Republic of Iraq

Ministry of Higher Education & Scientific Research

Supervision and Scientific Evaluation Directorate

Quality Assurance and Academic Accreditation

International Accreditation Dept.

Academic Program Specification Form For 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 and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification. |

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| College of Engineering  University of Baghdad | ***1. Teaching Institution*** |
| Mechanical Engineering Department (MED) | ***2. University Department/Centre*** |
| **ME 303** Heat Transfer | ***3. Course title/code& Description*** |
| B.Sc. in Mechanical Engineering | ***4. Program(s) to which it Contributes*** |
| 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.  Each graduating student has to successfully complete 163 credits. Each subject credit is one 50-minute lecture a week or 3 hours of lab a week. There is *no* on-line subject which may be used as supplementary material for the class room instruction. | ***5. Modes of Attendance offered*** |
| 2017-2018 | ***6. Semester/Year*** |
| 120 hrs. / 3 hrs. per week | ***7. Number of hours tuition (total)*** |
| 1st & 2nd ***/.*** Academic Year 2017 – 2018 | ***8. Date of production/revision of this specification*** |
| ***9. Aims of the Course***  1. ***Conservation of Energy*** - Each student can apply conservation of mass and energy to a control volume or control surface.  2. ***Fundamentals of Conduction*** - Each student understands the phenomenological origin of Fourier’s law and is familiar with the development of the general heat diffusion equation based on Fourier’s law and the principle of conservation of energy. Each student can model boundary conditions and can reduce and solve the general heat diffusion equation for one-dimensional, steady-state problems. Each student can analyze steady state systems using thermal circuits.  3. ***Extended Surfaces*** - Each student can analyze extended surfaces (fins and fin arrays).  Each student can evaluate a fin or a fin array using fin performance parameters.  4. ***Two-dimensional conduction*** - Each student can describe the analytical and numerical methods commonly used to analyze two-dimensional, steady state heat conduction. Each student can use finite difference methods to solve two-dimensional, steady state problems.  5. ***Transient Conduction*** - Each student can analyze transient problems using the lumped capacitance method, one-dimensional analytical solutions and transient finite difference methods.  6. ***Fundamentals of Convection*** - Each student understands the physical phenomena associated with convection, Newton’s law of cooling, and the significance of non dimensional parameters in convection heat transfer.  7. ***Convection Correlations*** - Each student can use empirical correlations to analyze external and internal, forced and free convection problems.  8. ***Fundamentals of Radiation*** - Each student understand the physical mechanisms involved in radiation heat transfer. Each student can calculate total, hemispherical radiative properties of real surfaces from their spectral, directional counterparts.  9. ***Radiative Surface Exchange*** - Each student can analyze the radiative heat exchange between surfaces and in diffuse, gray enclosures. | |
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| ***10·Learning Outcomes*** |
| The student will be able to:  1. Differentiate among three basic modes of heat transfer.  2. Analyze thermal systems. They will be able to assess the feasibility of a design and estimate efficiency of a configured system.  3. Apply calculus and linear algebra procedures appropriate to solve specific heat transfer problems in an engineering setting  4. Identify important engineering terms and basic thermal concepts to be used in other engineering courses. |
| ***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. |
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| ***12. Assessment Methods***  ***Program Outcome Assessment Techniques***  Survey of Alumni***.***  The related committees in the department; such as scientific-, QA-, student affairs-, cooperation mechanism- committee.  Employment trends of our graduates will be tracked, e.g. place of employment and job title, every year.  Survey of Employers of Graduates will be given at least every year to determine if the PEOs are still relevant to the employers of our graduates.  The POs themselves will be re-evaluated every few years first by the faculty and then with the Council Presidency Department. Informal review of the POs will occur in conversations with alumni.  ***Summary of Student Outcomes Assessment Techniques***  Alumni survey.  Co-op Employer evaluation data is obtained at the end of the student co-op experience from co-op employer surveys regarding student performance.  Student Co-op evaluation data is obtained from students at the end of their co-op experience regarding the students’ perception of their performance.  Senior Exit Survey are given every year to determine how well students feel they have achieved the student outcomes.  Summary of student performance is gathered in the form of final grades of the  ME courses.  Evaluation of student data, specifically of transcripts for each graduate, is analyzed for time to graduation and retention rate as well as performance in ME courses.  Embedded assessment is performed in every class, every year. Not all student outcomes are evaluated in every single class but a representative sample is chosen. This will be accomplished by assess student assignments, quizzes, exams, lab reports, projects and presentations.  Examinations, Tests, and Quizzes.  Extracurricular Activities.  Student Engagement during Lectures.  Responses Obtained from Students, Questionnaire about Curriculum and  Faculty Member ( Instructor ). |
| ***13. Grading Policy***  1. Quizzes:  - There will be a ( 10 – 15 ) 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 2014 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 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Introduction**  **-Conduction heat transfer**  **-Thermal conductivity**  **-Heat transfer coefficient** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp. | 1 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-convection heat transfer**  **-Radiation heat transfer** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 2 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Steady state, one dimensional conduction**  **- Heat transfer in a wall** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 3 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat transfer in radial and spherical coordinate**  **- Overall heat transfer coefficient** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 4 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Critical thickness of insulation**  **- Heat generation systems**  **- Heat generation in a cylinder** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 5 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Systems of conduction – convection**  **-Fins** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 6 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Steady state, 2D conduction**  **-Analytical method to solve 2D problems**  **-Graphical method**  **- Conduction shape factor** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 7 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Numerical method**  **-Electrical analog** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 8 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Unsteady state conduction heat transfer**  **-Lumped heat capacity system** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 9 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat transfer in semi-infinite sold**  **-Multi-dimensions systems** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 10 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **Heisler charts** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 11 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **- Convection heat transfer**  **-boundary layer over a flat plate**  **-Energy equation for boundary layer**  **-Thermal boundary layer**  **-Heat transfer of laminar flow inside pipes** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 12 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat transfer in turbulent boundary layer**  **-relation between heat transfer and fluid friction** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 13 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Forced convection heat transfer**  **-Empirical equations of flow inside pipes** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 14 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **Systems of natural convection heat transfer**  **-Natural convection heat transfer from vertical plate**  **-Vertical plate and vertical cylinder**  **-Horizontal cylinder**  **- Horizontal plate**  **-Inclined surface and enclosure** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 15 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat exchangers**  **-overall heat transfer coefficient**  **-Fouling factor**  **-Types of heat exchangers** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 16 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Types of heat exchangers**  **-LMTD method** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 17 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-NTU method** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 18 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Design of a heat exchanger** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 19 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Radiation heat transfer**  **-Physical mechanism**  **-Radiation properties**  **-Shape factors of radiation** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 20 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat transfer between black bodies** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 21 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Infinite parallel planes** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 22 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Radiation shields** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 23 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Radiation in absorbed and transmitted mediums**  **-Radiation between real surfaces** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 24 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Heat exchange between absorbed, transmitted and reflected surfaces** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 25 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Fundamental concepts and classification of solar energy** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 26 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Solar time** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 27 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Solar angles** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 28 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Solar intensity and its calculation** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 29 |
| 1 – 4 of article (12) | 1-12 of  article (11) | **-Solar collector**  **-efficiency and performance of solar collector**  **Thermal storage** | a,l,m,n,  o,p,q,r | 4  2 the.  1 tut.  1 exp | 30 |

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| ***15. Infrastructure*** | | |
| **TEXTBOOK**   1. **Heat transfer by J.P. Holman** 2. **Heat transfer by Abdullah El - Bahadly**   **REFERENCES**   * **Fundamentals of heat and mass transfer by Incropera and Dewitt** * **Heat transfer Schaum's series** * **Engineering heat transfer by Donatello** * **Heat transfer exercises by Chris Long** * **Principles of heat transfer by Frank Kreith** | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER | |
| Laboratory experiments in the ( Heat  Lab) of the department.  Available websites related to the subject.  Extracurricular activities. | Special requirements (include for example workshops, periodicals, IT software, websites) | |
|  | Community-based facilities  (include for example, guest  Lectures , internship, field studies) | |
| ***16. Admissions*** | | |
| ME303 Courses | | Pre-requisites |
| / | | Minimum number of students |
| 75 | | Maximum number of students |
| Asst. Prof. Dr. Luma Fadhel  ***Course title*** Radiation heat transfer and solar energy | | ***17. Course Instructors*** |

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