Enclosure XID

Semester - II		
Course Code	**Course Title**	**Course Credit**
19PMBID102/ 19PBTID102	**DSE-ID: Industrial Instrumentations**	**4 Credits**

Course Description:
A chemical or process plant is required to carry out testing of raw material and desired products effectively, economically and safely. Therefore, this course deals with the fundamental concepts of industrial instrumentations. Various instruments will be taught in order to analyze basic parameters such as Viscosity, Temperature, Pressure and Density.

Course Purpose:
1. To understand and apply the basic concept of industrial instrumentations in chemical industries.
2. To understand Principle, construction and working of industrial instrumentations.
3. To understand the direct and indirect methods of measurement.
4. To apply knowledge of calibration of the instruments.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (K_1 to K_6)
CO_1	Understand the direct and indirect methods of measurement of industrial parameters.	K1, K2
CO_2	Understand the process of how to use instrument.	K1, K2
CO_3	Know the Design of industrial instrumentations.	K1, K2, K3
CO_4	Explain role of Industrial instrumentation including temperature, pressure, viscosity, liquid level and density.	K1, K2, K3
CO_5	Calibrate instruments applied for temperature, pressure, viscosity, liquid level and density.	K3

Course Content	Hours

Module-I : Basics of Industrial Instrumentation	10 hrs
• An introduction to Instrumental methods, Major steps in solving an analytical problem, Basics functions of instruments • Measurement, Signals and Data: Signal-to-Noise ratio, Sensitivity and Detection limit • Noise, Accuracy and Instrument calibration, the meaning of measurement • Basics of Industrial Instrumentation: • Introduction, Types of measurement: Direct measurement, indirect measurement, Functions of measuring instruments, Elements of instrument, Classification of measuring instrument, - According to operation - According to the source of power - According to the arrangement - Characteristics of an instrument: Static characteristics and Dynamic characteristics	
Module-II : Viscosity	10 hrs
• Introduction • Principle, construction and working of following Viscosity measurement devices: 1. Orifice type viscometer 2. Falling sphere viscometer 3. Rotational viscometer 4. Brookfield viscometer 5. Saybolt viscometer 6. Redwood viscometer 7. Ostwald viscometer	
Module-III : Temperature	9 hrs
• Introduction, various Temperature scales • Construction of the element of Temperature measuring elements: • Thermometer bulb and well, Thermometer capillary and armor, Receiving element • (Pressure spring), Recording (Indicating) element • Principle, construction and working of following Temperature measuring instruments: 1. Volume gas thermometer 2. Glass thermometer 3. Bimetallic thermometer 4. Pressure spring thermometer 5. Vapour actuated thermometer 6. Pneumatic balance pressure thermometer 7. Resistance thermometer 8. Industrial resistance thermometer bulbs (RT bulbs) • Introduction, Laws of radiation • Principle, construction and working of following Radiation Temperature measuring instruments: 1. Radiation pyrometers 2. Black body devices 3. Vacuum thermocouple	

4. Balometer 5. Photoelectric pyrometer 6. Optical pyrometer	
Module-IV : Pressure	9 hrs
• Introduction, • Principle, construction and working of following Pressure measurement devices: • Liquid column manometer: -U-tube manometer -Inclined manometer -Well type manometer -Ring type manometer 1. Barometer 2. Bourdon gauge 3. Bellows gauge 4. Diaphragm gauge 5. McLeod gauge 6. Thermal conductivity gauge 7. Pirani gauge 8. Thermocouple gauge 9. Ionization gauge • **Measuring pressure in corrosive fluids:** 1. Single coil siphon 2. Diaphragm seal 3. Liquid seal 4. Purge system	
Module-V : Liquid level and Density	10 hrs
• 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 • Level measurement for dry materials. **Level measurement in pressure vessels:** • Radiation level indicator • Ultrasonic method for level measurement **Density measurement:** • Introduction • Principle, construction and working of following Density measurement devices: 1. Liquid level method of measuring specific gravity or density, 2. Displacement meter for measuring specific gravity or density, 3. Hydrometer	

Suggested laboratory experiments:
• Not applicable

Pedagogic tools:
• Chalk and Board
• LCD and Videos.
• Instruments

Text books
1. D.P. Eckman, (2014), Industrial Instrumentation, John-Wiley's and sons. 2. W. Merritt and D. Settle, 7th Edition, Instrumental methods of Analysis, CBS Publishers
Laboratory Manual/ Book
•

Suggested reading / E-resources
1. W.G. Andrews, Applied Instrumentation in process industries, volume 1, 2 and 3, Gulf Publication

Suggested MOOCs
• Smart Plant Instrumentation (SPI) - INtools

Methods of assessing the Course Outcomes The COs of the course will be assessed through
• CIE • SEE

CIA Components	**Marks**
Test – 1 (2 modules, 1 ½ hours, set for 30 marks)	5
Test – 2 (5 modules, 3 hours, set for 50 marks)	15
Assignment	10
Seminar	10
Class activity: One Minute Paper, Application Cards	10
Grand Total	**50**

Semester - II		
Course Code	**Course Title**	**Course Credit**
19PBTID202 / 19PMBID202 / 19PCEID202	**DSE-ID: CHEMICAL TECHNOLOGY**	**4 Credits**

Course Description:
A chemical or process plant is required to carry out transformation of raw material into desired products effectively, economically and safely. Therefore, this course deals with the fundamental concepts of chemical technology comprising various chemical industries like ceramics, refreactories, soap, Detergents, paints, pigments and sugar etc. This course also deals with the new technologies and new developments in chemical technology.

Course Purpose:
1. To apply Knowledge of fundamentals of process industries.
2. To understand the technology used in various chemical technology industries.
3. To understand scientific literature, new technologies and new developments in chemical technology.
4. To design process flow diagrams/process block diagrams for the manufacture of various chemicals from process description.

Course Outcomes: Upon completion of this course, the learner will be able to		
CO No.	**CO Statement**	**Blooms taxonomy Level (K_1 to K_6)**
CO_1	Understand the advanced concepts of ceramic & refractories industries.	K1, K2,
CO_2	Apply the basic technology of soap & detergents industries.	K1, K2, K3
CO_3	Apply the fundamental technology of paint industries.	K2, K3

CO_4	Evaluate the concepts of pigment industries.	K2, K3
CO_5	Apply the basic concepts and technology of sugar industries.	K1, K2, K3

Course Content	Hours
Module-I : Ceramic and Refractories:	10 hrs
• **Ceramics:** Introduction, Classification based on reduction in porosity, Raw Materials, Manufacturing process, Glazing, Decoration, Methods of Applying colours. • **Refractories:** Introduction, Classification, properties and manufacturing Processes of refractories, Introduction, manufacturing process, properties and uses of Fire clay bricks, Silica bricks.	
Module-II : Soaps and Detergents:	10 hrs
• **Soaps:** Introduction, Raw Materials, Manufacturing process, Classification, Cleaning action, Recovery of glycerin from spent lye. • **Detergents:** Introduction, Classification, Biodegradability of surfactants, Difference between soaps and detergents, Enzyme containing detergents, Eco friendly detergents (Zeolites), Detrimental effects of detergents, Manufacture of shampoos.	
Module-III :Paints:	10 hrs
• **Paints:**Introduction, Classification based on application, raw materials for paint, manufacturing processes, setting process of paints, requirements of good paint, paint failure, PVC, Methods of application, Paint removers, Special applications of paints.	
Module-IV : Pigments:	09 hrs
• **Pigments:**Introduction, Classification, Manufacturing processes and Uses of Various types of pigments o White Pigment : White lead, TiO_2, ZnO. o Blue Pigment : Ultramarine blue, Cobalt Blue, Iron Blue. o Red Pigment : Red lead, Synthetic iron oxide o Green Pigment : Chrome green, Guignet green, Chromium oxide.	
Module-V :Sugar:	09 hrs
• Introduction, Manufacture of cane sugar, Extraction of juice, Purification of juice, Defection, Sulphitation and Carbonation, Concentration or evaporation, Crystallisation, Separation of crystals, Drying, Refining, Grades, Recovery of sugar from molasses, Bagasse, Preparation of celotex, • Manufacture of sucrose from beet root, Testing or estimation of sugar, Double sulphitation process, Double carbonation: Double sulphitation process.	

Suggested laboratory experiments:
• Not Applicable

Pedagogic tools:
• Chalk and Board
• LCD and Videos.

Text books

1. Kirk, R. E. (2004), Encyclopedia of chemical technology, 5th Edition, NY: Wiley-blackwell ISBN-13: 9780471484943.
2. Sharma, B. K. (2011), Industrial chemistry,16th Edition, India: Krishna Prakashan Media (P) Ltd., ISBN-13: 978-81-8283-120-9.
3. Poucher, W. A. (1991), Perfumes, Cosmetics & Soaps, 9th Edition, London: Chapman & Hall, ISBN-0-412-27340-3.
4. Stanburry, P. F. Whitaker A., HALLS. J., (2003), Principles of Fermentation technology, 2nd Edition, UK: Elsevier, ISBN: 0-7506-4501-6.
5. Austin, G. T, (1998) Shreve's Chemical Process Industries, 4th Edition NY: McGraw Hill, ISBN 13: 9780070571457.
6. B.K. Sharma, Industrial Chemistry,2014, ISBN: 978-93-86901-54-5, 1-1800.

Laboratory Manual/ Book

- .Not Applicable

Suggested reading / E-resources

1. Goldschmidt, Streitberger, Basics of coating Technology, BASF Handbook, ISBN-13: 978-3866309036.
2. Paints and pigments, https://nzic.org.nz/ChemProcesses/polymers/10D.pdf.
3. Entire Functions of Sugar Industryhttp://shodhganga.inflibnet.ac.in/bitstream/10603/113307/10/chapter_-5.pdf

Suggested MOOCs

- Process Technology & Process
- Chemical Technology by Coastline Community College, Community college in Fountain Valley, California.http://www.coastline.edu/academics/process-technology.

Methods of assessing the Course Outcomes

The COs of the course will be assessed through

- CIA
- SEE

CIA Components	Marks
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