Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: Chemical Engineering | **Semester: IV**

Subject: Fluid Mechanics | **Code:** B019411(019)

Periods per week (L-T-P): (3-1-0) | **Credits: 04**

Number of class Test to be conducted: 2 (Minimum) | **No. of assignment to be submitted: 05**

Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

PREREQUISITES: Knowledge of Engineering Mathematics and Physics.

COURSE OBJECTIVES:

1. To introduce the basic concepts of fluid mechanics and their applications in Chemical Engineering to design the equipment for measurement and transport of fluids in chemical plants and to design the related piping and control systems.
2. To develop the ability to determine pressure and velocity variations in internal and external flow of fluids to identify the basic mechanisms, formulate problems and solve the problems by analysis or by application of experimental data.
3. The objective of this course is to introduce the mechanics of fluid, relevant to chemical engineering operation.
4. Theoretical and practical preparation enabling students to apply the acquired knowledge and skills in professional and specialist courses.

COURSE DETAILS:

Unit 1: Systems, Fluids: Properties And Classification, Fluid Statics And Fluid Dynamics, Laminar, Transition And Turbulent Flows, Applications of Fluid Flow In Chemical Engg., Hydrostatic Equilibrium, Manometers: Simple, Differential And Inclined, Properties of Manometric Liquids, Decanter: Continuous, Gravity And Centrifugal. **(10 hrs)**

Unit 2: Fluid Flow Phenomena: Newtonian And Non-Newtonian Fluids, Viscosity And Momentum Flux, Laminar &Turbulent Flow In Boundary Layers, Friction Factor Chart, Friction Factor &Pressure Drop**,** Dimensional Analysis and Pie Theorem, Dimensional less groups. **(10 hrs)**

Unit 3: Material & Energy Balance, Continuity Equation, Equation Of Motion, Bernoulli's Equation, Flow Of Incompressible Fluids, Flow Past Immersed Bodies, Packed And Fluidized Beds, Introduction To Fluidization, Minimum Fluidization Velocity. **(08 hrs)**

Unit 4: Pipes fitting and Valves: Pipe Sizing For Flow Of Liquids And Gasses, Joints And Fittings, Sudden Contraction And Expansion, Classification Of Valves And Pumps And Their Selection Criteria, Losses In Piping, Valves And Fittings, Performance Of Centrifugal Pumps, Characteristic Curves For Pumps, NPSH Calculation For Pumps, Fans And Blowers. **(10 hrs)**

Unit 5: Flow And Control Devices, Control Valve, Valve Characteristics, Sizing Of Control Valves, Flow Measurement using Venturi Meter, Orifice Meter, Rota Meter & Pitot Tube, Weir, V- Notches And Square Notches. **(08 hrs)**

On completion of each unit, students have to submit one assignment from every unit.

COURSE OUTCOMES (COs):

CO1: Students will able to define basic terms, values and laws in the areas of fluids properties, statics, kinematics and dynamics of fluids, and hydraulic design of pipes,

CO2: Students have the competency to describe the methods of fluid mechanics laws and phenomena while analyzing the operational parameters of hydraulic problems, systems and machines,

CO3: Students have the capability to illustrate the tables and diagrams, and equations which define the associated laws and theories.

CO4: Students have the conceptual ability to interpret and optimize operational parameters of hydraulic problems, systems and machines.

CO5: Students will explain the correlation between different operational parameters.

CO6: Students have overall competency to demonstrate and elucidate the complicated calculations of fluid mechanics.

TEXT BOOKS:

1. McCabe W.L., Smith J.C., Hariot P., "Unit Operations in Chemical Engineering", McGraw Hill International, 7th ed., 2005.
2. Badger W.L., Banchero J.T., "Introduction to Chemical Engineering", Tata McGraw Hill Publishing Co. Ltd.
3. V.Gupta and S.K. Gupta , Fundamentals of Fluid Mechanics, 2nd Edition.

REFERENCE BOOKS:

1. B.Mersey, Fluid Mechanics, Chapman, Landon.
2. Brown et al, " Unit Operation" John Wiley Sons.

OPEN SOURCE LEAENING:

http://nptel.ac.in/

http://ocw.mit.edu/courses/chemical-engineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Heat Transfer Operation** Code: B019412(019)
Periods per week (L-T-P): **(3-1-0)** Credits: **04**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks- 150 [ESE-100, CT-20, TA-30]**

PREREQUISITES: Knowledge of Engineering Mathematics and Physics, Thermodynamics.

COURSE OBJECTIVES:

1. Basic concept of heat transfer.
2. Design and rating of heat exchangers with and without phase change
3. The course is designed to provide an overview of various modes of heat transfer, its mechanism, and the industrial aspects of conduction, convection and radiation.
4. Condensation and evaporation phenomena, design and construction of equipment forman integral part of this course.

COURSE DETAILS:

Unit 1: Classification of Heat Flow Processes, Concept of driving force and Resistance, Conductive Heat Transfer, Fourier's Law, Steady State Conduction, Compound Resistances in Series, Critical Insulation Thickness, Heat Flow Through a Cylinder and Sphere, Introduction to Unsteady State Heat Conduction, Numerical Problems based on the above. **(08 hrs)**

Unit 2: Principles of Heat Flow in Fluids, Natural and Forced Convection, Concept of films and Two film theory. Individual and Overall Heat Transfer Coefficients, Dirt factor, Controlling Resistance, Logarithmic Mean Temperature Difference, Dimensional Analysis and Dimensionless Groups in Heat Transfer, Dittuse- Boelter Equation and other correlations, Numerical Problems based on the above. **(08 hrs)**

Unit 3: Heat Transfer from Condensing Vapors, Dropwise and Filmwise Condensation, Condensation of Superheated Vapors, Heat Transfer to Boiling Liquids, Critical, Heat Flux, Nucleate Film Boiling. Radiation Heat Transfer, Kirchoff's Law, Black body Radiation, Numerical Problems based on the above. **(10 hrs)**

Unit 4: Heat Transfer Equipments ,Operation and Preliminary Design concepts of Heat Exchangers, Condensers, Double Pipe, Multipass Shell and Tube type Heat Exchangers, Transfer Units in Heat Exchangers, NTU and HTU, Numerical Problems based on the above. **(10 hrs)**

Unit 5: Evaporation, Types of Evaporators Performance of Tubular Evaporators, Duhring's Rule, Elevation in Boiling Point and Effect of Hydrostatic Head, Steam Economy, Enthalpy Balance, Multiple effect Evaporators, Methods of feeding, Numerical Problems based on the above. **(10 hrs)**

On completion of each unit, students have to submit one assignment from every unit.

COURSE OUTCOMES (COs):

CO1: Identify and select type of shell and tube heat exchanger,
CO2: Design shell and tube heat exchanger, shell and tube heat exchanger, finned tube and other compact heat exchanger.
CO3: After undergoing this course the students will acquire knowledge about various modes of heat transfer, its mechanism, and the industrial aspects of conduction, convection and radiation.
CO4: After undergoing this course the students will understand about design and construction of heat transferequipments.
CO5: Student will be able to elaborate heat transfer concepts with theories and applications to the solutions of practically relevant chemical engineering problems
CO6: Identify, formulate and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, and thermodynamics.

TEXT BOOKS:

1. W.L. McCabe and J.C. smith, "Unit Operations In Chemical Engineering",4thEdn., McGraw Hill publishing Co., 1985.
2. Badger and Bancharo, "Introduction to Chemical Engg." McGraw Hill.

REFERENCE BOOKS:

1. D. Q. Kern, "Process Heat Transfer", McGraw Hill publishing Co., New York 1950.
2. A.S.Foust, L. A. Wenzel, C.W. Clump, Louis Maus and L.B. Anderson, "Principles of Unit Operations", John Wiley, New York, 1959.
3. W.H.Mc Adams, "Heat Transmission", McGraw Hill publishing Co., New York 1954.

OPEN SOURCE LEARNING:
http://nptel.ac.in/ http://ocw.mit.edu/courses/chemicaenginering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Organic Process Technology** Code: B019413(019)
Periods per week (L-T-P): **(3-1-0)** Credits: **04**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

PREREQUISITES: Basic knowledge in Engineering Physics and Mathematics, Physical and Organic Chemistry.

COURSE OBJECTIVES:
1. The purpose of the course is to improve knowledge of the chemical processes along with emphasis on recent technological development.
2. To develop and assess alternative system designs for chemical engineering systems incorporating considerations such as feasibility, cost, safety, legal/regulatory issues and societal impacts.
3. The aim of the course is to study process technologies, availability of raw materials, production trends, and preparation of flow sheets.
4. Study the engineering and environmental problems of various chemical industries.
5. Illustrative knowledge on organic processes.

COURSE DETAILS:

Unit 1: Nitration: Introduction, agents, liquid and vapour phase nitration, nitration equipments, mixed acid preparation. Dyes and Intermediates: Introduction, classification of dyes, manufacture of dyes. **(10 hrs)**

Unit 2: Halogenations: Types of halogenations reactions, preparation of chloral. Pesticides: Introduction of pesticides, classification of insecticides, manufacturing of BHC & DDT. **(10 hrs)**

Unit 3: Sulfonation and Sulfation: Introduction, agents, chemical & physical factors, sulfonation equipments, sulfonation of benzene. Pulp and Paper: Raw materials, pulping processes, recovery of chemicals, stock preparation and paper making (production of paper from pulp). **(10 hrs)**

Unit 4: Esterification: Esterification By organic acid, study of continuous esterification column. Manufacture of ethyl acetate, cellulose acetate & nitroglycerine. Vegetable Oil: Types of oil, extraction and processing of vegetable oil, Types of animal's fat & oil. Types of waxes. Manufacturing of Soap & Detergent. **(10 hrs)**

Unit 5: Polymerization: Introduction, types of polymerization, methods of polymerization, properties of polymers. **(06 hrs)**

On completion of each unit, students have to submit one assignment from every unit.

COURSE OUTCOMES (COs):

CO1: After undergoing this course the students will acquire knowledge regarding various technological aspects of chemical industries.
CO2: It encourages the student to think invent and develop novel unit operations and processes.
CO3: Describe the principles, and process technology of different organic process and its application to industries.
CO4: After undergoing this course the students will understand about manufacturing process and technical problems associated with this.
CO5: Student will be able to understand synthetic *organic* chemistry for preparing the product.
CO6: Elucidate to *process* chemistry and *organic* synthesis with an emphasis on the science and *technology.*

TEXT BOOKS:
1. Groggins P. H., "Unit Processes in Organic Synthesis", McGraw-Hill Book Co.
2. Austin, G.T., "Shreve's Chemical Process Industries", McGraw-Hill Book Co.

REFERENCE BOOKS:
1. Gopala Rao M. and Marshall S., "Dryden's Outlines of Chemical Technology", East-West Press Pvt Ltd.
2. Pandey G. N., "A Text Book of Chemical Technology", Volume – II, Vikas Publishing House Pvt. Ltd.

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http://nptel.ac.in/
http://ocw.mit.edu/courses/chemicalengineering

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Numerical Methods in Chemical Engineering** Code: B019414(019)
Period per week (L-T-P): **(2-1-0) / Week** Credits: **03**
No. of Class Test to be conducted: **2 (Minimum)** No. of assignments to be submitted: **05**
Scheme of Examination (Theory): **Total Marks-150 [ESE-100**, **CT-20**, **TA- 30]**

PREREQUISITES: Knowledge of 10+2 Standard and Advance Engineering Mathematics.

COURSE OBJECTIVES:
1. To get exposed to finite differences and interpolation.
2. To be through with the numerical differentiation and integration.
3. To find numerical solutions of ordinary differential equations and unsteady state heat and mass transfer problems.
4. To find numerical solutions of partial differential equations.

COURSE DETAILS:

Unit 1: Treatment Engineering Data (08 hrs)
Graphical Representation, Empirical Equation, Interpolation, Newton's Formula, Extrapolation, Graphical Integration, Numerical Differentiation and Integration.

Unit 2: Interpretation of Engineering Data (08 hrs)
Propagation of Errors, Variance and Distribution of Random Errors, Properties of Variance, Confidence Limits for Small Samples, Analysis of Variance.

Unit 3: Formulation of Ordinary Differential Equation (10 hrs)
Functional Relationship, Mathematical Origin of Differential Equations, Ordinary Differential Equations, Partial Differential Equations, Application of Ordinary Differential Equations to Common Chemical Engineering Problems.

Unit 4: Formulation of Partial Differential Equation: (10 hrs)
Finite Difference Approximation, Classification of 2^{nd} Order Equations, Linear Finite Difference Equation, Non-Linear Finite Difference Equations, Application of Ordinary Differential Equations, Application of Ordinary Differential Equations to Common Chemical Engineering Problems.

Unit 5: Numerical Solution of Ordinary Differential Equations: (10 hrs)
Second-Order Equations, Numerical-Solution Method, Picard's Method, Modified Euler's Method, Method of W.E. Milne, Method of Runge-Kutta, Numerical-Solution of Equations of Higher Order, Application of Runge-Kutta, Method to Higher-Order Equations.

On completion of each unit, students have to submit one assignment from every unit.
COURSE OUTCOMES (COs):

CO1. Understand the basic algorithms for solution of and be able to solve linear algebraic equation.
CO2. Understand the basic algorithms for solution of and be able to solve non-linear algebraic equation.
CO3. Understand the basic algorithms for solution of and be able to solve problems in ordinary differential equations.
CO4. Understand the basic algorithms for solution of and be able to solve numerical integration problems.
CO5. Deal comfortably when encountering and solving the types of problems listed above.

TEXT BOOKS:
1. Harold S. Mickley, Thomas S. Sherwood and Charles E. Reed, "Applied Mathematics in Chemical Engineering".
2. Dr. B. S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers.

REFERENCE BOOKS:
1. Chapra and Canal, "Numerical Methods for Engineers" McGraw-Hill International Edition.
2. Dr. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers.

OPEN SOURCE LEARNING:
http://nptel.ac.in/
http://ocw.mit.edu/courses/chemical-engineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject**: Material Science** Code: B019415(019)
Periods per week (L-T-P): **(2-0-0)** Credits: **02**
Number of class Test to be conducted: **2 (Minimum)** No. of assignment to be submitted: **05**
Scheme of Examination (Theory): Total Marks-**150 [ESE-100, CT-20, TA-30]**

PREREQUISITES: Knowledge of (10+2) Physics, Chemistry and Basic Mechanical Engineering.

COURSE OBJECTIVES:

1. To give adequate knowledge of oxidation and reduction reactions.
2. To give Executable approach of Selection of MOC for a given application, maintenance and corrective measures for various engineering materials.
3. Criteria for selection of materials in chemical process industry.
4. To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion.

COURSE DETAILS:

Unit 1: Introduction to materials, bonding between atoms: metallic bonding, ionic bonding covalent bonding, Van der waals bond, thermal expansion, elastic modulus and melting point of materials Role of material selection in design, Effect of structure on properties: subatomic to macroscopic level. Elasticity, micro elasticity and phase transformation. **(10 hrs)**

Unit 2: Corrosion, Theories of corrosion and methods of corrosion control. Degradation and recycling. Theory of alloying and their construction, Applications of alloys in industries, Constitutional diagrams, Cast iron as material of construction with reference to its application in chemical Engineering. **(08 hrs)**

Unit 3: Imperfection in solid: vacancies, equilibrium concentration of vacancies, interstitial and substitution impurities in solid, dislocation, types and characteristics of dislocation, interfacial defects, stacking faults. **(08 hrs)**

Unit 4: Materials of construction with reference to application in chemical industry, Mild steel, high carbon steel, Stainless steel, High silicon steel, Molybdenum and tungsten steel. Nonferrous metals – Copper, Aluminum, Lead, Chromium, Tin, Brass, Bronze and Monel metal. **(08 hrs)**

Unit 5: Semi- crystalline materials: classification, structure and configuration of ceramics, polymers, and copolymer. Non-crystalline/amorphous materials: Silicates, glass transition temperature, viscoelasticity. **(06 hrs)**

On completion of each unit, students have to submit one assignment from every unit.

COURSE OUTCOMES (COs):

CO1: Illustrate the importance of selection materials for engineering purpose.
CO2: Considerate the corrosion phenomena on the basis of the fundamentals of chemical engineering
CO3: Student will be able to correlate the structure and properties of materials.
CO4: Student will be able to describe causes of mechanical failure.
CO5: Student will be able to combines engineering, physics and chemistry principles to solve real-world problems associated with the industrial material.

TEXT BOOKS:
1. Agrawal B.K., Introduction to Engg Materials,TataMcgraw Hill, Edition 1988.
2. Khurmi R.S., Materials Science,S Chand ,1st edition.

REFERENCE BOOKS:
1. Gupta K.M., Material Science & Engineering, Umesh Publication, 1st Edition

OPEN SOURCE LEAENING:
http://nptel.ac.in/
http://ocw.mit.edu/courses/chemicaengineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Fluid Mechanics Lab** Code: B019421(019)
Period per week (L-T-P): **(0-0-2) / Week** Credit: **01**
Scheme of Examination (Laboratory): **Total Marks- 60 [ESE-40, TA- 20]**

PREREQUISITES: Knowledge of Engineering Mathematics and Physics and Fluid Mechanics.

COURSE OBJECTIVES:

1. To introduce the basic concepts of fluid mechanics and their applications in Chemical Engineering to design the equipment for measurement and transport of fluids in chemical plants and to design the related piping and control systems.
2. To develop the ability to determine pressure and velocity variations in internal and external flow of fluids to identify the basic mechanisms, formulate problems and solve the problems by analysis or by application of experimental data.
3. The objective of this course is to introduce the mechanics of fluid, relevant to chemical engineering operation.

COURSE DETAILS (At least ten experiments):

1. Determination of viscosity.
2. Experiment to determine characteristics of laminar and turbulent flow.
3. Flow through packed bed.
4. Flow through venturi meter.
5. Flow through orifice meter.
6. Flow through pipe fitting (Minor Losses).
7. Determination of friction factor (Major Losses).
8. Characteristics of centrifugal pump
9. Verification of Stokes's law.
10. Verification of Bernoulli's theorem.
11. Calibration of rotameter.

COURSE OUTCOME (COs):

CO1: Students will be able to distinguish and calibrate different flow measuring devices.
CO2: Students will be able to characterize the flow field based on the Reynolds number.
CO3: Students will be able to measure the pressure distribution on stream lined and bluff bodies.
CO4: Students will be able to calibrate the friction in ducts
CO5: Students will be able to visualize the flow around the objects using flow visualization techniques.

TEXT BOOKS:
1. McCabe W. L., Smith J. C., Hariot P., "Unit Operations in Chemical Engineering", McGraw Hill International, 7th ed., 2005.
2. Badger W. L., Banchero J. T., "Introduction to Chemical Engineering", Tata McGraw Hill Publishing Co. Ltd.
3. V. Gupta and S.K. Gupta, Fundamentals of Fluid Mechanics, 2nd Edition.

REFERENCE BOOKS:
3. B.Mersey, Fluid Mechanics, Chapman, Landon.
4. Brown et al, " Unit Operation" John Wiley Sons.

OPEN SOURCE LEAENING:
http://nptel.ac.in/
http://ocw.mit.edu/courses/chemical-engineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Heat Transfer Operation Lab** Code: B019422(019)
Period per week (L-T-P): **(0-0-2) / Week** Credit: **01**
Scheme of Examination (Laboratory): **Total Marks- 60 [ESE-40, TA- 20]**

PREREQUISITES: Knowledge of Engineering Mathematics and Physics, Thermodynamics, Heat Transfer Operation.

COURSE OBJECTIVES:

1. To introduce the basic concept of heat transfer and their application in chemical engineering to design.
2. Design and rating of heat exchangers with and without phase change.
3. Design of compact heat exchanger.
4. The course is designed to provide an overview of various modes of heat transfer, its mechanism, and the industrial aspects of conduction, convection and radiation.
5. Condensation and evaporation phenomena, design and construction of equipment formanintegral part of this course.

COURSE DETAILS (At least ten experiments):

1. Determination of Thermal Conductivity and Thermal Resistance of given compound resistances in series by Slab System.
2. Determination of Thermal Conductivity of insulating powder by Spherical Dome.
3. Determination of Heat Transfer Coefficient in Double Pipe Heat Exchanger for Counter-current Flow.
4. Determination of Heat Transfer Coefficient in Double Pipe Heat Exchanger for Co-current Flow.
5. Determination of Heat Transfer Coefficient in Shell & Tube Heat Exchanger for Co-current Flow.
6. Determination of Heat Transfer Coefficient in Shell & Tube Heat Exchanger for Counter-current Flow.
7. To study the temperature distribution along the length of Pin Fin in Natural Convection.
8. To study the temperature distribution along the length of Pin Fin in Forced Convection.
9. To study heat transfer characteristic of Single Effect Evaporator.
10. To study heat transfer characteristic of open pan evaporator.
11. To study heat transfer characteristic of horizontal tube condenser.
12. To study the steam PV cell pilot scale system.

COURSE OUTCOMES (COs):

CO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex heat transfer problems.
CO2: Identify, formulate and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, and thermodynamics.
CO3: Perform study state conduction experiments to estimate the thermal conductivity of different heat transfer equipment.
CO4: Estimate heat transfer coefficient in forced convection and free convection.
CO5: Identify, formulate and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, and thermodynamics.

TEXT BOOKS:

3. W.L. McCabe and J.C. smith, "Unit Operations In Chemical Engineering",4thEdn., McGraw Hill publishing Co., 1985.
4. Badger and Bancharo, "Introduction to Chemical Engg." McGraw Hill.

REFERENCE BOOKS:

4. D. Q. Kern, "Process Heat Transfer", McGraw Hill publishing Co., New York 1950.
5. A. S. Foust, L. A. Wenzel, C.W. Clump, Louis Maus and L.B. Anderson, "Principles of Unit Operations", John Wiley, New York, 1959.
6. W.H.Mc Adams, "Heat Transmission", McGraw Hill publishing Co., New York 1954.

OPEN SOURCE LEARNING:
http://nptel.ac.in/
http://ocw.mit.edu/courses/chemicaenginering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Organic Process Technology Lab** Code: B019423(019)
Period per week (L-T-P): **(0-0-2) / Week** Credit: **01**
Scheme of Examination (Laboratory): **Total Marks- 60 [ESE-40, TA- 20]**

PREREQUISITES: Basic knowledge in Engineering Physics and Mathematics, Physical and Organic Chemistry, Organic Process Technology.

COURSE OBJECTIVES:

1. Adequate and conceptual knowledge on various unit operations and process applicable in organic process industries.
2. Through understanding about the principles, working methodologies and technologies in organic process industries.
3. Illustrative understanding about physical and chemical characteristics of the various organic chemicals through hands on suitable experimentation processes.
4. Demonstrative skills on the usage of the various instruments pertaining to the respective experimentations.

COURSE DETAILS (At least ten experiments):

1. To determine the acid value of given oil sample.
2. To determine the saponification value of given oil sample.
3. To determine the % of total fatty material present in given soap.
4. To determine the moisture content of the given soap sample.
5. To determine the esterification value of the given oil sample.
6. Manufacture of toilet soap.
7. To determine the moisture content of prepared toilet soap.
8. Preparation of phenol-formaldehyde resin.
9. Solvent Extraction of oil from oilseed by sohxlet apparatus
10. To determine the iodine value of the given oil sample.
11. To determine the % of oil in given oil bearing seed sample.
12. To determine free alkali content in given soap sample.
13. Manufacture of detergent.
14. Manufacture of phenyl.

COURSE OUTCOMES (COs):

CO1. Define and exemplify the physical and chemical characteristics of different types of organic chemicals and calculations there under.
CO2. Describe and analyze the adopted experimental procedures of the different organic samples for significant outcomes.
CO3. Demonstrate and deduce the suitable conclusions about the various properties of the different organic samples through exact hands on experimentation processes.
CO4. Illustrate the operating principles and working methodologies of various types of instruments used for analytical studies.

TEXT BOOKS:
1. Groggins P. H., “Unit Processes in Organic Synthesis”, McGraw-Hill Book Co.
2. Austin, G.T., “Shreve’s Chemical Process Industries”, McGraw-Hill Book Co.

REFERENCE BOOKS:
1. Gopala Rao M. and Marshall S., “Dryden’s Outlines of Chemical Technology”, East-West Press Pvt Ltd.
2. Pandey G. N., “A Text Book of Chemical Technology”, Volume – II, Vikas Publishing House Pvt. Ltd.

OPEN SOURCE LEARNING:
http://nptel.ac.in/
http://ocw.mit.edu/courses/chemicalengineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester**: IV**
Subject: **Virtual Lab** Code: B019424(019)
Periods per week (L-T-P): **(0-0-2)/Week** Credits: **01**
Scheme of Examination: Total Marks: **60 [ESE: 40, CT: 00, TA: 20]**

PREREQUISITES: Knowledge of Fluid Mechanics, Heat Transfer Operations and Organic Process Technology with basic knowledge of computer.

COURSE OBJECTIVES:

1. Virtual labs are simulated learning environments that allow students to explore concepts and theories without stepping into a physical science lab.
2. To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
3. To provide a complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.
4. To share the knowledge of costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances.

COURSE DETAILS:

1. Verification of Bernoulli's theorem - https://youtu.be/DW4rItB20h4
2. Experiment to determine characteristics of laminar and turbulent flow - https://youtu.be/xmNcHsvEDRE
3. Flow through venture meter and orifice meter - https://youtu.be/kcPawgvFehI
4. Determination of Heat Transfer Coefficient in Shell & Tube Heat Exchanger for Co-current Flow and Counter-current Flow - https://youtu.be/OyQ3SaU4KKU
5. Determination of Thermal Conductivity and Thermal Resistance of given compound resistances in series by Slab System - https://youtu.be/R-5McNR2274
6. To study heat transfer characteristic of horizontal tube condenser - https://youtu.be/fM1oPt89lrE
7. To study heat transfer characteristic of Single Effect Evaporator - https://youtu.be/VBaz3NIIJ9o
8. To determine the saponification value of given oil sample - https://youtu.be/ersHDsiAVko
9. To determine the moisture content of the given soap sample - https://youtu.be/FfxHot6BLZk
10. To determine the iodine value of the given oil sample - https://youtu.be/_5ObG6fIAdQ
11. Solvent Extraction of oil from oilseeds by Soxhlet apparatus - https://youtu.be/SEicK9UT7pY

COURSE OUTCOMES (COs):

1. Students will be able to perform many experiments that are difficult to perform in real laboratories because of the risks.
2. Present day internet and computer technologies overcome limitations that can no more hamper students and researchers in enhancing their skills and knowledge.
3. Modeling the physical phenomenon by a set of equations and carrying out simulations to yield the result of the particular experiment. This can, at-the-best, provide an approximate version of the 'real-world' experiment.
4. Student will be able to know Latest and updated experiments.

SUGGESTED OPEN SOURCE LEARNING WEBSITES:

1. https://youtu.be/SEicK9UT7pY
2. https://youtu.be/_5ObG6fIAdQ
3. https://youtu.be/FfxHot6BLZk
4. https://youtu.be/ersHDsiAVko
5. https://youtu.be/VBaz3NIIJ9o
6. https://youtu.be/fM1oPt89lrE
7. https://youtu.be/R-5McNR2274
8. https://youtu.be/OyQ3SaU4KKU
9. https://youtu.be/xmNcHsvEDRE
10. https://youtu.be/DW4rItB20h4
11. http://nptel.ac.in/
12. http://ocw.mit.edu/courses/chemical-engineering/

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Chemical Engineering** Semester: **IV**
Subject: **Indian Culture and Constitution of India** Code: B000406(046)
Periods per week (L-T-P): **(0-0-2)** Credits: **Nil**
Scheme of Examination (Theory): **Total Marks-10 [ESE: 00, CT: 00, TA: 10]**

PREREQUISITES: Knowledge of Indian Culture and Elementary History.

COURSE OBJECTIVES:

1.The objective of the course is how to deal and adjust in the society under government regulations.
2.An engineer must know the limits of state action and regulations by acquainting himself with the laws that applied by the bureaucrats.
3.The knowledge of Constitution is necessary for student in order to ensure that the rules and regulations under which public and private sector works, do not violate the provisions of the Constitution.
4.Student must understand the compulsions of the public private partnership and philosophy of state ownership of key industries.

COURSE DETAILS:

1.The Constitution – Introduction the History of the Making of the Indian Constitution. Preamble and the Basic Structure, and its interpretation. Fundamental Rights and Duties and their interpretation. State Policy Principles.
2.Union Government- Structure of the Indian Union. President – Role and Power. Prime Minister and Council of Ministers. Lok Sabha and Rajya Sabha.
3.State Government- Governor – Role and Power. Chief Minister and Council of Ministers. State Secretariat.
4.Local Administration -District Administration. Municipal Corporation. Zila Panchayat. Election Commission - Role and Functioning. Chief Election Commissioner. State Election Commission.
5.Cultural and Educational Rights- Article 29: Article 30 Article 49 Article 51A.

COURSE OUTCOMES (COs):

CO1: Student will able to define the basic rule on which the democracy functions and also able to guide in functioning of a democracy and to define the right of a citizen over state and other persons
CO2: Student will able to determine the duty of the state and also the duty of the individual vis a vis the country.
CO3: Student will able to know a constitution as it is important because it ensures that those who make decisions on behalf of the public fairly represent public opinion.
CO4: Student will able to know a constitution as it is an aggregate of fundamental principles or established precedents that constitute the legal basis of a polity, organization or other type of entity and commonly determine how that entity is to be governed.

SUGGESTED BOOKS:
1.Ethics and Politics of the Indian Constitution, Rajeev Bhargava Oxford University Press, New Delhi, 2008.
2.Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
3.The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)83

SUGGESTED OPEN SOURCE LEARNING WEBSITES:
1.https://www.constitution.org/cons/india/const.html
2.http://www.legislative.gov.in/constitution-of-india
3.https://www.sci.gov.in/constitution
4.https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india