**COURSE SPECIFICATION**

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| This course introduces fundamental properties of the neutron. It covers reactions induced by neutrons, nuclear fission, slowing down of neutrons in infinite media, diffusion theory, the few-group approximation, point kinetics, and fission-product poisoning. We emphasize the nuclear physics basis of reactor design and its relationship to reactor engineering problems. |

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| BAGHDAD | 1. Teaching Institution |
| ENERGY | 2. University Department/Centre |
| Nuclear Reactor Theory – 4th year | 3. Course title/code |
| BACALORIOUS | 4. Programme(s) to which it contributes |
| WEAKELY | 5. Modes of Attendance offered |
| YEARLY | 6. Semester/Year |
| HOURS120 | 7. Number of hours tuition (total) |
| 1/12/2022 | 8. Date of production/revision of this specification |
| 9. Aims of the Course | |
| 1-To teach students the fundamental behaviors of neutron populations in matter | |
| 2-To teach students analytical and computational methods for the solution of neutron transportand diffusion problems | |
| -3-To teach students the essential elements of reactor kinetics behavior | |
| 4-To prepare students for nuclear reactor core design | |
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| 10· Learning Outcomes, Teaching ,Learning and Assessment Methods |
| 1. Knowledge and Understanding   A1.Be able to calculate neutron interaction probabilities.  A2.Demonstrate setup and solution of the diffusion equation in differentgeometries  A3.Demonstrate calculations of the multiplication factor in one and two groups.  A4.Demonstrate calculations for numerical solution of the diffusion equation..A5.Be able to solve the neutron slowing down equation  A6.Demonstrate calculations of resonance integrals and resonance escape probabilities.  A7.Be able to solve the time dependent neutron equation.  A8.Be able to write and use solutions of the point kinetic equations.  A9.Demonstrate understanding of basic concepts in heterogeneous systems |
| B. Subject-specific skills  B1.to calculate the size and composition of the system(fast or thermal reactors) required to maintain the balance between the number of neutrons produced in fission and the number lost(absorption ,leakage)  B2.to study the behavior of the neutron population in a noncritical reactor ( reactor kinetics)  B3. |
| Teaching and Learning Methods |
| Lectures  Discussion  Project team  Application learning |
| Assessment methods |
| 1-homeworkes  2-daily and monthly quizzes  3-final exams |
| C. Thinking Skills  C1application learning  C2.dicussion method  C3.learning.  C4. |
| Teaching and Learning Methods |
| Lectures  Discussion  Project team  Application learning |
| Assessment methods |
| 1-Homeworkes  2-daily and monthly quizzes  3-final exams |

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| D. General and Transferable Skills (other skills relevant to employability and personal development)  D1.Give the student an information about nuclear reactor operation and structure D2.And how the nuclear power generation and important  D3.And the safety and dangerous of nuclear power.  D4. Using nuclear power for safely purpose |

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| 11. Course Structure | | | | | |
| Assessment Method | Teaching  Method | Unit/Module or Topic Title | ILOs | Hours | Week |
| Quizzes and Homework | Lecture and discussion | Nuclear reactors and nuclear power | Nuclear reactors and nuclear power | 4 |  |
| Quizzes and Homework | Lecture and discussion | Nuclear reactors and nuclear power | Nuclear reactors and nuclear power | 4 |  |
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| Quizzes and Homework | Lecture and discussion | Nuclear reactors and nuclear power | Nuclear reactors and nuclear power | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Neutron diffusion and moderations | Neutron diffusion and moderations | 4 |  |
| Quizzes and Homework | Lecture and discussion | Nuclear reactor theory | Nuclear reactor theory | 4 |  |
| Quizzes and Homework | Lecture and discussion | Nuclear reactor theory | Nuclear reactor theory | 4 |  |
| Quizzes and Homework | Lecture and discussion | Nuclear reactor theory | Nuclear reactor theory | 4 |  |
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| Quizzes and Homework | Lecture and discussion | Nuclear reactor theory | Nuclear reactor theory | 4 |  |
| Quizzes and Homework | Lecture and discussion | Nuclear reactor theory | Nuclear reactor theory | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | The time-dependent reactor | The time-dependent reactor | 4 |  |
| Quizzes and Homework | Lecture and discussion | Radiation shielding | Radiation shielding | 4 |  |
| Quizzes and Homework | Lecture and discussion | Radiation shielding | Radiation shielding | 4 |  |
| Quizzes and Homework | Lecture and discussion | Radiation shielding | Radiation shielding | 4 |  |

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| 12. Infrastructure | |
| . 1-Introduction to Nuclear Engineering, Lamarsh, Second edition, Addison-Wesely,USA,1972  2-Heat transfer and Fluid Flow in Nuclear Systems, Henri Fenech, Wiley & son, 1988.  Nuclear Power Reactor Safety, E.E. Lewis | 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 |
|  | Minimum number of students |
|  | Maximum number of students |