Republic of Iraq

Ministry of Higher Education & Scientific Research

Supervision and Scientific Evaluation Directorate

Quality Assurance and Academic Accreditation

InternationalAccreditation Dept.

Academic Program Specification FormFor The Academic Year 2017-2018

University: Baghdad

College : Engineering

Number Of Departments In The College : 12 Twelve

Date Of Form Completion : April – 3 / 2018

Dean ’s Name

Date : / 4 / 2018

Signature

Dean ’s Assistant For Scientific Affairs

Date : / / 2018

Signature

The College Quality Assurance And University Performance Manager

Date : / / 2018

Signature

Quality Assurance And University Performance Manager

Date : / / 2018

Signature

**TEMPLATE FOR COURSE SPECIFICATION**

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

**COURSE SPECIFICATION**

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| 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 anddemonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification. |

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| College of Engineering  University of Baghdad | ***1. Teaching Institution*** |
| Mechanical Engineering Department (MED) | ***2. University Department/Centre*** |
| Air-Conditioning and RefrigerationME403  The purpose of this course is to introducestudents to the basic elements of heating, ventilation, air conditioning and refrigeration (HVAC/R) systems. Heat laws, psychometrics, heating and cooling load estimating, duct and pipe design, selection of fans in air conditioning systems.  Also the basic principles of refrigeration and their application in HVAC/R. Basic theory and principles of operation, principles of heat transfer, basic refrigeration theory, vapour compression cycles, air cycles, vapour absorption refrigeration systems. Vapor compression components (compressors, evaporators, condensers, expansion valves, cooling coils and towers. Then enable students to demonstrate and apply knowledge of design, select components for, and prepare design documents for Air conditioning and Refrigeration systems. | ***3. Course title/code& Description*** |
| B.Sc. in Mechanical Engineering | ***4. Programme(s) to which itContributes*** |
| Annual System ; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects. | ***5. Modes of Attendance offered*** |
| 1st& 2nd/ Academic Year 2017 – 2018 | ***6. Semester/Year*** |
| 150 hrs. / 5 hrs. per week | ***7. Number of hours tuition (total)*** |
| April – 3 / 2018 | ***8. Date of production/revision of this specification*** |
| ***9. Aims of the Course*** | |
| 1. To understand thermodynamics, fluid flow and heat transfer in HVAC/R applications. 2. Knows basic components in both air conditioning and refrigeration systems. 3. Requirements on indoor environment in order to ensure good health and first-rate living and working conditions. 4. understand air conditioning and refrigeration terminology 5. Design and function of air-conditioning systems to comply with requirements on the indoor environment. 6. To understand the principles of refrigeration and air conditioning. 7. To calculate the cooling and heating load for different applications. 8. Working principles of vapour compression and vapour absorption cooling processes; 9. To design and implement air conditioning and refrigeration systems using standards. 10. Implications of the design of refrigeration systems on temperature levels in the form of key factors for efficient use of energy. 11. Energy Conservation and Management. | |

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| ***10·Learning Outcomes*** |
| Upon Successful completion of this module, the student should be able to:   1. Understand the principles of thermodynamics, fluid flow and heat transfer in HVAC/R applications. 2. Understand the comfort and health—indoor environmental quality. 3. Define moist air properties and psychometricchart calculations, humidity control and analysis of air conditioning processes. 4. Perform heating and cooling load estimation using latest ASHRAE’S CLTD/SCL/CLF Method. 5. Explain types of air-conditioning systems and the mechanical refrigeration system. 6. Understand the principle codes and standards of duct design in Air-conditioning System. 7. Understand the P-h chart and basic principle of vapour compression cycle. 8. Explain types of fans and building air distribution 9. Understand the effects of CFC’s, HCFC and HFC systems on the environment and ozone layer. 10. Analyze various refrigeration cycles such as Carnot, standard vapor compression, multi-pressure systems and absorption systems. 11. Model and analyze various equipment: compressors, heat exchangers, condensers, evaporators, expansion valve, heating and cooling coils, and cooling towers and vapour compression cyclesby using the **Cool Pack** software in process calculation of, thermodynamics properties of refrigerants, water vapor and analyzing various refrigeration cycles. 12. The student will be able to determine the measurement values of air conditioning cooling devices for real cycle. 13. Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to HVAC/R problems and Applications. Design and conduct experiments of HVAC and refrigeration, as well as analyze, interpret data and apply the experimental results for the services. 14. Work in groups and function on multi-disciplinary teams. 15. Identify, formulate and solve engineering HVAC/R problems. 16. Understand professional, social and ethical responsibilities. 17. Communicate effectively. 18. Use the techniques, skills, and modern engineering tools necessary forengineering practice in HVAC/R applications. |
| ***11.Teaching and Learning Methods*** |
| 1. Lectures. 2. Tutorials. 3. Homework and Assignments. 4. Lab. Experiments. 5. Tests and Exams. 6. In-Class Questions and Discussions. 7. Connection between Theory and Application. 8. Field Trips. 9. Extracurricular Activities. 10. Seminars. 11. In- and Out-Class oral conservations. 12. Reports, Presentations, and Posters. 13. Group Work   This will be organized to simulate the professional mechanical services engineering discipline. The students will engage in-class activities encouraging optimal use of the individual's preferred learning style while developing the students ability to work together as a team. Activities here will include problem solving as a group, investigations and report documentation as well as allow them to investigate possible solutions to real. |
| ***12. Assessment Methods***  1. Examinations, Tests, and Quizzes.  2. Extracurricular Activities.  3. Student Engagement during Lectures.  4. Responses Obtained from Students, Questionnaire about  Curriculum and Faculty Member ( Instructor ). |
| ***13. Grading Policy***  1. Quizzes:  - There will be a ( 20 – 25 ) closed books and notes quizzes during the academic year.  - The quizzes will count 20% of the total course grade.  2. Tests, 2-3 Nos. and will count 10% of the total course grade.  3. Extracurricular Activities, this is optional and will count extra  marks ( 1 – 5 % ) for the student, depending on the type of activity.  4. Final Exam:  - The final exam will be comprehensive, closed books and  notes, and will take place on January 2018 from 9:00 AM - 12:00 PM  in rooms ( M12 + M13 )  - The final exam will count 70% of the total course grade |

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| ***14. Course Structure*** | | | | | |
| Assessment  Method | Teaching  Method | Unit/Module or  Topic Title | LOs  ( Article  10 ) | Hours | Week |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Introduction Historical Notes, Common HVAC/R Units and Dimensions | a,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 1 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Comfort and health—indoor environmental quality | b,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 2 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Moist air properties, moist air properties and psychometric calculationsconditioning processes | c,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 3 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Heat Transmission in Building Structures | c,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 4 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Space Heating Load | d,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 5 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Cooling Load | d,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 6 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Heat Gain, Cooling Load, and Heat Extraction Rate | d,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 7 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Air-conditioning systems and types | e,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 8 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Air-conditioning systemsand types | e,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 9 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | P-h chart and basic principle of vapour compression cycle | f,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 10 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Duct design in air-conditioning system | f,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 11 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | duct design—sizing | f,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 12 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | P-h chart and basic principle of vapour compression cycle | g,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 13 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Fans and building air distribution | h,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 14 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Introduction to Refrigeration | i,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 15 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Refrigerants and its effects of on the environment and ozone layer | i,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 16 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Performance of Refrigeration Systems | j,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 17 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Theoretical Single-Stage Compression Cycle | j,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 18 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Refrigerants | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 19 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Refrigeration Equipment Components | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 20 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Compressors | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 21 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Condensers | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 22 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Evaporator | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 23 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Expansion valves | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 24 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Real Single-Stage Cycle | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 25 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Absorption Refrigeration | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 26 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Theoretical Absorption Refrigeration System | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 27 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Aqua–Ammonia Absorption System | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 28 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | The Lithium Bromide–Water System | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 29 |
| Hours  1 - 4 of article (12) | 1-13 of  article (11) | Chillers | k,l,m,n,  o,p,q,r | 5  3 theo.  1 tut.  1 exp. | 30 |

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| ***15. Infrastructure*** | | |
| ***Textbook***   1. Principles of Air conditioning and Refrigeration, [Khalid](http://www.google.iq/search?hl=ru&tbo=p&tbm=bks&q=inauthor:%22Roy+J.+Dossat%22) Ahmed Al joudi,1986.   ***References***   1. Heating, Ventilation, and Air Conditioning in Buildings, [John W. Mitchell](http://eu.wiley.com/WileyCDA/Section/id-302479.html?query=John+W.+Mitchell), [James E. Braun](http://eu.wiley.com/WileyCDA/Section/id-302479.html?query=James+E.+Braun) , 2011. 2. Heating, Ventilating, andAir Conditioning, McQuiston, Faye C.,2005. 3. Refrigeration and Air conditioning, Wilbert F. Stoecker, Jerold W. Jones,1986 4. Principles of Refrigeration, [Roy J. Dossat](http://www.google.iq/search?hl=ru&tbo=p&tbm=bks&q=inauthor:%22Roy+J.+Dossat%22),1997.   ***Others***   1. Notebook prepared by the instructor of the course 2. Collection of sheets of solved and unsolved problems and Exams questions | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER | |
| Laboratory experiments in the ( Fluids  Lab ) of the department.  Available websites related to the subject.  Extracurricular activities. | Special requirements (include forexample workshops, periodicals,IT software, websites) | |
| Field and scientific visits.   * Extra lectures by foreign guest lecturers. | Community-based facilities  (include for example, guest  Lectures , internship,field studies) | |
| ***16. Admissions*** | | |
| ME202&ME203Courses | | Pre-requisites |
|  | | Minimum number of students |
| 25 | | Maximum number of students |
| Instructor:  Asst. Prof. Dr. Kareem Hassan Ali | | ***17. Course Instructors*** |

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