TEMPLATE FOR COURSE SPECIFICATION

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 Baghdad / Alkhwarizmi College of Engineering
2. University Department/Centre	Biomedical Engineering Department
3. Course title/code	Thermodynamics
4. Programme(s) to which it contributes	B.Sc. Biomedical Engineering
5. Modes of Attendance offered	Full Time
6. Semester/Year	1 Course
7. Number of hours tuition (total)	45 Hours for each course
8. Date of production/revision of this specification	2021

9. Aims of the Course

This course aims at providing the student with the necessary basic and advanced concepts for the followings:

To present a comprehensive treatment of classical thermodynamics while retaining an engineering perspective. To lay the groundwork for subsequent studies in such fields as fluid mechanics, heat transfer and to prepare the students to effectively use thermodynamics in the practice of engineering. To develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments. To present a wealth of real world engineering examples to give students a feel for how thermodynamics is applied in engineering practice.

10· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Knowledge and Understanding

Graduates will be able to:

A1. Use their information and thoughtful of the appropriate modelling, scientific and computational tools that support medical instrumentation, to solve, in depth, analytical, design or theoretical problems in this field.

A2. Apply their data and understanding of physical and clinical laws, arithmetic analysis in order to model medical device and any other similar systems.

A3. Explain the role of Biomedical Engineers in medical instrumentation group of work and the constraints within which their clinical judgment will be exercised.

B. Subject-specific skills

B1. Discuss the principles of general block diagram for medical systems.

B2. Discuss the design requirements and specifications, the preliminary stages of designs and their modified action and work, via series of videos and figures.

B3. Use the preliminary understanding to build a virtual explanation for the desired and undesired plan of design.

B4. Discuss the ability to explain new modification and the new trend of clinical supportive works.

Teaching and Learning Methods

The teaching and learning of such important Couse include the followings:

1. Lectures by the instructor himself explaining the main and important points of design.
2. Free discussion of the brain storm presented at the lecture times and discuss the new and future trends.
3. Seminars presented by the student and discussed directly by the other student and instructor.
4. Discussions of important points and induced ideas through social media.

Assessment methods

1. Seminar presented and discussed.
2. Site visited through group of students and under supervising of official medical company.
3. Home works and challenges of design thoughts.
4. Quizzes and exams.

C. Thinking Skills

C1. Apply appropriate analytical mathematics, scientific and engineering tools to the analysis of problems;
C2. Analyze and solve engineering problems;
C3. Design a medical device system, component or process to meet a need;
C4. Integrate knowledge and understanding of other scientific, mathematical, computational or engineering disciplines in order to support their engineering specialization.

Teaching and Learning Methods

• Internal lectures from manufacturers or clinicians;
• Feedback given to students during tutorials;
• Question and answer sessions during lectures or staff Office Hours;
• Guided reading of texts, journal articles etc., for individual and group projects;

Assessment methods

• Individual written report(s).
• Group discussions of group work brainstorm case studies.
• Practical skills will be assessed through troubleshoot technique.
• Experimental, research and design skills will be assessed through laboratory experiments write-ups, coursework reports, project reports and presentations;
• Presentation skills through group presentations and poster presentations.

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

D1. Apply in depth problem solving and analytical thinking to a diverse range of problems;
D2. Use appropriate multi-disciplinary skills to solve medical device problems, combining the biological and engineering knowledge gained through the degree;
D3. Demonstrate numeracy and literacy in written reports, project work and examinations;
D4. Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
First course					
1	3		A Review of Thermodynamic Concepts ▪ Energy ▪ Heat ▪ Heat transfer ▪ Temperature ▪ Distinction between heat and temp. ▪ What is the thermodynamics? ▪ What is the difference between Heat Transfer and Thermodynamics? ▪ Energy in thermodynamics ▪ Internal energy ▪ Total energy ▪ Broadening Our Understanding of Energy ▪ What is the thermal-fluid sciences? ▪ What is the bio transport? ▪ Application Areas of Thermodynamics ▪ Units of Energy ▪ Units of Temperature		
2	3		Introductory Concepts & Definitions in Thermodynamics ▪ Defining Systems & Types of Systems – System – Types of Systems • closed system (control mass) • open system, or a control volume, ▪ Describing Systems and Their Behavior – Property – Extensive and Intensive Properties – State, Process, Path and Cycle – Path functions and point functions – Equilibrium – Uniform, Steady and Steady-Flow Process – Actual and Quasi-equilibrium Processes		
3	3		Energy Transfer by Work ▪ Moving Boundary Work ▪ Special cases of P&V		

			relationships – The constant volume proces – The constant pressure – PV = Constant process = C – The process $PV^n = C$. ▪ Shaft Work ▪ Spring Work ▪ Electrical Work ▪ Flow work and power		
4	3		Energy Transfer by Heat ▪ Adiabatic system ▪ Isothermal process ▪ Determine heat transfer rate		
5	3		Equation of State ▪ The ideal gas law – Kinetic Theory of Gases – Boyle's Law – Charles s law – Gay-Lussac's Law – Avogadro's Law – General Gas Law		
6	3		Heat and Other Forms of Energy ▪ Latent energy or latent heat. - Enthalpy of Ideal Gases - Specific Heats of Gases, Liquids, and Solids ▪ Specific Heats (Heat Capacity) of Ideal Gases ▪ Specific Heats of Solids and Liquids		
7	3		Solution of problems		Quiz 1
8	3		▪ The First Law of Thermodynamics ▪ Energy Balance for Closed Systems ▪ The First Law Applied to Various Process - The Constant-Temperature Process (Isothermal process) - The Constant-Volume Process - The Constant-Pressure Process - The Adiabatic Process		
9	3		Energy Balance for Steady-Flow Processes Surface Energy Balance Heat Transfer Mechanisms ▪ Conduction – Thermal Conductivity – Thermal Diffusivity ▪ Convection		

			▪ Radiation		
10	3		Solution of problems		Quiz 2
11	3		▪ Mass and Energy Analysis of Control Volumes ▪ Conservation of Energy for a Control Volume ▪ Forms of the Control Volume Energy Rate Balance ▪ Some Steady - Flow Engineering Devices - Nozzles and Diffusers - Compressors and Pumps - Heat exchangers - Throttling Devices - Pipe and Duct Flow		
12	3		Phase-Change Processes of Pure Substances ▪ Compressed liquid and Saturated liquid ▪ Saturated Vapor and Superheated Vapor ▪ Saturation Temperature and Saturation Pressure Property Diagrams for Phase-Change Processes ▪ The *T*- υ Diagram ▪ The *P*- υ Diagram		
13	3		Steam Tables Saturated ▪ Saturated Liquid and Saturated Vapor States ▪ Saturated Liquid–Vapor Mixture Superheated Vapor ▪ Compressed Liquid		
14	3		Solution of problems		
15	3		Mid exam		

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	**1.** Engineering Thermodynamics by P. K. Nag **2.** Introduction to Thermal Systems Engineering by Michael J. Moran **3.** Heat and Mass transfer by Rajendra Karwa
Special requirements (include for example workshops, periodicals, IT software, websites)	Check the new modern websites talking about the new modifications
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	BME 445
Minimum number of students	20
Maximum number of students	30