1.1.3

List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes		
Name of the Subjects	*Yellow*	
Employability Contents	*Green*	
Entrepreneurship Contents	*Light Blue*	
Skill Development Contents	*Pink*	

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Chemical Engineering*

Programme Name : *B.Tech.*

Academic Year : 2020-21

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	*CH203TPC01*	*Material & Energy Balance Calculations*
02.	*CH203TPC02*	*Fluid Mechanics*
03.	*Course Code should be in CAPITAL LETTERS*	*First Letter of Each Word should be Capital*
04.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
05.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
06.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
07.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
08.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
09.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*
10.	*xxxxxxxxxxxxxx*	*xxxxxxxxxxxxxx*

Scheme and Syllabus

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)

SCHEME FOR EXAMINATION (Effective from Session 2021-22)

B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING

SECOND YEAR, THIRD SEMESTER (AICTE-NEW)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
	THEORY					Sessional			
			L	T	P	IA	ESE	TOTAL	
01.	CH203TBS05	Biology	3	0	0	30	70	100	3
02.	CH203TBS06	Mathematics-III	3	1	0	30	70	100	4
03.	CH203TPC01	Material and Energy Balance Calculations	3	1	0	30	70	100	4
04.	CH203TPC02	Fluid Mechanics	3	1	0	30	70	100	4
05.	CH203TPC03	Thermodynamics-I	3	0	0	30	70	100	3
	PRACTICAL								
01.	CH203PPC01	Chemical Engineering Lab-I	0	0	3	30	20	50	1.5
02.	CH203PPC02	Fluid Mechanics Lab	0	0	3	30	20	50	1.5
		Total	15	3	6			600	21

IA – Internal Assessment
Total Marks – 600

ESE - End Semester Examination
Total Periods / week - 24

Total Credits: 21

BoS held on 01.10.2021

B. Tech. (Chemical Engg.)- II Year

w.e.f : Session 2021-22

CH203TPC01 Material and Energy Balance Calculations [L:3, T:1, P:0]

Objectives:

The course will serve as a basis for all further chemical engineering courses that are part of the curriculum.

Unit I : Introductory concepts of units, physical quantities in chemical engineering, Dimensionless groups, "basis" of calculations Gases, Vapours and Liquids: Equations of state, Vapour pressure, Clausius Clapeyron equation, Cox chart, Duhring's plot, Raoult's law.

Unit II : Humidity and saturation, humid heat, humid volume, dew point, humidity chart and its use.

Unit III : Material Balance: Introduction, solving material balance problems without chemical reaction, material balances with recycle, bypass and purge, material balance with chemical reaction, concept of stoichiometry and mole balances, examples, including combustion.

Unit IV : Energy Balance: open and closed system, heat capacity, calculation of enthalpy changes.

Unit V : Energy balances with chemical reaction, heat of reaction, heat of combustion.

Suggested Text Books:

1. S. N. Saha, "Chemical Process Engineering Calculation", Dhanpat Rai Publication Co. (Pvt.) Ltd., New Delhi
2. B. I. Bhatt & S. M. Vora, "Stoichiometry", Tata McGraw Hill Publishing Co. Ltd.

Suggested References Books:

1. R. M. Felder & R. W. Rousseau, "Elementary Principles of Chemical Processes", John Wiley & Sons.
2. O. A. Hougen, K. M. Watson & R. A. Ragatz, "Chemical Process Principles, Part I Material & Energy Balances", CBS Publishers & Distributors.
3. D. M. Himmelblau & J. B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Pearson India Education Services.
4. V. Venkataramani, N. Anantharaman, K. M. Begum & S. Meera, "Process Calculations", Prentice Hall of India.
5. D. C. Sikdar, "Chemical Process Calculations", Prentice Hall of India.

Outcomes:

Students completing the course will

- Develop mastery over process calculations relevant to Chemical Engineering Processes
- Be able to handle elementary flow-sheeting, material and energy balance calculations
- Be able to solve problems based on without and with chemical reactions, and involving concepts like recycle, bypass and purge.
- Be familiar with equations of state and properties of gases and liquids, including phase transition.

CH203TPC02 **Fluid Mechanics** **[L:3, T:1, P:0]**

Objectives:

The objective of this course is to introduce the mechanics of fluids (fluid statics and fluid dynamics), relevant to Chemical Engineering operations. The course will impart the knowledge of basic concepts of kinematics of flow, different forces on fluids, flow visualization, flow measurement, flow transportation and types of flow.

Unit I : Fluid Static & Applications: Hydrostatic equilibrium, hydrostatic equilibrium in centrifugal field and its applications in chemical engineering like manometers decanters. Fluid Flow Process: velocity gradient and shear, types of fluids, concept of viscosity, kinematic viscosity, nature of flow- laminar, turbulent, Reynolds number, boundary layer formation and separation.

Unit II : Basic Equations for Fluid Flow: Mass balance & momentum balance equations, Bernoulli's equation without and with corrections for solid boundaries, kinetic energy, friction factor, pump work.

Unit III : Incompressible Fluids : Flow through pipes, flow characteristics- shear stress, friction factor, laminar flow for newtonian fluids, Hagen Poiseuille equation, laminar flow for non-newtonian liquids, turbulent flow through pipes and close channels and its characteristic equations, friction factor and its dependence on roughness, Reynolds number, friction factor for flow through channels of non-circular cross section – concept of equivalent diameter, frictional losses due to sudden change in velocity or direction of flow; expansion, contraction, effect of fittings, flow of liquids in thin layers.

Unit IV : Transportation of Fluids: pipe fitting like bends, elbows, flanges, tee and different types of valves, seals for moving parts, pumps, NPSH, power requirement, types of pumps – centrifugal & positive displacement, trouble shooting in operation – priming & cavitation, characteristic curves – head / capacity / power / efficiency, capacity- head flow and head work relationship, metering of fluids: variable head meters- venturi meter & orifice meter, variable area meter – rotameter, insertion meters – pitot tube.

Unit V : Differential analysis: mass and momentum balances, Navier-Stokes equation, unidirectional flow, viscous flow, Stokes law, skin drag and pressure drag, potential flow, potential function, solution of Laplace equation.

Suggested Text Books :

1. M. White, Fluid Mechanics, Tata-McGraw Hill.
2. V. Gupta & S. K. Gupta, Fundamentals of Fluid Mechanics, New Age International.
3. W. L. McCabe, J. C. Smith & P. Harriot, Unit Operations of Chemical Engineering, McGraw-Hill International Edition.

BoS held on 01.10.2021 **B. Tech. (Chemical Engg.)- II Year** **w.e.f : Session 2021-22**

4. O. Wilkes, Fluid Mechanics for Chemical Engineers, Prentice Hall of India.
5. R. W. Fox, P. J. Pritchard & A. T. McDonald, Introduction to Fluid Mechanics, Wiley-India.
6. R. Welty, C. E. Wicks, R. E. Wilson, G. Rorrer, Fundamentals of Momentum, Heat and Mass Transfer, Wiley.

Suggested References Books :

1. B. R. Munson, D. F. Young, T. H. Okiishi & W. W. Huebsch, Wiley-India.
2. R. L. Panton, Incompressible Flow, Wiley-India.
3. R. B. Bird, W. E. Stewart & E. N. Light foot, Transport Phenomena, Wiley India.

Outcomes :

- Velocity profiles by simplification of equations of motion in simple 1-D flows
- Boundary layer thicknesses, friction factor, pressure drop, power requirements in single phase flow in pipes
- Two phase gas/liquid pressure drop
- Power requirements, NPSH requirements of pumps

Courses Focus on Employability/Entrepreneurship/Skill Development