

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR

1	NAME OF DEPARTMENT:				CHEMICAL ENGINEERING				
2	Semester:		B. Tech. – Third Semester						
3	Subject Code:		ME20312CL		Course title:		Strength of Materials		
4	Contact hours		L=3		T=1		P=3		
5	TA:	20	FE:	15	SE:	15	ESE:	70	Credits – 4
6	Examination Time				3 hrs				
7.	Pre-requisite: Nil								
8.	Objective: To study the mechanical properties of materials								
9.	Details of Course:								

Unit –I

Stress (Axial Load): Normal stress, Shear stress, Factor of safety, plane stress, stress components associated with arbitrary oriented faces in plane stress.

Stress-Strain Relation: Hook's Law, Poission's ratio, strain components, strain components associated with arbitrary sets of axes, Tensile test, elastic stress-strain relation.

Unit– II

Torsion: Basic assumptions, Torsion formula, Hollow and Stepped circular shafts, Angular Deflection.

Flexural Loading: Theory of pure bending, Flexural formula, Shear force and Bending moments diagram for different types of loading and support conditions on beams. Transverse shear stress distribution in circular hollow circular, I-box and T, angle sections.

Unit – III

Deflection of Beams: Strain curvature and moment curvature relation, Solution of beam deflection problems by Direct integration method, Area moment method, super position.

Unit – IV

Principle Stresses and Strains: Normal and Shear stress, concept of equivalent bending & equivalent twisting moment, Mohr's circle of stress and strain, Strain Rosette's.

Unit – V

A) Columns: Euler's formula for different end conditions, Concepts of equivalent length, Eccentric loading, Ranking formula.

B) Pressure Vessels: Thin Presswee vessel Circumferential and longitudinal stresses in cylindrical shell, spherical shell under internal pressure. Introduction to think presswee vessel.

Suggested Text Books & References:

1. Ramamurtham, S., "Strength of Materials", Dhanpat Rai & Sons, 1991.
2. Popov, E.P., "Mechanics of Materials", Printice Hall Inc. 1984.
3. Andrew, P. and Singer, F.L. "Strength of Materials", Happer & Row Publishers, New York, 1987.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR

1 NAME OF DEPARTMENT: **CHEMICAL ENGINEERING**
2 Semester: **B. Tech. – Third Semester**
3 Subject Code: **CL20313CL** Course title: **Computer Programming, in C++**
4 Contact hours **L=3 T=1 P=0**
5 TA: **20** FE: **15** SE: **15** ESE: **70** Credits – **4**
6 Examination Time **3 hrs**
7. Pre-requisite: **Computer basics**

8. Objective: **To develop the skills of programming among students so that it can be used for modeling and simulation of chemical equipments.**

9. Details of Course:

Unit-I

Characters used in c++, Data types, Flow chart, Arithmetic operations and expressions, Relational and logical operators, Hierarchy of operations, Standard library functions, Header files.

Unit-II

If -else statement, For loop, While loop, Break statement, Concept of array, Multi dimensional array, Inline function, Function , Pass by value, Pass by reference, Scope of integer and variables.

Unit-III

Pointer, Structure, , Procedure and object oriented language, Class, Object, Inheritance, Type of inheritance

Unit-IV

Polymorphism, Run time polymorphism, Compile time polymorphism, Operator overloading, File handling.

Unit-V

Solution of chemical engineering problems related to mass, momentum, energy transfer: Newton- Raphoson method, Eulers method, Runga_kutta method, Simpson's rule. Gauss elimination method.

Name of Text Books:

1. John R. Hubberd, Programming with C++, Schaum's outline, Tata McGraw- Hill Publishing Co. Ltd., New Delhi.
2. Robert Lafore, Object Oriented Programming in C++, Sams Publication.
3. Grewal B. S., Numerical Methods in Engineering and Science, Khanna Publication, New Delhi.

Name of reference Books:

1. Venugopal K R, Rajkumar, Ravishankar, T., Mastering C++, Tata McGraw Hill. Publishing Co. Ltd., New Delhi.
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill, Publishing Co. Ltd., New Delhi.
3. Ravichandran, Programming with C++, Tata McGraw-hill Education Private Ltd., New Delhi.
4. Numerical Recipes in C++

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1 NAME OF DEPARTMENT: **CHEMICAL ENGINEERING**
2 Semester: **B. Tech. – Third Semester**
3 Subject Code: **CL20314CL** Course title: **Inorganic Process Technology**
4 Contact hours **L=3 T=1 P=0**
5 TA: **20** FE: **15** SE: **15** ESE: **70** **Credits – 4**
6 Examination Time **3 hrs**
7. Pre-requisite: **Nil**

8. Objective: **To study the industries** with reference to its raw materials available, manufacturing process and process flow diagrams, Unit operations and Unit process involved, economic aspects and general engineering problems associated followed by present status of the industry.

9. Details of Course:

Unit – I

Unit operation and Unit process concepts, Soda Ash, Common Salt, Salt Cake and Glauber's Salt, Chlorine and Caustic Soda.

Unit – II

Sulfur and Sulfuric Acid Industries, Industrial Gases-Acetylene, Oxygen and Nitrogen, Carbon Dioxide, Hydrogen, Bromine.

Unit – III

Nitrogen Industries-Ammonia, Nitric Acid, Ammonium Nitrate, Phosphorous, Phosphoric Acid, Calcium Phosphates, Ammonium Phosphates, Urea.

Unit – IV

Hydrochloric Acid, Glass Industries, Sodium silicates, Ceramic Industries, Alumina, Aluminum, Magnesium.

Unit – V

Explosives-Types and Characteristics; Nitroglycerin and Dynamite, Nitrocellulose, Hydrazine, Military Explosives, Portland Cements, Lime.

Name of Text Books:

1. M. Gopala Rao and Marshall Sittig: Dryden's Outlines of Chemical Technology, III Edition; Affiliated East-West Press Pvt Ltd, New Delhi.
2. George T. Austin : Shreve's Chemical Process Industries, McGraw Hill Book Company.

Name of Reference Books:

1. S.D. Shukla and G.N. Pandey, Text Book of Chemical Technology Vol 1, 1977.

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1	NAME OF DEPARTMENT:				CHEMICAL ENGINEERING				
2	Semester:				B. Tech. – Third Semester				
3	Subject Code:				CL20315CL	Course title:	Industrial Process		
							Calculation		
4	Contact hours				L=3	T=1	P=0		
5	TA:	20	FE:	15	SE:	15	ESE:	70	Credits – 4
6	Examination Time				3 hrs				
7.	Pre-requisite: Nil								

8. Objective: To introduce the concept of material and energy balance as applied to chemical engineering systems.

9. Details of Course:

Unit – I

Unit and its conversion, Stoichiometric & Composition relations PVT behaviors, Gas laws, Partial pressure and pure component volume methods. Concepts of degree of freedom.

Unit – II

Vapor-liquid equilibrium and concept of Humidity and saturation: Molal Humidity, Cox Chart. Analysis of processes involving condensation, crystallization & vaporization, psychometric chart, Crystallization.

Unit – III

Material Balance – Selection of a basis, conservations of mass/atom, material balance for systems with & without chemical reactions, analysis of systems with by pass, recycle & purge operations.

Unit – IV

Energy Balance calculations:

Calculation of heat of change of phase, heat of reactions, Dissolution & mixing, combustion. Energy balance with and without chemical reaction. Combustion calculations.

Unit – V

Effect of pressure & temperature on heat of reaction. Determination of temperature for adiabatic & non adiabatic reactions. Combined steady state material & energy balances for Units with multiple sub-systems.

Name of Text Books:

1. Bhatt and Vora, 'Stoichiometry', McGraw Hill Publications.
2. Hougen and Watson, "Chemical Process Principles Part – I Material and Energy Balance 2nd Edition.
3. Narayanan K.V. and Lakshmikutty B. "Stoichiometry & process calculations, Prentice hall of India.

Name of Reference Books:

1. Himmelblau, Basic Principles and Calculations in Chemical Engineering, Pearson Education Pvt. Ltd.
2. Ghoshal, sanyal, Dutta, Introduction to Chemical Engineering.

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1	NAME OF DEPARTMENT:			CHEMICAL ENGINEERING					
2	Semester:			B. Tech. – Third Semester					
3	Subject Code:			CL20316CL	Course title:		Material Technology		
4	Contact hours			L=3	T=1		P=0		
5	TA:	20	FE:	15	SE:	15	ESE:	70	Credits – 4
6	Examination Time			3 hrs					
7.	Pre-requisite: Nil								

8. Objective: **To study and behavior of materials useful in chemical equipments**

9. Details of Course:

Unit – I

Properties and behavior of materials useful in structure, machines and equipments, atomic arrangements and imperfections elasticity, micro elasticity and phase transformation. Theories of corrosion and corrosion and method of corrosion control.

Unit – II

Theory of alloying, constitutional diagrams, their construction and applications. Cast iron as material of construction with reference to its application in chemical Engineering, selection of material, general criterion of selection of material of construction in process industries.

Unit – III

Materials of construction and their technology with reference to application in chemical industry mild steel, high carbon steel, stainless steel, high silicon steel, molybdenum and tungsten steel, heat treatment of plane steel.

Unit – IV

Nonferrous metals – copper, aluminum, lead, chromium, tin, brass, bronze and monel.

Unit – V

Non-metals – Glass, Enamels, graphite, wood, plastics, rubber, ebonite lining materials, composite materials: fiber reinforced plastic composite material, concrete, asphalt and asphalt mixture, ceramic mixture and silicates, structure and properties, polymeric material.

Name of Text Books:

1. Russel E*Gackebach, Materials selection for process plants.
2. Frank Ramford, Chemical Engineering materials.
3. Lee Z.Z., Materials of construction for Chemical Process Industries.

Name of Reference Books:

1. Agrawal B.K., Introduction to Engineering Materials.
2. Khurmi R.S., Materials Science.
3. Gupta K.M., Material Science & Engineering.

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1	NAME OF DEPARTMENT:				CHEMICAL ENGINEERING				
2	Semester:		B. Tech. – Third Semester						
3	Subject Code:		CL20323CL		Course title:		Computer Lab		
4	Contact hours		L=0		T=0		P=3		
5	TA:	30	FE:	0	SE:	0	Pract.	20	Credits – 2
	ESE:								
6	Examination Time				3 hrs				

7. Pre-requisite: **CHU 301**

8. Objective: **To provide hands-on experience of experiments on programming languages.**

9. Details of Course:

List of programs:

1. Largest number among three numbers
2. To convert score into equivalent grade
3. To sum n numbers using while loop
 4. To find sum of marks of six subject and its average for ten students using nested for loop
5. Program using while-break statement
6. Program using break and continue statement
7. Program using goto statement
8. Program using switch-case statement
9. Program to use mathematical function
10. User defined function and main function
11. To find maximum between two number using user defined function
12. To find maximum between two number using user defined function and do while loop
13. To find maximum between three numbers using functions
14. Program using call by value method
15. Program using call by reference method
16. Passing an array to a function and returning the sum
17. Program for more than one control variables
17. To initialize the array and print the value
18. Passing the value in array
19. Find the max value in given array
18. To change base of any no
19. Program for bubble sorting
20. Program for local variable and global variable
21. Program for structure
22. Program for class
23. Program for inheritance
24. Program for polymorphism
25. Program for file handling
26. Solution of differential equations

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1	NAME OF DEPARTMENT:			CHEMICAL ENGINEERING			
2	Semester:			B. Tech. – Third Semester			
3	Subject Code:			CL20322CL	Course title:	Inorganic Process Lab	
4	Contact hours			L=0	T=0	P=3	
5	TA:	30	FE:	0	SE:	0	Pract. 20 Credits – 2
						ESE:	
6	Examination Time				3 hrs		
7.	Pre-requisite: CHU302						
8.	Objective: To provide hands-on experience of experiments on inorganic process technologies						
9.	Details of Course:						

Experiments to be performed (minimum 10 experiments)

1. Determine the percentage % purity of H_2SO_4 of given acid sample
2. Determine the percentage % composition of NaOH and Na_2CO_3 sample
3. Determination of percentage silica present in the given Cement sample
4. Determination of the moisture present in the cement sample
5. Determination of the combustion loss in the cement sample
6. Determination percentage %Cu present in the given Copper Sulphate sample
7. Determination of the hardness (Total & permanent) of the water sample
8. Determination of percentage of lime present in the cement sample
9. Determination of % Ca in given Dolomite sample
10. Determination of % Mn in given Pyrolusite sample.
11. Determination of % Ca in given Lime stone sample.
12. Determination of % silica in given Ash sample.
13. Determination of N in given fertilizer sample
14. Determination of P in given fertilizer sample
15. Determination of K in given fertilizer sample
16. To prepare Chrome Red in lab.
17. Estimate the percentage of available Cl_2 in sample of bleaching powder by iodometry.

List of Equipments/Machines Required

- (i) Weighing Balance
- (ii) Muffle Furnace
- (iii) Water Bath
- (iv) Hot Air Oven
- (v) Heating Mantle
- (vi) Silica Crucible

Recommended Books:

1. Outlines of Chemical Engineering – Dryden
2. Experimental Chemistry – S.S. Dara