COURSE SPECIFICATION
((Basic Principle of Chemical Engineering II))

HIGHER EDUCATION PERFORMANCE REVIEW:
PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Technology
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Basic Principle of Chemical Engineering II /CE/R-241, CE/P-241
4. Programme(s) to which it contributes	Second stage
5. Modes of Attendance offered	Full
6. Semester/Year	2 semester/year
7. Number of hours tuition (total)	Theory (3Hr/weak)
8. Date of production/revision of this Specification	30/5/2016
9. Aims of the Course	
• The aims of the course provide a deep knowledge , wide scope and improved understanding of the mechanisms in heat balance as well as a better insight into analytical and empirical methods applied in analysis of energy balance related problems . • The students should gain knowledge to apply the energy balance in engineering problems .	

10· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Knowledge and Understanding

A1-The terminology associated with energy balances , concepts , and units .

A2- Introduction to energy balances for processas without reaction .

A3 –Calculation of enthalpy changes .

A4 –Energy balances : how to account for chemical reaction .

A5 –Ideal process , efficiency , and the mechanical energy balance .

A6 –Heat of solution and mixing .

A7- Humidity (psychrometric) charts and their use .

A8- Unsteady state material and energy balances .

B. Subject-specific skills

B1 –Application of energy balances in the absence of chemical reactions .

B2- Application of energy balances in processes that include reactions .

B3- Application of humidity charts .

B4- Application of unsteady state material and energy balances .

Teaching and Learning Methods

- . Lectures, tutorials , Example classes , and Weekly homework problems .

Assessment methods

- Quizzes , Weekly homework , Homework problemes , Partial test (Oral questions : Multiple choice , Alternative response) , Midterm exam , and Final exam .

C. Thinking Skills

C1- An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems.

C2- Communicate effectively and logically, both orally and in writing;

C3. An ability of scientific analysis for energy balance problems and evaluate their solutions.

C4. Work in teams with the ability to use modern sources (PC, references).

Teaching and Learning Methods

- Lectures, tutorials , Example classes , and Weekly homework problems .

Assessment methods

- Quizzes , Weekly homework , Homework problemes , Partial test (Oral questions : Multiple choice , Alternative response) , Midterm exam , and Final exam .

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1- apply mathematical skills to practical problems;

D2-communicate effectively, both orally and in writing;

D3-manage time and modern resources (PC, references);

D4- work in teams;

D5- be creative, particularly in mathematical analysis and solution of problems;

D6- extract information from published sources.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1st semester					
1	3	Ability to characterize and specify of types of energy.	Define or explain energy, system,closed system, nonflow system,open system, flow system,surroundings, property, extensive property, intensive property, state,heat,work, kinetic energy,potential energy internal energy,enthalpy,initial state, final state, state variable, cyclical process, and path function .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
2	3				
3	3	Ability to characterize and specify of the concept of the conservation of energy .	Classify for a given problem the process as an open or close system and a steady state or unsteady state system .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez, open questions that have a definite answer, or do not have a definite answer
4	3				
5	3	Ability to characterize and specify the phase transitions .	Calculate enthalpy and internal energy changes from heat capacity equations, graphs and charts,and tables given the initial and final states of the material .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
6	3				
7	3	Ability to simplifications of the general energy balance .	Express the general energy balance in words	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez, open questions that have a definite answer, or do not have a definite answer
8	3		write it down with symbols and variables for open system .		
9	3		write it down with symbols and variables for closed system .		

10	3	Ability to specify how to account for chemical reaction .	Explain the meaning of standard heat of formation , heat of reaction .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
11	3		Explain the meaning of higher and lower heating values .		
12	3	Ability to characterize the application of energy balances in processes that include reactions .	Apply the general energy balance to open and closed systems involving complete reactions .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez,open questions that have a definite answer, or do not have a definite answer
13	3		Apply the general energy balance to open and closed systems involving incomplete reactions .		
14	3	Ability to characterize and specify the ideal reversible processes .	Identify a process as reversible or irreversible given a description of the process .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez, open questions that have a definite answer, or do not have a definite answer
15	3		Define efficiency and apply the concept to calculate the work for an irreversible process .		
2nd semester					
16	3	Ability to characterize and specify the ideal reversible processes .	Write down each of the terms in the steady state mechanical energy balance for an open system .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez,open questions that have a definite answer, or do not have a definite answer
17	3		Apply the mechanical energy balance when appropriate to problems so that you can predict pressure drops ,velocities, friction losses ,and pump sizes .		
18	3	Ability to characterize and specify the heats of solution and mixing .	Distinguish between ideal solutions and real solutions .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
19	3		Distinguish between integral heat of solution ,differential heat of solution ,heat of solution at infinite dilution, and heat of solution in the standard state .		
20	3	Ability to characterize and specify the heats of solution and mixing .	Calculate the heat of mixing ,or the heat of dissolution at standard conditions	Lectures, tutorials, example classes, practical	partial test (oral questions :- multiple choice, alternative response), Quez,open questions that have a
21	3		Apply an energy balance to problems in which the heat of mixing is significant .		

				applications	definite answer, or do not have a definite answer
22	3	Ability to characterize and specify the humidity charts and their use .	Define and understand humidity ,dry-bulb temperature,wet-bulb temperature , moist volume ,and adiabatic cooling line .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
23	3		humidity chart .		
24	3	Ability to characterize and specify the humidity charts and their use .	Use the humidity chart to determine the properties of moist air	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez,open questions that have a definite answer, or do not have a definite answer
25	3		calculate enthalpy changes .		
26	3	Ability to characterize and specify the unsteady state material and energy balances .	Write down the macroscopic unsteady state material balances .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), open questions that have a definite answer, or do not have a definite answer
27	3		Write down the macroscopic unsteady state energy balances .		
28	3	Ability to characterize and specify the unsteady state material and energy balances .	Solve simple ordinary differential material or energy balance equations given the initial conditions .	Lectures, tutorials, example classes, practical applications	partial test (oral questions :- multiple choice, alternative response), Quez, open questions that have a definite answer, or do not have a definite answer
29	3		Take a word problem and translate it into a differential equations .		
30	3		Renewable energy .		

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	o **Lecturers** o **D.M.Himmelblau and J.B.Riggs ,Basic Principles and Calculations in Chemical Engineering ,7th Edition , 2004 .** o **R.M.Felder and R.W.Rousseau ,Elementary Principles of Chemical Processes ,3rd Edition ,2005 .**

Special requirements (include for example workshops, periodicals, IT software, websites)	websites
Community-based facilities (include for example, guest Lectures, internship, field	field trips
13. Admissions	
Pre-requisites	Before undertaking this module the student should have undertaken the following: Basic Principles of chemical engineering I , as well simultaneous courses:- Physical chemistry.
Minimum number of students	Non
Maximum number of students	Non