NATIONALLY HARMONISED B.Sc. CHEMICAL ENGINEERING PROGRAM				
Course Code	ChEg2084			
Course Name	Heat and Mass Transfer			
Degree Program	B.Sc. in Chemical Engineering			
Module Name	**Chemical Engineering Basics**			
Module Coordinator	N.N.			
Lecturer	N.N.			
Instructor's Contact Information	Office: Phone: Email: Office hour:			
ECTS	5			
Student Work Load	Lecture	Tutorial	Laboratory or Practice	Home study
Weekly basis	**3**	**2**	**0**	**3**
Semester basis(total)	48	32	0	48
Mode of delivery	Parallel (per semester)			
Course Objectives & Competences to be Acquired	The course aims to introduce students to with basic principle of heat and mass transfer in different material and its application in different processes. At the end of this course: • The students will have a sound understanding of principles and different modes of heat transfers • The students will have a sound understanding of principles and different modes of mass transfers • The students will have a sound understanding of the relation between heat and mass transfers; • The student will be able to model heat and mass transfer phenomena in different material and processes;			
Course Description/Course Contents	**1.Fundamentals of Heat and Mass Transfer** 1.1 Theory of transport phenomena 1.2 Analogy of heat, mass and momentum transfer			

	1.3 Heat ,Thermodynamics and Temperature 1.4 Modes of heat transfer 1.5 General heat conduction equation-Fourier's equation 1.5 Electrical analogy **2. Steady State Conduction** **2.1 One-dimensional Steady State Conduction** 2.1.1 Heat conduction equation for rectangular, cylindrical & spherical coordinates, conduction with internal heat generation 2.1.2 Heat flow through rectangular systems 2.1.3 Heat flow through radial systems 2.1.4 Effect of variable thermal conductivity 2.1.5 Heat transfer from extended surfaces **2.2 Two-dimensional Steady State conduction** 2.2.1 The methods of separation of Variables 2.2.2 Numerical methods of analysis 2.2.3 Finite difference method **3. Unsteady-state Heat conduction** 3.1 Lumped heat capacitance method 3.2 Transient heat flow in semi-infinite solid 3.3 Transient numerical analysis Explicit method implicit method

	4. Convective Heat, Mass and Momentum transfer 4.1 The convection boundary layer 4.2Local and Average Convection Coefficients 4.3 Laminar and Turbulent flow 4.3The Boundary Layer Equations 4.4 Physical Interpretation of the Dimensionless Parameters 4.5 Forced convection with flow through pipes and over plates Laminar flow over flat plate Laminar flow in pipes Turbulent flow over a flat plate Turbulent flow in pipes 4.7 Natural (free) convection Laminar free convection on a vertical surface Free convection from horizontal plates **5. Introduction to Thermal Radiation** 5.1 Introduction 5.2 Radiation Heat Fluxes 5.3 Blackbody Radiation 5.4 Absorption, Reflection, and Transmission by Real Surfaces 5.5 Kirchhoff's law **6. Diffusion Mass Transfer** 6.1 Physical Origins and Rate Equations 6.2 Mass Transfer in Nonstationary Media 6.3 Conservation of Species for a Stationary Medium 6.4 Mass Diffusion with Homogeneous Chemical Reactions

Pre-requisites	Fluid Mechanics for Chemical Engineers
Semester	Year 2, Semester II
Status of Course	Compulsory
Teaching & Learning Methods	Classroom contact/Lecture, group work, interactive tutorial sessions (group and pair work/discussions) and individual work (independent learning).
Assessment/Evaluation	Continuous Assessment.....50% • Assignments.....10% • Quizzes.....10% • Tests.....30% End term exam.....50% --- 100%
Course Policy	**Attendance**: As per harmonized academic policy **Assessments**: students are supposed to handle all assessments on time. **Cheating/plagiarism:** it is strictly forbidden and any misconduct is accountable per the students' code of conduct. Also, please do not chew gum, eat, listen to recorders or CD players, wear sunglasses, or talk about personal problems. Please be sure to turn off pagers and cell phonesbefore class and exam sessions
Literature	**Text Book:** F.P. Incropera& D.P. DeWitt: Fundamentals of Heat and Mass Transfer **Reference Books** J.P Holman, Heat Transfer
Approval Section	**Module coordinator/module team**