**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 programme specification. |

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| University of Baghdad | 1. Teaching Institution |
| Energy Engineering Dept./College of Eng. | 2. University Department/Centre |
|  | 3. Course title/code |
| B.Sc. | 4. Programme(s) to which it contributes |
| Weekly | 5. Modes of Attendance offered |
| Year | 6. Semester/Year |
| 90 h | 7. Number of hours tuition (total) |
| 2016 | 8. Date of production/revision of this specification |
| 9. Aims of the Course | |
| 1.Build a scientific foundation for students to understand the design requirements for systems of renewable energies  2. Development of intellectual ability of students to absorb the energy necessary to find alternatives solutions  3. The best solutions to study designs to produce the highest possible efficiency of energy | |
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| 10· Learning Outcomes, Teaching ,Learning and Assessment Methode |
| 1. Knowledge and Understanding   A1.The student learns the rules and the basic concepts of energy resources.  A2.Recognizes the principles and basicsto solve energy producing problems.  A3. Recognizes the principles and basics of the design of production projects. |
| B. Subject-specific skills  B1.Apply all the basic information on the question during the design  B2.Analysis and interpretation of the necessary steps to solve the equations required for the best design of the system  B3. Use media technologies to give practical examples |
| Teaching and Learning Methods |
| 1. The method of lecturing.  2. Experiential learning.  3. Make research reports  4. Discussion. |
| Assessment methods |
| A daily and monthly tests and homework |
| C. Thinking Skills  C1.Inference  C2.Understand the question  C3.Solve the problem |

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| D. General and Transferable Skills (other skills relevant to employability and personal development)  D1.Giving students the knowledge skill renewable energy engineering  D2. Evaluate the work in a scientific way by students |

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| 11. Course Structure | | | | | |
| Assessment Method | Teaching  Method | Unit/Module or Topic Title | ILOs | Hours | Week |
| Testing | The lecture and discussion | Solar Collectors | Introduction to solar collectors | 3 hour | 1 |
| Testing | The lecture and discussion | Types of solar collector | Define important types of collectors | 3 hour | 2 |
| Testing | The lecture and discussion | Solar water heating systems | Rules and basic theories of water heating by solar | 3 hour | 3 |
| Testing | The lecture and discussion | Black container water heater | Define the two types of black container | 3 hour | 4 |
| Testing | The lecture and discussion | Solar building heating systems | Rules and basic theories of building heating by solar | 3 hour | 5 |
| Testing | The lecture and discussion | Energy storage | Rules and basic theories of energy storage | 3 hour | 6 |
| Testing | The lecture and discussion | Air and water thermal storage systems | Learn how the two systems store energy | 3 hour | 7 |
| Testing | The lecture and discussion | Design of solar heating system | Modules and basic theories of heating system | 3 hour | 8 |
| Testing | The lecture and discussion | Solar cooling | Rules and basic theories of solar cooling | 3 hour | 9 |
| Testing | The lecture and discussion | Wind power | Introduction to wind energy | 3 hour | 10 |
| Testing | The lecture and discussion | Power content of wind | Learn how to calculate the power of wind | 3 hour | 11 |
| Testing | The lecture and discussion | Force from wind | Rules and basic theories of wind force and airfoil | 3 hour | 12 |
| Testing | The lecture and discussion | Wind turbine design | Rules and basic theories of wind turbine | 3 hour | 13 |
| Testing | The lecture and discussion | Types of wind turbine | Define the two types of wind turbines | 3 hour | 14 |
| Testing | The lecture and discussion | System design features | Learn the requirement for best design | 3 hour | 15 |
| Testing | The lecture and discussion | Hydro power | Introduction to hydro power | 3 hour | 16 |
| Testing | The lecture and discussion | Types of hydro turbines | Define the two types of hydro turbines | 3 hour | 17 |
| Testing | The lecture and discussion | Principles of hydro power | Rules and basic theories of hydro power | 3 hour | 18 |
| Testing | The lecture and discussion | Assessing the resource for small installations | Learn how to assess the system requirements | 3 hour | 19 |
| Testing | The lecture and discussion | An impulse turbine | Rules and basic theories of impulse turbine | 3 hour | 20 |
| Testing | The lecture and discussion | Jet velocity and nozzle size | Learn how to choose nozzle size and jet velocity | 3 hour | 21 |
| Testing | The lecture and discussion | Reaction turbines | Rules and basic theories of reaction turbine | 3 hour | 22 |
| Testing | The lecture and discussion | Photovoltaic Systems | Introduction to photovoltaic systems | 3 hour | 23 |
| Testing | The lecture and discussion | Semiconductors | Learn the type of solar cell materials | 3 hour | 24 |
| Testing | The lecture and discussion | p-n junction | Study the components of photovoltaic cell | 3 hour | 25 |
| Testing | The lecture and discussion | Photovoltaic Effect | Rules and basic theories of Photovoltaic effect | 3 hour | 26 |
| Testing | The lecture and discussion | PV cell characteristics | Study the basic characteristics of Photovoltaic cell | 3 hour | 27 |
| Testing | The lecture and discussion | Design of PV systems | Rules and basic theories of PV design | 3 hour | 28 |
| Testing | The lecture and discussion | Cell temperature | Learn the effect of cell temperature | 3 hour | 29 |
| Testing | The lecture and discussion | Sizing of PV systems | Learn the rules to choose a PV size | 3 hour | 30 |

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| 12. Infrastructure | |
| **1. Energy of thermal process/Duffie and Beckman**  **2. Renewable energy/John Twidell** | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER |
|  | Special requirements (include for example workshops, periodicals, IT software, websites) |
|  | Community-based facilities  (include for example, guest  Lectures , internship , field studies) |

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| 13. Admissions | |
|  | Pre-requisites |
| 15 | Minimum number of students |
| 30 | Maximum number of students |