engaging presentations while employing effective rhetorical strategies and audience engagement techniques.
CLOBJ4	Master advanced grammatical structures and syntax to enhance clarity and precision in writing and speaking.
CLOBJ5	Explore and discuss the cultural and contextual factors that influence language use, including dialects, registers, and socialists.

Course Learning Outcomes:

CLO1	Develop advanced communication skills.
CLO2	Become more proficient in formal writing.
CLO3	Apply interpersonal communication skills to be more productive at the workplace.
CLO4	Identify, set and achieve the goals with the help of public speaking.
CLO5	Use wide range of vocabulary to communicate effectively.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation

Course Content:

Sr.	**Topic**	**Weightage**	**TeachingHrs**
1	**ABCD**	**5**	**2**
2	**Public Speaking** Define Public Speaking Importance of Public speaking Types of Public speaking Techniques to master public speaking	**10**	**5**
3	**Activity – Speaking** World's best public speakers (activity based)	**5**	**1**

4	**Debate Vs Group Discussion** Define Debate vs GD Importance of debate Techniques to master debate	**10**	**5**
5	**Activity – Debate** Debate activity	**10**	**2**
6	**Vocabulary Building** Advanced vocabulary building Homophones Homonyms Analogies	**10**	**2**
7	Reading Comprehension **Reading Comprehension**	**10**	**5**
8	**Grammar - Error Analysis** Para- jumble sentence completion confusable sentences Incorrectly spelt words One word substitute Cloze Passages	**10**	**2**
9	**Report Writing** Report Writing	**10**	**2**
10	**Memo Writing** Memo Writing	**10**	**2**
11	**Narrative Story Writing** Narrative Story Writing	**10**	**2**
12	**Activity - Tourism Pitch** Activity - Tourism Pitch	**5**	**2**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Business Correspondence and Report Writing By Sharma, R. And Mohan, K.
2. Communication Skills By Kumar S and Lata P | New Delhi Oxford University Press
3. Practical English Usage By MICHAEL SWAN
4. A Remedial English Grammar for Foreign Student By F.T. WOOD
5. On Writing Well By William Zinsser | Harper Paperbacks,2006 | 30th anniversary edition
6. Oxford Practice Grammar By John Eastwood | Oxford University Press
7. Quantitative Aptitude for Competitive Examinations By Dr. R.S. Aggarwal

- **Course Name:** IPDC Including History & Culture of India and IKS-2 (VAC-3)
  Course Code: 00019303VA01
  Prerequisite: IPDC Including History and Culture of India and IKS-I (00019302VA01)
  Rationale: IPDC aims to prepare students for the modern challenges they face in their daily lives. Promoting fortitude in the face of failures, Unity amongst family discord, Self-discipline amidst Distractions... and many more priceless lessons. The course focuses on morality and character development at the core of student growth, to enable students to become self-aware, sincere, and successful in their many roles - as an ambitious student, reliable employee, caring family member, and considerate citizen.

Course Learning Objectives:

CLOBJ1	Understand the historical development of India, including key events, movements, and figures that have shaped its political and administrative landscape.
CLOBJ2	Analyse the structure, functions, and processes of public administration in India, including governance, policy-making, and implementation.

CLOBJ3	Explore the diverse cultural heritage of India, including traditions, languages, religions, and art forms, and their influence on contemporary society.
CLOBJ4	Examine the social and political factors that affect public administration and development in India, including caste, class, and gender issues.
CLOBJ5	Analyze the economic transformation of India, including the transition from a traditional economy to a mixed economy, and the impact of globalization.
CLOBJ6	Develop critical thinking skills to analyze case studies and real-world scenarios related to public administration and cultural dynamics in India.

Course Learning Outcomes:

CLO1	To provide students with a holistic value-based education that will enable them to be successful in their academic, professional, and social lives.
CLO2	To give the students the tools to develop effective habits, promote personal growth, and improve their well-being, stability, and productivity.
CLO3	To allow students to establish a stronger connection with their family through critical thinking and development of qualities such as unity, forgiveness, empathy, and effective communication.
CLO4	To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.
CLO5	To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.
CLO6	To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr.	**Topic**	**Weigh tage**	**Teaching Hrs**
1	**Remaking Yourself : Begin with the End in mind** Students will learn to visualize their future goals and will structure their lives through smart goals to give themselves direction and ultimately take them to where they want to go.	**6**	**2**
2	**Remaking Yourself: Being Addiction-Free** Students will explore the detrimental effects of addictions on one's health, personal life, and family life. They will learn how to take control of their life by becoming addiction free.	**6**	**2**
3	**Selfless Service: Case Study: Disaster Relief** Students will apply previous lessons of seva, to analyse the case study of the Bhuj earthquake relief work.	**6**	**2**
4	**Soft Skills: Teamwork & Harmony** Students will learn the six steps of teamwork and harmony that are essential for students' professional and daily life.	**6**	**2**
5	**My India My Pride: Present Scenario** To implement the transformation of India from a developing	**6**	**2**

	country into a developed country it is necessary to have a value-based citizen. Students will see how the transformation to a greater India relies on the vision and efforts of themselves as a youth.		
6	**Learning from Legends: Leading Without Leading** Students will explore a new approach to leadership, through humility.	**7**	**2**
7	**My India My Pride: An Ideal Citizen – 1** Students will learn that to become value-based citizens, they must first develop good values in their lives. They start by exploring the values of responsibility and integrity.	**7**	**2**
8	**My India My Pride: An Ideal Citizen – 2** Students will learn that by developing the values of loyalty, sincerity, and punctuality; they become indispensable and can leave a strong impression. They will start developing these values by trying to keep perfection in every small task and by looking at the bigger picture.	**7**	**2**
9	**Facing Failures: Timeless Wisdom for Daily Life** Students will learn the role wisdom plays in finding long-term stability. They will use ancient wisdom to solve their modern-day challenges.	**7**	**2**
10	**From House to Home: Forgive & Forget** Students will understand the importance and benefits that forgiveness plays in their personal and professional life. They will learn to apply this knowledge in realistic situations.	**7**	**2**
11	**Remaking Yourself: Stress Management** Students will learn to cope with current and future causes of stress.	**7**	**2**
12	**Remaking Yourself: Better Health Better Future** A healthy body prevents disease and stress; increases positivity, productivity, and brainpower. Students will learn to maintain good health through regular exercise, healthy eating habits, and regular and sufficient sleep.	**7**	**2**
13	**Learning from Legends: Words of Wisdom** A panel of learned and experienced mentors will personally answer practical questions that students face in their daily life.	**7**	**2**
14	**Soft Skills: Financial Planning** Students will develop a variety of practical financial skills that prepare them to become financially stable throughout their future careers.	**7**	**2**
15	**Remaking Yourself: Impact of Company and Life After IPDC** Students will understand that the type of company that we keep, has a crucial role in determining who we are and who we will become. They will develop the ability to create a positive environment around them. This concluding lecture encourages students to keep practising these priceless lessons and prepares them for the next steps in their lives.	**7**	**2**
	Total	**100%**	**30**

- **Course Name:** Intellectual Property Rights (UE-3)
  Course Code: 17010103UE01

  Prerequisite: Students should have a basic understanding of creative and innovative processes, familiarity with different types of intellectual property (such as copyrights, trademarks, and patents), and awareness of the significance of IP rights in promoting innovation and protecting creators.

  Rationale: Studying Intellectual Property (IP) is crucial for students as it helps them understand how IP rights incentivize creativity and innovation, equips them with knowledge to protect their own intellectual contributions, and fosters an appreciation for the legal and economic impacts of IP in various industries.

Course Learning Objectives:

CLOBJ1	Define key concepts related to intellectual property rights, including patents, trademarks, copyrights, and trade secrets.
CLOBJ2	Understand the legal frameworks governing intellectual property at national and international levels, including relevant treaties and agreements.
CLOBJ3	Differentiate between various types of intellectual property and their specific protections, applications, and limitations.
CLOBJ4	Analyse issues related to infringement, enforcement mechanisms, and the legal remedies available for protecting intellectual property rights.
CLOBJ5	Evaluate the role of intellectual property rights in promoting innovation, creativity, and economic development in various industries.

Course Learning Outcomes:

CLO1	Identify the different forms of intellectual property and describe the importance of protection of IP.
CLO2	List out the criteria/essential requirements of IP protection, duration, rights conferred and remedies provided.
CLO3	Demonstrate a solid understanding of the key concepts, principles, and categories of intellectual property rights, as well as the legal frameworks that govern them..
CLO4	Demonstrate ethical awareness and professional responsibility in dealing with intellectual property issues, recognizing the balance between promoting innovation and creativity while respecting the rights of creators, innovators, and the public interest..
CLO5	Evaluate as against other the international legal framework related to IP protection and articulate the problem areas for the deficiency.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation

Course Content:

Sr.	**Topic**	**Weightage**	**TeachingHrs**

1	**PATENT** Introduction to Intellectual Property Law (IPR); Meaning of patent; Patentable inventions; Procedure for obtaining patent Rights of patent holder; Infringement and remedies of patent	**25%**	**15**
2	**COPYRIGHT** Introduction, meaning and characteristics of copyright Rights of copyright owner; Infringement and remedies of copyright	**25%**	**15**
3	**TRADEMARK** Introduction and meaning of trademark; Types of trademark Procedure for registering trademark; Infringement and remedies of trademark	**25%**	**15**
4	**OTHER IPR** **Geographical Indications:** Overview on Geographical **Indication Act Designs:** Overview on Design Act, 2000 **Semiconductor Integrated Circuits Layout:** Overview on Semiconductor Integrated Circuits Layout Design Act, 2000 **Plant Varieties and Farmers' Rights:** Overview on Protection of Plant Varieties and Farmers' Rights Act, 2001	**25%**	**15**
	Total	**100%**	**60**

Text Book and Reference Book:

1. Law Relating to Intellectual Property Rights By V K Ahuja | Lexis Nexis
2. Intellectual Property Rights By P. Narayanan | , Eastern Law House Private Ltd, Pub. Year 2001
3. The Global Regime for the Enforcement of Intellectual Property Rights By X. Seuba Cambridge University Press, Pub. Year 2017
4. Globalizing Intellectual Property Rights By D. Matthews | Routledge, Pub. Year 2003

- **Course Name:** Fundamentals of Industrial Chemistry-II
  Course Code: 11011703DS01
  Prerequisite: Students shall have basic knowledge on general chemistry.
  Rationale: The polymer industry meets the demand for versatile materials used in manufacturing, construction, and consumer goods, driving innovation in materials science and engineering. The pharmaceutical industry plays a critical role in healthcare by researching, developing, and producing medications to treat and prevent diseases, improving quality of life and public health globally.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.

CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.
CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr.	Topic	Weightage	TeachingHrs
1	**Industrial Waste Water Management:** Sources, uses, quality (alkalinity, hardness, total solids, pH, COD, BOD), characterization, Removal of colloidal and disperse impurities from water: (a) sedimentation; (b) coagulation, softening of water, Industrial waste water, waste water treatment levels: (a) primary; (b) secondary; (c) tertiary	**25%**	**15**
2	**Cement Industry:** Introduction, Lime and its manufacture, Gypsum Plaster, Cement, Types of cement and its Chemical Composition, Manufacture of Portland Cement, Setting and Hardening of Portland Cement. Heat of Hydration of Cement, Concrete and RCC, Decay of Concrete	**25%**	**15**
3	**Polymer Industry:** Introduction, types and coding of polymer, Classification of polymer: 1) linear; 2) branched; 3) crosslink; 4) homo and hetro; 5) graft, free radical polymerization, properties of polymer: 1) average molecular weight; 2) glass transition temperature; 3) strength; 4) resistance; 5) solubility; 6) elastic; 7) mechanical, Synthesis, Properties and uses of polyethylene and phenol formaldehyde resin, polymer / plastics processing techniques, applications	**25%**	**15**
4	**Pharmaceutical Industry:** Introduction, definition and classification of drugs, drug interactions, synthesis / properties / manufacturing and uses of aspirin and paracetamol, different excipients, formulations, different dosage forms, Introduction of	**25%**	**15**

	tablets & capsules, difference between capsules and tablets, quality control & assurance with API.		
	Total	**100%**	**60**

Text Book and Reference Book:

1. Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing by David J. am Ende and Joseph T. DiStefano III
2. Introduction to Industrial Chemistry by A.C. Ganorkar
3. Industrial Chemistry: For Advanced Students" by Jack R. Plimmer

- **Course Name:** Fluid Transport Mechanism
  Course Code: 110111703DS03

  Prerequisite: Students shall have basic knowledge on material science and mathematics.
  Rational: Students will be able to understand how fluids move through different systems is crucial for designing efficient processes and infrastructure, such as pipelines, pumps, and heat exchangers.

Course Learning Objectives:

CLOBJ1	Understand the fundamental principles of fluid mechanics and transport phenomena.
CLOBJ2	Analyse the properties of fluids, including viscosity, density, and pressure, and their impact on transport mechanisms.
CLOBJ3	Explore different types of fluid flow (laminar and turbulent) and the governing equations that describe each.
CLOBJ4	Introduce key transport equations, including the Navier-Stokes equations, continuity equation, and energy equations.
CLOBJ5	Examine the design and analysis of piping systems for transporting fluids, including flow rate calculations and pressure loss assessments.
CLOBJ6	Investigate real-world applications of fluid transport mechanisms in various industries, including chemical, petroleum, and environmental engineering.

Course Learning Outcomes:

CLO1	Articulate the fundamental concepts of fluid mechanics and their relevance to transport mechanisms.
CLO2	Assess and describe the properties of fluids and their implications for transport processes.
CLO3	Distinguish between laminar and turbulent flow and analyse flow patterns using appropriate equations.
CLO4	Utilize transport equations to solve problems related to fluid flow and transport phenomena.
CLO5	Design and analyse piping systems for efficient fluid transport, including calculations for pressure loss and flow rates.
CLO6	Demonstrate proficiency in using instruments and techniques for measuring fluid properties and flow characteristics.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	

4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr. No.	Topic	Weigh tage	Teachin g Hrs.
1.	**Introduction of Fluid:** Definition of fluid and its properties, Classification of Fluid. Newton's law of viscosity, Simple Numerical Examples. **Fluid Statics:** Dimensions and units : Physical Properties of Fluids, Specific Gravity, Viscosity, Surface Tension, Atmospheric, gauge and Vacuum Pressure, Measurement of pressure-Piezometer, U-tube and differential manometers.	**25%**	**15**
2.	**Fluid Kinematics:** Stream line, Path Line and Streak lines and Stream tube, Classification of Flows steady and unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrotational flows equation of continuity for one dimensional flow, Boundary layer theory.	**25%**	**15**
3.	**Flow and Velocity measurement:** Venturi meter, orifice meter, pitot tube for velocity measurement, variable area meter (rotameter), flow nozzles. Flow over notches & weirs; discharge over a triangular & rectangular notch, correction in Bernoulli's equation for effect of solid boundaries, pump work in Bernoulli's equation.	**25%**	**15**
4.	**Fluid Transportation**: Introduction, pipe, tubing and fitting, valves: (a) ball valve; (b) needle valve; (c) globe valve; (d) non return valve; (e) diaphragm valve; (f) control valve; (g) butterfly valve, Centrifugal Pump, Classification, Working, Work-done, Manometric head, losses and efficiencies specific speed, pumps in series and parallel performance characterizes curves, NPSH, Reciprocating pumps working, Discharge, Slip, Indicator diagrams.	**25%**	**15**
	Total	**100%**	**60**

Text Book and Reference Book:

1. Fluid Mechanics for Chemical Engineers by James O. Wilkes
2. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal
3. Unit Operation by K A Gavhane

- **Course Name:** Lab-1 (Fundamentals of Industrial Chemistry-II)
  Course Code: 11011703DS02

  Prerequisite: Students shall have basic knowledge on general chemistry.
  Rationale: The polymer industry meets the demand for versatile materials used in manufacturing, construction, and consumer goods, driving innovation in materials science and engineering. The pharmaceutical industry plays a critical role in healthcare

by researching, developing, and producing medications to treat and prevent diseases, improving quality of life and public health globally.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.
CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.
CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	**-**	**4**	**2**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

List of Practical:

1. To determine percentage of acetaminophen in paracetamol tablet
2. To determine percentage of acetyl salicylic acid in aspirin tablet
3. To determine percentage of Methyl Salicylate in pain relief gel or spray
4. To estimate calcium in lime stone or dolomite ore
5. To estimate the amount of Calcium and Calcium oxide in the given sample of cement extract
6. To study the setting characteristic of different sample of cement
7. To prepare urea formaldehyde resin
8. To prepare of Nylon 6:6 polymer

9. To Determine BOD and COD of given waste water sample
10. To determine the physical parameters such as turbidity, pH, and conductance of a water sample.

Text Book and Reference Book:

1. Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing by David J. am Ende and Joseph T. Di. Stefano
2. Introduction to Industrial Chemistry by A.C. Ganorkar
3. Industrial Chemistry: For Advanced Students" by Jack R. Plimmer

- **Course Name:** Lab-2 (Fluid Transport Mechanism)
  Course Code: 11011703DS04

  Prerequisite: Students shall have basic knowledge on material science and mathematics.
  Rational: Students will be able to understand how fluids move through different systems is crucial for designing efficient processes and infrastructure, such as pipelines, pumps, and heat exchangers.

Course Learning Objectives:

CLOBJ1	Understand the fundamental principles of fluid mechanics and transport phenomena.
CLOBJ2	Analyse the properties of fluids, including viscosity, density, and pressure, and their impact on transport mechanisms.
CLOBJ3	Explore different types of fluid flow (laminar and turbulent) and the governing equations that describe each.
CLOBJ4	Introduce key transport equations, including the Navier-Stokes equations, continuity equation, and energy equations.
CLOBJ5	Examine the design and analysis of piping systems for transporting fluids, including flow rate calculations and pressure loss assessments.
CLOBJ6	Investigate real-world applications of fluid transport mechanisms in various industries, including chemical, petroleum, and environmental engineering.

Course Learning Outcomes:

CLO1	Articulate the fundamental concepts of fluid mechanics and their relevance to transport mechanisms.
CLO2	Assess and describe the properties of fluids and their implications for transport processes.
CLO3	Distinguish between laminar and turbulent flow and analyse flow patterns using appropriate equations.
CLO4	Utilize transport equations to solve problems related to fluid flow and transport phenomena.
CLO5	Design and analyse piping systems for efficient fluid transport, including calculations for pressure loss and flow rates.
CLO6	Demonstrate proficiency in using instruments and techniques for measuring fluid properties and flow characteristics.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation

List of Practical:

1. To study different type to pressure measuring instrument
2. To study Laminar, Turbulent & Transition flow using Reynolds experiment
3. To verify the Bernoulli's Theorem
4. To study velocity of fluid by using orifice meter & venturi meter
5. To study flow measurement using variable area meter
6. To study pressure drop created by different type of fittings
7. To study flow through different notch & Weirs
8. To study working of centrifugal pump
9. To determine pressure drop created due to friction in pipes
10. To study working of reciprocating pump

Text Book and Reference Book:

1. Fluid Mechanics for Chemical Engineers by James O. Wilkes
2. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal
3. Unit Operation by K A Gavhane

Semester: 4

- **Course Name:** Advanced English-II
  Course Code: 00019304AE01
  Prerequisite: 00019303AE01 - Advanced English-I
  Rationale: Advanced Communication Skills of English Language

Course Learning Objectives:

CLOBJ1	Understand the definition of communication and recognize its significance in various contexts.
CLOBJ2	Explain the process of communication and its components.
CLOBJ3	Identify the levels and flow of communication within different organizational structures.
CLOBJ4	Recognize common barriers to effective communication and develop strategies to overcome them.
CLOBJ5	Define non-verbal communication and distinguish between its various forms, including kinesics, proxemics, paralinguistic, and chromatics.

Course Learning Outcomes:

CLO1	Develop advanced communication skills.
CLO2	Become more proficient in formal writing.
CLO3	Apply interpersonal communication skills to be more productive at the workplace.
CLO4	Identify, set and achieve the goals with the help of public speaking.
CLO5	Use wide range of vocabulary to communicate effectively.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	Corporate Etiquettes 1. Tips and guide to develop personality and gain various etiquettes manners, case studies and activities. 2. Telephone etiquettes	**3%**	**1**
2	Etiquette for foreign business trips	**3%**	**1**
3	Etiquette for small talks	**3%**	**1**
4	Respecting privacy, Learning to say 'No'	**3%**	**1**
5	Introduction to Presentation Skills and Audience Analysis, Planning and Structuring Your Presentation Visual Aids, Body Language, and Non-Verbal Communication Voice Control, Delivery, and Overcoming Nervousness, Engaging Your Audience and Handling Questions	**33%**	**10**

6	Email etiquettes & Writing	**7%**	**2**
7	Article writing	**7%**	**2**
8	Poster making	**7%**	**2**
9	Advertisement designing	**7%**	**2**
10	Convincing skills	**7%**	**2**
11	Insane inventor	**7%**	**2**
12	Picture perception	**4%**	**1**
13	Book review	**3%**	**1**
14	Movie review	**3%**	**1**
15	Critical thinking	**3%**	**1**
	Total	**100%**	**30**

Text Book and Reference Book:

1. Business Correspondence and Report Writing Sharma, R. And Mohan, K. By Sharma, R. And Mohan, K.
2. Communication Skills 2011 By Kumar S and Lata P | Oxford University Press
3. Practical English Usage By MICHAEL SWAN
4. A Remedial English Grammar for Foreign Student By F.T. WOOD
5. On Writing Well By William Zinsser | Harper Paperbacks,2006 | 30th anniversary edition
6. Oxford Practice Grammar, By John Eastwood | Oxford University Press

- **Course Name:** Basic German-II
  Course Code: 00019304AE02
  Prerequisite: 00019303AE02 - Basic German-I
  Rationale: German is the second most commonly used scientific language. Germany is the third largest contributor to research and development and offers research fellowships to scientists from abroad. Germany awards a generous number of scholarships and other support to study in Germany. Working holiday visas are available for young people from a range country, and special visas are offered to skilled workers and professionals. There are agreements for student exchange between Germany and many countries of the world. Knowing the language of your German business partners improves your relations and therefore your chances for effective communication and success.

Course Learning Objectives:

CLOBJ1	Learn to pronounce German words and phrases accurately.
CLOBJ2	Understand and respond to basic spoken German in everyday contexts, such as introductions, ordering food, and asking for directions.
CLOBJ3	Gain confidence in using German for basic communication.
CLOBJ4	Be able to introduce yourself and provide basic personal information (name, nationality, age, occupation, etc.)
CLOBJ5	Learn basic social etiquette, such as formal and informal greetings and polite expressions.

Course Learning Outcomes:

CLO1	Communicate, understand various City Places, Body Parts, Professions. Can also able

	to frame the Sentences with the help of Modal Verbs.
CLO2	Can communicate in German with Friends and in shopping mall and also able ask and guide Directions in German Language.
CLO3	Can read basic Passages in German
CLO4	Write basic topics in German.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	-	100	-	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	**Grammar and Vocabulary** Körperteile (Body Parts) Beruf (Professions) Konjunktion (Conjunctions) Modal Verb Zeitformen (Tenses) Briefeschreiben (Letter writing)	33%	10
2	**Speaking skills** Dialogue Sprechen (Suggested Situation) Richtungen (Asking Directions) Conversation between two People Conversation in shopping mall/Shop	20%	6
3	**Reading Skills** Lebenslauf (Daily activities) Kurzgeschichten (Short stories)	20%	6
4	**Listening Skills** Objekt (Objects) Audio Übung (audio exercises) Conversation identification	27%	8
	Total	100%	30

Text Book and Reference Book:

1. Netzwerk A1 Deutsch als Fremdsprache Kursbuch By Stefanie Dengler, Paul Rusch | Klett- Langenscheidt
2. Studio D By Hermann Funk| Cornelsen
3. The Everything Essential German Book By Edward Swick | Adams Media

- **Course Name:** Basic French-II
  Course Code: 00019304AE03
  Prerequisite: 00019303AE03 - Basic French-I
  Rationale: Basic Communication Skills of French Language.

Course Learning Objectives:

CLOBJ1	Understand and respond to simple spoken French, such as greetings, introductions, and common questions.
CLOBJ2	Use basic vocabulary and phrases to introduce yourself and others, ask simple

	questions, and express basic needs.
CLOBJ3	Recognize and understand familiar words, short phrases, and simple sentences in written French.
CLOBJ4	Write short sentences and paragraphs to convey basic personal information (e.g., a self-introduction or daily routine).
CLOBJ5	Identify basic cultural practices in France and other Francophone regions, such as mealtime customs or formal vs. informal address (tu vs. vous).
CLOBJ6	Build a solid foundation for progressing to intermediate French language studies.

Course Learning Outcomes:

CLO1	Recognize and use essential vocabulary and basic grammatical structures in French.
CLO2	Talk about future activities and plans.
CLO3	Ask and respond to questions in French.
CLO4	Describe feelings in French.
CLO5	Talk about likes and dislikes.
CLO6	Engage in simple conversations in French on familiar topics.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	**Grammar** Articles (definite, indefinite and partitive)\ repositions (à, en, au, aux, à la, à l', chez, du, de la, des, d') Les verbs (Present Tense) : ir, re, irregular verbs Le futur Proche Poser et Répondez aux questions (Asking Questions) – Qui, Quand, Où, Pourquoi, Quel, Quelle, Quels, Quelles	**33%**	**10**
2	**Listening Skills** Class room objects Study Subjects Common nouns of places Seasons	**17%**	**5**
3	**Speaking Skills** Talking to a French Speaking Stranger Talking about hobbies Talking and writing about hobbies	**17%**	**5**
4	**Reading Skills and Writing Skills** My family (Ma famille) Les dialogues (Talking to a classmate on the 1st day of school/college. / Talking to a friend about your family or vice versa. / Talking and writing about hobbies. / Talking to a	**33%**	**10**

	French Speaking Stranger.) My hobbies (Mes loisirs) My Best friend (Mon meilleure ami)		
	Total	**100%**	**30**

Text Book and Reference Book:

1. Saison 1 Didier By Marie-Noelle Cocton | Didier
2. Enchanté 0 By Ms. Archana Khurana | Rachna Sagar
3. Larrouse Dictionnaire de Poche
4. Larousse French Grammar (Mini) by Paperback
5. Larousse French Grammar (Mini) Paperback
6. Plaisir D'ecrire by By Viral Thakkar | Saraswati House Pvt. Ltd.

- **Course Name:** Physical Education and Sports
  Course Code: 00019404VA02
  Prerequisite: Basic understanding of physical fitness concepts and a willingness to actively participate in physical activities and team-based sports.
  Rationale: The objective of this course is promoting physical health, enhancing mental well-being, fostering social skills, and encouraging lifelong habits of fitness and teamwork, ultimately contributing to holistic personal development and community cohesion.

Course Learning Objectives:

CLOBJ1	Demonstrate an understanding of the principles of physical fitness and their role in maintaining a healthy lifestyle.
CLOBJ2	Acquire and demonstrate fundamental motor skills and techniques in a variety of sports and physical activities.
CLOBJ3	Understand and apply the basic rules, regulations, and scoring systems of selected sports and physical activities.
CLOBJ4	Explore a variety of recreational and competitive sports to identify personal interests for continued involvement.
CLOBJ5	Understand and apply safety measures, warm-up, and cool-down routines to minimize the risk of injury during physical activities.
CLOBJ6	Explore the cultural significance and historical evolution of various sports and physical activities.

Course Learning Outcomes:

CLO1	Learning of New Skills in Games and Sports.
CLO2	Develop healthy life style practices.
CLO3	Acquire Knowledge of well- being and physical fitness.
CLO4	Maintain physical fitness through sports.
CLO5	Improve skills of critical thinking, creative-thinking, problem-solving, team-work leadership, cooperative.
CLO6	Behaviour and technical competencies.

Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	

1	**-**	**2**	**2**	**-**	**20**	**20**	**20**	**40**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	**History and Basic Concept of Sports and Fitness:** Concept of Sports and Fitness Aims and Objectives,Importance of Sports and Fitness Difference between Games and Sports History of Sports Ancient and Modern Olympics Asian Games and Common Wealth Games functioning	**33%**	**5**
2	**Concepts of Physical Fitness and Rules and Techniques of Games:** Concepts of Physical Fitness Fitness Components Meaning and development of strength, speed and accuracy in different physical activities Sports Nutrition Importance of a Balanced Diet Rules and Techniques(games like Football, Athletics, Kho Kho, Kabaddi, Hockey etc.) Basic concepts and rules of different sports Fundamental Skills of Games and Sports	**34%**	**5**
3	**Trends in Sports and Fitness:** Personality Development through Sports Team building through Group games General Sports Policies Role of Khel Mahakumbh in Gujarat to promote Sports Careers in Physical Education and Sports	**33%**	**5**
	Total	**100%**	**15**

List of Practical:

Fundamental Skill Development Activities:

1. Marking fields or courts on ground,
2. Group Games or Relay Race,
3. Outdoor Games,
4. Fundamental Skill Development Activities:
    - Practicing general warm-up, stretching
    - Practicing cardio and respiratory fitness
    - Walking, Skipping and Running
5. Participate and match practice in Game and Sports.

Text Book and Reference Book:

1. A Text book of Sports and Exercise Physiology By Dey, Swapan Kumar | Jaypee Brothers Medical publishers

2. Competition Level Book of Sports and Games By Dr. A. Mahaboojan, and etal | Lakshya Publisher and Distributor
3. Exercise, Physiology, Fitness and sports Nutrition By B. Srilakshmi,V.Suganthi and G. Kalaivani Ashok | New AgeInternational Publisher
4. Health and Physical Education By Puri & Chandra S S | Surjeet Publications
5. Rules of Games and Sports, Updated Version 2024 By Shrivastava, Singh and Kumar | KSK Publishers and Distributors, Delhi
6. Sports Nutrition and Weight Management By Prof. V. Satyanarayana | Sports Publications, Delhi
7. Swasthya Shiksha By Dixit, Suresh | Sports Publications, Delhi
8. Principles and History of Physical Education By Kamlesh, M.L | New Delhi: Friends Publication

- **Course Name:** National Cadet Corps (NCC)
  Course Code: 00019404VA03
  Prerequisite: Student who opts for this course should be physically fit and free from any major ailment.
  Rationale: The objective of the NCC as a value-added course is to develop character, comradeship, secular outlook, discipline, leadership, and a spirit of adventure among youth.

Course Learning Objectives:

CLOBJ1	Develop leadership skills through participation in group activities, drills, and role-specific responsibilities.
CLOBJ2	Cultivate self-confidence, discipline, and resilience in challenging situations.
CLOBJ3	Foster qualities such as integrity, patriotism, and respect for the nation's ideals.
CLOBJ4	Acquire basic military training, including drill practice, map reading, field craft, and weapon handling.
CLOBJ5	Enhance physical fitness through regular exercises, endurance training, and adventure activities like trekking, rock climbing, and camping.
CLOBJ6	Acquire hands-on experience with handling and firing small arms, adhering to safety protocols.

Course Learning Outcomes:

CLO1	Demonstrate the ability to work effectively in teams with mutual respect, fostering camaraderie and teamwork.
CLO2	Exhibit self-discipline and adhere to established rules and regulations in various activities, promoting an organized and disciplined approach.
CLO3	Develop leadership qualities, including decision-making, problem-solving, and the ability to inspire and motivate others.
CLO4	Understand and respect diverse cultures and religions, promoting unity, harmony, and a secular outlook in all interactions.
CLO5	Engage in activities that enhance physical fitness, environmental awareness, and resilience, fostering a spirit of adventure and sustainable living.
CLO6	Actively participate in community service initiatives, demonstrating social responsibility, empathy, and a commitment to societal well-being.

Teaching & Examination Scheme:

Teaching Scheme	Evaluation Scheme

L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	2	2	-	20	20	20	40	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	**Introduction to NCC:** History and significance of NCC, Organizational structure and functioning	14%	2
2	**Leadership and Personality Development:** Leadership qualities and styles, Communication skills, Team building and management	16%	3
3	**National Integration and Awareness :** Importance of national integration, Cultural diversity and unity	14%	1
4	**Health and Hygiene:** Basic health and hygiene practices, First aid and emergency response	14%	2
5	**Environmental Awareness:** Conservation and sustainable practices, Role of NCC in environmental protection	14%	2
6	**Disaster Management:** Types of disasters and their impact, Preparedness and response strategies	14%	2
7	**Social Service and Community Development:** Role of NCC in community service, Planning and executing social service activities	14%	2
	Total	100%	15

List of Practical:

1. **Drill:** Basic drill movements, Marching and parade techniques
2. **Physical Fitness:** Physical training exercises, Endurance, strength building, and Yogasana
3. **Community Service Projects:** Participation in local community service projects, Planning and execution of social activities

Text Book and Reference Book:

1. Cadet's Hand Book Common Subject, All Wings (in English DGNCC, New Delhi
2. Cadet's Hand Book Common Subject, All Wings (in Hindi) DGNCC, New Delhi)
3. Cadet's Hand Book Specialized Subject, All Wings DGNCC, New Delhi

- **Course Name:** Foundations of Yoga
  Course Code: 00019404VA01

Prerequisite: An open mind, basic health, consistency, a quiet space, comfortable clothing, a yoga mat, proper guidance, and a willingness to connect with your body, breath, and mind.
Rationale: The foundation of yoga promotes physical flexibility, mental clarity, emotional resilience, and spiritual growth, fostering a holistic approach to well-being that enhances overall health and encourages a deeper connection between mind, body, and spirit.

Course Learning Objectives:

CLOBJ1	Understand the historical evolution of yoga and its roots in ancient Indian philosophy.
CLOBJ2	Understand the concepts of asanas (postures), pranayama (breathing techniques), dhyana (meditation), and their interrelation.
CLOBJ3	Demonstrate knowledge of foundational yoga asanas, including their alignment, benefits, and contraindications.
CLOBJ4	Explore the application of yoga in stress management, emotional well-being, and enhancing mental resilience.

Course Learning Outcomes:

CLO1	To introduce students to the basic principles and philosophy of yoga.
CLO2	To provide an understanding of the physical and mental benefits of yoga.
CLO3	To teach foundational yoga postures, breathing techniques, and meditation practices.
CLO4	To cultivate a personal yoga practice that promotes well-being and stress management.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
1	-	2	2	-	20	20	20	40	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	**Introduction to Yoga:** Definition and History of Yoga Different Paths of Yoga (Hatha, Raja, Karma, Bhakti, Jnana) Importance and relevance of Yoga in modern life	20%	3
2	**Philosophy of Yoga:** The Eight Limbs of Yoga (Ashtanga Yoga) Basic concepts of Patanjali's Yoga Sutras Concept of Mind, Body, and Spirit connection	15%	2
3	**Basic Anatomy and Physiology for Yoga:** Understanding the Musculoskeletal System Respiratory and Circulatory Systems in relation to Yoga Physiological and Anatomical Effects of Asanas on the Human Body	20%	3
4	**Introduction to Pranayama and Meditation:** Basics of Pranayama (Breathing Techniques) Introduction to Meditation: Importance and Benefits	20%	3

	Techniques for Developing Concentration and Mindfulness		
5	**Shat chakras**	**5%**	**1**
6	**Yoga and Health:** Physical and Mental Health Benefits of Yoga Yoga for Stress Management Yoga and Lifestyle Diseases (e.g., Hypertension, Diabetes)	**20%**	**3**
	Total	**100%**	**15**

List of Practical:

- **Warm-up and Preparation:**
  - Basic Warm-up Exercises
  - Joint Mobilization and Stretching
- **Foundational Yoga Postures:**
  - Standing Postures: Tadasana, Ardhakatichakrasana, Ardhachakrasana,Padahastasana, Trikonasana and Vrikshasana step by step with Sthiti, main procedure, and vishrama.
  - Sitting Postures: Vajrasana, Suptavajrasana, Shashankasana, Ushtrasana,Marjarasana,Pashchimottanasana, Bhadrasana,
  - Swasthikasana, Siddhasana,Padmasana, Gomukhasana and Ardhamatsyendrasana step by step with Sthiti, main procedure, and vishrama.
  - Supine Postures: Shavasana, Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana and Setubandhasana step by step with Sthiti, main procedure and visrama
  - Prone Postures: Bhujangasana, Shalabhasana, Dhanurasana, and Makarasana step by step with Sthiti, main procedure and vishrama.
  - Introduction to Sun Salutations (Surya Namaskar)
- **Pranayama Techniques:**
  - Perform Kumbhakabhedas namely-Suryabhedana, Ujjayi, Sitkari, Sheetali, Bhastrika and Bhramari.
  - Perform Nadishuddhi Pranayama with inhalation-retention-exhalation in the ratio of 1:4:2 in a comfortable sitting posture.
- **Shuddhikriya Techniques:**
  - Perform Jalaneti, Kapalabhati and Trataka.
- **Meditation and Relaxation Techniques:**
  - Guided Meditation for Beginners
  - Techniques for Relaxation: Yoga Nidra
  - Mindfulness Meditation Practice
  - Breath Awareness Meditation

Text Book and Reference Book:

1. A Text book of Sports and Exercise Physiology By Dey, Swapan Kumar | Jaypee Brothers Medical publishers
2. Competition Level Book of Sports and Games By Dr. A. Mahaboojan, and etal | Lakshya Publisher and Distributor

3. Exercise, Physiology, Fitness and sports Nutrition By B. Srilakshmi,V.Suganthi and G. Kalaivani Ashok | New AgeInternational Publisher
4. Health and Physical Education By Puri & Chandra S S | Surjeet Publications
5. Rules of Games and Sports, Updated Version 2024 By Shrivastava, Singh and Kumar | KSK Publishers and Distributors, Delhi
6. Sports Nutrition and Weight Management By Prof. V. Satyanarayana | Sports Publications, Delhi
7. Swasthya Shiksha By Dixit, Suresh | Sports Publications, Delhi
8. Principles and History of Physical Education By Kamlesh, M.L | New Delhi: Friends Publication
9. Light on Yoga (TextBook) By B.K.S. Iyengar
10. The Yoga Sutras of Patanjali (TextBook) By Swami Satchidananda
11. The Heart of Yoga (TextBook) By T.K.V. Desikachar
12. Yoga Anatomy (TextBook By Leslie Kaminoff and Amy Matthews

- **Course Name:** Fundamentals of Industrial Chemistry-III
  Course Code: 11011704DS01
  Prerequisite: Basic knowledge of general Chemistry including of atomic structure, chemical bonding, stoichiometry, and basic thermodynamics.
  Rationale: Students will be able to understand the various industries and their applications in day to day life.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.
CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.
CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr.	Topic	Weightage	TeachingHrs
1	**Dye Industry:** Introduction, sensation, auxochrome and chromophores groups, bathochromic and hypsochromic effect, color and constitution classification of dyes based on chemical constitution, dying, methods of dying on different fabrics, non-textile use of dye, applications.	25%	15
2	**Paints & Pigments Industry:** Introduction, Manufacture of white, black and basic colour Inorganic Pigments, physical and characteristics of pigments. Paint: Introduction, Constituents of paints, formulation of paints for various purposes, manufacture of paints.	25%	15
3	**Metal & alloys Industries:** Introduction, characteristics and physical properties of metal, Role of Furnace, impurities, commercial form, allotrope form and properties of Iron (Fe), Manufacturing of cast or pig iron through blast furnace, Introduction of alloy, purpose to make alloy, types of alloy, special steel, different metal alloys.	25%	15
4	**Petrochemical:** Introduction and detail out about petroleum, Classification of petroleum products: Fuels; Lubricating oils; Miscellaneous petroleum products, Purification of Petroleum products.	25%	15
	Total	100%	60

Text Book and Reference Book:

1. Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing by David J. am Ende and Joseph T. Di Stefano III
2. Introduction to Industrial Chemistry by A.C. Ganorkar
3. Industrial Chemistry: For Advanced Students by Jack R. Plimmer

- **Course Name:** Industrial Chemical Operations-I
  Course Code: 11011704DS03

  Prerequisite: Basic knowledge of general chemistry, Organic chemistry and Physical chemistry.

  Rational: To improve energy efficiency in various industrial processes by recovering and reusing waste.

Course Learning Objectives:

CLOBJ1	Understand the basic principles governing industrial chemical processes and operations.
CLOBJ2	Explore the design, operation, and optimization of chemical processes in industrial settings.
CLOBJ3	Analyse various separation techniques used in chemical processes, including distillation, filtration, and chromatography.
CLOBJ4	Examine different types of chemical reactors and their design considerations for efficient operation.
CLOBJ5	Emphasize the importance of safety practices and the environmental impact of industrial chemical processes.
CLOBJ6	Investigate methods for ensuring product quality and compliance with industry standards.

Course Learning Outcomes:

CLO1	Develop and propose designs for chemical processes that optimize efficiency and productivity.
CLO2	Compare and select appropriate separation techniques for various chemical processes.
CLO3	Assess the performance and suitability of different reactor types for specific chemical reactions.
CLO4	Identify and apply relevant safety standards and environmental regulations in industrial chemical operations.
CLO5	Implement quality assurance techniques to ensure product consistency and compliance with industry regulations.
CLO6	Present technical information and findings related to industrial chemical operations clearly and effectively in both written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	**Chemical process:** Typical chemical process with chart, Definition, Difference and examples of unit process and unit operation, Classification of unit operation, unit systems (pressure, energy, heat) with SI, MKS, CGS, FPS units, Degree of freedom. **Introduction of Material of Constructions (MOC):** Introduction, Material classes and Class Members, Material Properties, Process attribute charts, Overview of material selection chart.	25%	15
2.	**Distillation:** Basic of Distillation, Batch Distillation, Difference between Batch	25%	15

	and continous distillation, boiling point, Vapour-liquid equilibrium, Boiling point diagram (bubble and dew point), Equilibrium diagram, Raoult's law, Dalton's law, Relative volatility, Method of distillation: 1) simple; 2) flash/equilibrium; 3) fractional; 4) Batch; 5) packed; 6) steam, Various plates (bubble, sieve, valve) **Gas Absorption:** Introduction, Difference between absorption and distillation, Selection criteria for solvent in gas absorption, Minimum liquid gas ratio, Pressure drop, absorption equipment.		
3.	**Heat Exchangers:** Introduction, Double and shell / tube heat exchanger, shell and tube side passes and their differences, Heat exchanger equipment: (1) fixed tube sheet; (2) floating or removable heat exchanger; (3) U-tube heat exchanger; (4) Kettle reboiler exchanger, Different surface heat exchangers: extended; plate type; scrapped, concept of LMTD, fouling factors, overview of TEMA standards for HEs	**25%**	**15**
4.	**Extraction:** Liquid-liquid and solid-liquid (leaching) extraction, Difference between extraction and distillation, Application of extraction, Ternary system, Solvent selection for extraction, Extraction Equipment: Stage type; continuous type, Mixer settlers, Perforated plate column, Spray tower, Packed tower, Pulse column, Rotating disk contractor.	**25%**	**15**
	Total	**100%**	**60**

Text Book and Reference Book:

1. Unit Operation-I by K AS Gavhane
2. Mass transfer Operation by Robert Treybal
3. Fundamental of heat exchanger design by R.K Shah

- **Course Name:** Industrial Instrumentation & Process Control-I
  Course Code: 11011704DS05
  Prerequisite: Basic knowledge of different industry and their products.
  Rational: To make aware about process control of different industry and their safety norms.

Course Learning Objectives:

CLOBJ1	Understand the basic principles of instrumentation and process control in industrial settings.
CLOBJ2	Explore different types of instruments used for measurement and control, including sensors, transmitters, and controllers.
CLOBJ3	Examine various process control strategies, including open-loop, closed-loop, feedback, and feed forward control systems.
CLOBJ4	Introduce methods for designing and implementing effective control systems tailored to specific industrial processes.
CLOBJ5	Familiarize students with data acquisition techniques and the importance of data

	analysis in process control.
CLOBJ6	Emphasize the significance of safety, reliability, and maintenance in instrumentation and control systems.

Course Learning Outcomes:

CLO1	Identify various types of instruments and their applications in measuring physical and chemical properties.
CLO2	Analyse and compare different control strategies and their effectiveness in industrial applications.
CLO3	Develop and propose designs for control systems that meet specific operational requirements.
CLO4	Utilize data acquisition techniques to collect and analyse process data effectively.
CLO5	Evaluate safety protocols and reliability measures associated with instrumentation and control systems.
CLO6	Discuss the implications of emerging technologies on instrumentation and process control practices.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation

Course Content:

Sr. No.	Topic	Weigh tage	Teachin g Hrs.
1.	**Basics of Electronics:** Introduction, PN junction Diode, basics of transistors and amplifiers, Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. AND, OR and NOT Gates, NAND AND NOR Gates. **Basics of Instrumentation:** Steady state system, Process control, open and closed loop control, feedback control system, block diagram, comparison between positive and negative feedback, Process measuring element, transfer function, transportation lag.	25%	15
2.	**Basics of Industrial Instrumentation:** Introduction, Types of measurement: (a) Direct; (b) indirect, Functions of measuring instruments, Elements of instrument, Classification of measuring instrument: (a) According to operation; (b) According to the source of power; (c) According to the arrangement; (d) Characteristics of an instrument: static and dynamic, Measurement, Signals and Data: Signal-to-Noise ratio, Sensitivity and Detection limit, accuracy and instrument calibration.	25%	15
3.	**Viscosity Measurement:** Introduction, Principle, construction and working of following Viscosity measurement devices: Orifice type viscometer; (2) Falling sphere (3) Rotational; (4) Brookfield; (5) Saybolt; (6)	25%	15

	Redwood. **Density Measurement:** Introduction, Principle, construction and working of following Density measurement devices: Liquid level method of measuring specific gravity or density; Displacement meter for measuring specific gravity or density; Hydrometer		
4.	**Level Measurements:** Introduction, Methods of liquid level Measurement: Direct method and indirect method, Principle, construction and working of following Liquid level measurement devices, Direct methods: Hook type level indicator; Sight glass; Float type level indicator, Indirect methods: Pressure gauge method; Bubbler system; Diaphragm box system; Air-trap system, Radiation level measurement, Ultrasonic meter.	**25%**	**15**
	Total	**100%**	**60**

Text Book and Reference Book:

1. Process System analysis by Donald R. Coughanowr
2. Industrial Instrumentation and Control by S. K. Singh

- **Course Name:** Lab-1 (Fundamentals of Industrial Chemistry-III)
  Course Code: 11011704DS02

  Prerequisite: Basic knowledge of general Chemistry including of atomic structure, chemical bonding, stoichiometry, and basic thermodynamics.
  Rationale: Students will be able to understand the various industries and their applications in day to day life.

Course Learning Objectives:

CLOBJ1	Introduce fundamental principles of chemistry as they relate to industrial applications.
CLOBJ2	Explore various chemical processes used in industries, including synthesis, separation, and purification methods.
CLOBJ3	Analyse the properties of raw materials and products to understand their behaviour in industrial processes.
CLOBJ4	Emphasize the importance of safety protocols, environmental regulations, and sustainable practices in industrial chemistry.
CLOBJ5	Investigate the role of chemistry in developing new materials and processes, focusing on innovation in the industrial sector.
CLOBJ6	Familiarize students with analytical methods used for quality control and process optimization in industrial settings.

Course Learning Outcomes:

CLO1	Demonstrate a clear understanding of fundamental chemical principles and their application in industrial settings.
CLO2	Evaluate different chemical processes, including reactions and separations, used in industrial applications.
CLO3	Identify and describe the properties of various materials and how these properties affect industrial processes.
CLO4	Recognize and apply safety protocols and environmental regulations relevant to

	industrial chemistry.
CLO5	Employ analytical methods to assess the quality and efficiency of industrial processes and products.
CLO6	Present findings and analyses related to industrial chemistry clearly and effectively, both in written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation

List of Practical:

1. To prepare Prussian Blue
2. To prepare Chrome Yellow
3. To prepare Malachite Green
4. To determine flash point & pour point of petroleum products
5. To determine the boiling point of different petroleum products
6. To study separation of hydrocarbon by azeotropic distillation
7. To determine the percentage of Iron (Fe) in the given steel sample
8. To determine the corrosion rate of Iron (Fe) in different acid aqueous solution
9. To determine and separate the constituents like Copper, Zinc, Tin, Lead, and Iron in brass
10. To synthesise Titanium Dioxide (TiO2) pigment in lab.
11. Performance testing of paints.
12. To analyse dye wastewater in laboratory

Text Book and Reference Book:

1. Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing by David J. am Ende and Joseph T. DiStefano III
2. Introduction to Industrial Chemistry by A.C. Ganorkar
3. Industrial Chemistry: For Advanced Students" by Jack R. Plimmer

- **Course Name:** Lab-2 (Industrial Chemical Operations-I)
  Course Code: 11011704DS04

  Prerequisite: Basic knowledge of general chemistry, Organic chemistry and Physical chemistry.
  Rational: To improve energy efficiency in various industrial processes by recovering and reusing waste.

Course Learning Objectives:

CLOBJ1	Understand the basic principles governing industrial chemical processes and operations.
CLOBJ2	Explore the design, operation, and optimization of chemical processes in industrial settings.
CLOBJ3	Analyse various separation techniques used in chemical processes, including distillation, filtration, and chromatography.

CLOBJ4	Examine different types of chemical reactors and their design considerations for efficient operation.
CLOBJ5	Emphasize the importance of safety practices and the environmental impact of industrial chemical processes.
CLOBJ6	Investigate methods for ensuring product quality and compliance with industry standards.

Course Learning Outcomes:

CLO1	Develop and propose designs for chemical processes that optimize efficiency and productivity.
CLO2	Compare and select appropriate separation techniques for various chemical processes.
CLO3	Assess the performance and suitability of different reactor types for specific chemical reactions.
CLO4	Identify and apply relevant safety standards and environmental regulations in industrial chemical operations.
CLO5	Implement quality assurance techniques to ensure product consistency and compliance with industry regulations.
CLO6	Present technical information and findings related to industrial chemical operations clearly and effectively in both written and oral formats.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,
CE- Continuous Evaluation

List of Practical:

1. To study simple laboratory batch distillation
2. To determine the vapour-liquid equilibrium data for the given binary system
3. To verify the Rayleigh's equation for distillation in a binary system
4. To study liquid-liquid extraction of acetic acid using ethyl acetate as solvent
5. To study solid-liquid extraction of NaOH using water as solvent
6. To study heat transfer of shell / tube or double pipe heat exchanger
7. To study & perform Finned Tube Heat Exchanger
8. To study performance in parallel & counter flow arrangement
9. To determine outside and Inside heat transfer coefficient for parallel plate type heat Exchanger.
10. To study batch azeotropic distillation

Text Book and Reference Book:

1. Fundamental of heat exchanger design by R.K Shah
2. Unit Operation-I by K AS Gavhane
3. Mass transfer by Robert treybal