B.Tech, Chemical Engineering

Criteria 1.1.1

GALGOTIAS UNIVERSITY

Vision and Mission of the University

Vision:

To be known globally for value based education, research, creativity and innovation.

Mission:

- Establish state-of-the-art facilities for world class education and research.
- Collaborate with industry and society to align the curriculum
- Involve in social out reach program to identify concerns and provide sustainable ethical solutions.
- Encourage life-long learning and term-based problem solving through an enabling environment.

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Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

0 ENG/DOME/B.Tech Chemical/1.1.1/1

GALGOTIAS UNIVERSITY

Department of Chemical Engineering

Vision, Mission, PEOs , POs& PSOs B.TechChemical Engineering:

Vision

To be internationally recognized undergraduate program that focuses on innovative research and application of knowledge for the development of the community.

Mission

MD1: To impart high quality education experience leading to a strong foundation of fundamentals.

MD2: To conduct innovative and interdisciplinary research for development of new technologies with the ethical usage of modern tools.

MD3: To facilitate graduates to assume leadership position by independent thinking and develop sustainable solutions to real world problems.

MD4: Engage aspirants in group activities to develop communication skills and lifelong learning

Program Educational Objectives

PEO1: To ensure our students are recognized for excellence and leadership and selected for high-ranking industrial, academic, government and other professional positions.

PEO2: The graduates will engage in multidisciplinary professional and ethical practices using modern tools contributing to the society at large.

PEO3: To prepare students for advanced studies in Chemical Engineering and its allied fields.

GALGOTIAS UNIVERSITY Uttar Pradesh

Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

SOENG/DOME/B Tech Chemical/1.1.1/2

Program Specific Objectives

PSO1: Ability to analyse different physical, chemical and biological systems/processes by applying the knowledge of unit operations and unit processes.

PSO2: Ability to make effective separation and purification of products in food, pharmaceuticals, textile, dye, petroleum and petrochemical industries by applying the knowledge of transfer processes.

Program Outcomes

1. Engineering Knowledge: Apply the knowledge of Mathematics, Science, and Engineering fundamentals, and an engineering specialization to solution of complex engineering problems.
2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Design/development of solutions: Design of solutions for complex engineering problems and design of system components or processes that meet the specified needs with appropriate considerations of public health and safety, and cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use researchbased methods including design of experiments, analysis and interpretation of data and synthesis of information leading to logical conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling complex engineering activities with an understanding of limitations.
6. The engineer and society:Apply reasoning within the contextual knowledge to access societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability : Understand the impact of the professional engineering solutions in the societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.

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Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

B.Tech/Chemical/111/2

8. Ethics :Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. Individual and team work :Function effectively as an individual independently and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication:Communicate effectively on complex engineering activities with the engineering community and with society at large such give and receive clear instructions.
11. Project management and finance:Demonstrate knowledge and understanding of engineering management principles and apply those to one's own work as a member and leader of a team to manage projects in multidisciplinary environments.
12. Life-long Learning:Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. Tech Chemical engineering curricula is in tune with national and global priorities by training students in skill-based programs, e.g., Pipe -net and Caesar-II for modeling of fluid flow and calculating process parameters to validate designs and its performances. Apart from domain-specific skills, the department ensures the handholding of its students in life skills like communication, human values, ethics by encouraging students to take two-semester projects which caters to need of local villagers and sensitizes our students to national policies like Unnat Bharat Abhiyan. The key objective of B Tech curricula is transforming young graduate into a responsible, ethical, well-skilled graduate engineer ready to serve the society.

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Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

ENG/DOME/B.Tech Chemical/1.1.1/4

BTCH2001	Fluid Mechanics	L	T	P	C
Version1.02	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	--				
Co-requisites					

COURSE OBJECTIVES

1. To understand the behaviour of fluids and theirproperties.
2. To develop the relationship between the proto type andmodel.
3. To study the development of boundarylayer.
4. To understand the different types of fluid transportationmechanisms.

COURSE OUTCOMES

On completion of this course, the students will be able

1. To understand the rheology of fluid and itskinematics.
2. To learn about different flow and pressure measuringdevices.
3. To gain knowledge about converting large-scale prototypes into small-scalemodels.
4. To understand boundary layer and no-slip boundarycondition.
5. To design various fluid machinery devices using the concepts of fluidmechanics.
6. To aware about advancement in fluid mechanics in terms of chemicalengineering application

CATALOGUE DESCRIPTION

Fluid mechanics includes fluid statics and dynamics, conservation of mass, momentum, and energy, incompressible in viscid flow, flow of a real fluid including laminar and turbulent flow, dimensional analysis and similitude. In this course student can develop the knowledge of flow through pipes and boundary layer concepts, pumps and compressors and applications to engineering problems.

TEXT BOOKS

1. Noel De Nevers, Souza Chris De, Richard De Neufville, (2004), *Fluid Mechanics for ChemicalEngineers*,3rdEdition,McGraw-HillInc.,NewDelhi,ISBN:978-0-072-97676- 2.
2. McCabe, W.L, Smith, J.C., and Harriot, P., (2004), *Unit Operations in Chemical Engineering*, 7th Edition, McGraw-Hill Inc., New Delhi, ISBN:978-0-072-84823-6.

REFERENCE BOOKS

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Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

SOENG/DOME/B.Tech Chemical/1.1.1/5

1. Frank M White, (2011), *Fluid Mechanics*, 7thEdition, Tata McGraw-Hill Inc., New Delhi. ISBN:978-0-071-33312-2.
2. Christie J. Geankoplis, (1993), *Transport Processes and Unit Operations*, 3rd Edition, Prentice-Hall Inc., New Delhi, ISBN:978-0-139-30439-2.
3. Modi, P.N., (2013), *Hydraulics and Fluid mechanics Including Hydraulic Machines*, 19th Edition, Standard Book House, New Delhi, ISBN:978-8-189-40126-9.

COURSE CONTENT

Unit I: Fluid PropertiesandFlow **6 lecturehours**

Units and dimensions - Properties of fluids- Density - Viscosity - Specific gravity - Surface tension - Compressibility - Capillarity - Fluid as continuum - Velocity and stress field - Classification of fluids- Newtonian and non-Newtonian fluids - Compressible - Incompressible - Classification of fluid motion- Steady flow - Unsteady flow - Uniform and non uniform flow - Rotational flow - Irrotational flow, 1-D,2-D, 3-D Flows-Stream line-Velocity potential line - Path line - Time line - Streak line.

Unit II:Fluid Statics **8 lecturehours**

Fluid statics - Basic equation - Equilibrium of fluid element - Pressure variation in a static fluid - Application of manometery- U-tube-inverted U-tube-Inclined - Variable area - Constant and Variable head meters- Orifice – Venturi - rotameter – V-notch- Differential analysis of fluid motion - Continuity - Euler's and Bernoulli's equations and their applications.

Unit III:DimensionalAnalysis **8 lecturehours**

The principle of dimensional homogeneity - Dimensional analysis - The pi-theorem - Rayleigh's equation - Non dimensional action of the basic equations - Similitude - Relationship between dimensionalanalysisandsimilitude-Useofdimensionalanalysisforscaleupstudies-Modeland proto type.

Unit IV: Flow through Pipes and BoundaryLayerConcepts **9 lecture hours**

Reynoldsnumberregimes-Internalflow-Flowthroughpipes–Pressuredropunderlaminarand turbulentflowconditions-Majorandminorlosses-Linesizing-Externalflows-Boundarylayer concepts - Boundary layer thickness under laminar and turbulent flow conditions - Friction and pressure drag - Flow through packed and fluidized beds - Superficialvelocity.

Unit V: PumpsandCompressors **9 lecture hours**

Types,Characteristicsandsizingofvalves-Classification,Performancecharacteristicsandsizing ofpumps-Centrifugal-Priming–Cavitation–Reciprocating-Specialtypepumps–Selecting

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Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

SOENG/DOME/B.Tech Chemical/1.1.1/6

criteriaforindustrialapplications-Compressors-Centrifugal-Reciprocating–Singleanddouble acting - Types, Performance, Characteristics, Types and working principles - Sizing – Selection criteria for industrial applications - Fans andblowers.

Unit VI: Advancement in fluid mechanics

Role of fluid mechanics in biomechanics engineering. Research aspect in chemical engineering.

Mode ofEvaluation

Components	Theory	
	Internal	TEE
Marks	50	50
Total Marks	100	

RELATIONSHIP BETWEEN THE COURSE OUTCOMES (COs) ANDPROGRAM OUTCOMES(POs)

Mapping between COs and Pos		
Sl. No.	Course Outcomes(COs)	Mapped Programme Outcomes
1	To understand the rheology of fluid and its kinematics.	2, 3
2	To learn about different flow and pressure measuring devices.	1, 3, 4
3	To gain knowledge about converting the large-scale prototypes into small-scale models.	1, 2, 6
4	Explain boundary layer and no-slip boundary condition.	2, 3
5	To design various fluid machinery devices using the concepts of fluid mechanics.	1, 2, 3, 5, 7

Department of Mechanical Engineering
Galgotias University, Uttar Pradesh

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SOENG/DOME/B.Tech Chemical/1.1.1/7