**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 |
| College of Engineering Energy Engineering Department ,(ENED) | 2. University Department/Centre |
| Introduction to Nuclear Engineering ENIR321 | 3. Course title/code |
| Energy Engineering /Department  | 4. Programming(s) to which it contributes |
| Annual System . there is only one mode of delivery , which is a Day program . the 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 (5) credits, Each subject credit is one 50- minute lecture a week or 3- hour lab a week . there is no on- line subject which may be used as supplementary material for the class room instructions . | 5. Modes of Attendance offered |
| 1st semester , Academic year 2014 -2015  | 6. Semester/Year |
| 72hrs / 4tr per week  | 7. Number of hours tuition (total) |
| 2016 | 8. Date of production/revision of this specification |
| 9. Aims of the Course |
| 1.To growth the understanding the physical laws which explain the atomic and nuclear stability  |
| 2.To growth the scientific power for the student such that they use atomic and nuclear laws in solution of the problems in different field :pure science,  |
| 3. prepare the student to understand the production of elementary particle ending with the Nuclear fission  |
| 4.prepare the student to understand the Interaction of the nuclear radiation (α ,βand ˠ -rags) and fission product with the materials  |

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| 10· Learning Outcomes, Teaching ,Learning and Assessment Method 1-Nuclear energy beginning from the  |
| 1. Knowledge and Understanding. By the end of the course, the student should be able to :

A1.Work in groups and function on solving different problems.A2.Understand professional , social and ethical responsibilities.A3.Communicate effectively. |
|  B. Subject-specific skillsB1. Understand the importance the principle of atomic and Nuclear physics to understand the Nuclear Engineering subject B2.know the elementary particles and the atomic structure , Isotopes ,and solving problem B3.to Understand Nuclear Binding energy its importance in nuclear stability (stable element or radioactive ), solving problem B4.to understand mass –energy relation , relativistic mechanics , wave behavior of particle , solving problems .B5.toUnderstand the atomic structure , atomic excitation stales , Radiation emission , Nuclear stability , natural and artificial radioactivity .B6 .to Understand the kinds of nuclear radiation (α ,β and ˠ - rags ) their properties and the conditions their production and solving problems .B7.to understand the Radioactive decay law for radioactive nuclei , decay constant , solving problem .B8.to understand the production of radioactive elements by nuclear reaction application and solving problems .B9.to know the natural and artificial radioactive series , their elements , properties and Using them in solving problems .B10. Nuclear equilibrium between the parent and the daughter of a given radioactive series , application and solving problems . B11.to understand the mechanism and conditions for Nuclear Reactions , application and solving problems .B12.Using the energy of reaction to know whether the element is radioactive to a given radiation or not , solving problems B13.to know the neutron microscopic cross section with different nuclei .B14.Neutron attenuation , its relation with material thickness , mean free path of neutron solving problems .B15. to know the relation of the neutron microscopic cross –section with neutron energy , calculation of cross – section by activation method , Maxwell – Boltzmann distribution law for thermal neutrons. B16.to know the nuclear fission the critical energy of fission , fissile and fissionable nuclei and nuclear fission cross section , solving problem .B17.Nuclear fission cross –section , the activity of nuclear fission product ,solving problem ˠ -rag interaction with matter , photoelectric effect , Compton scattering , production , ˠ-rag attenuation .B18. the meanfree path for ˠ-rag in different material (elements of compound ) and the energy deposition application , and solving problem Range of α, β, particles application and solving problem and fission products in different material , application and solving problem . |
| H.C. Teaching and Learning Methods |
| C 1.LecturesC 2.TutorialsC 3.Homework and assignmentsC 4.Tests and ExamsC 5.In-class questions and discussionsC 6.Connection between theory and application |
| M.D Assessment methods  |
| D 1.Examinations,Tests and Quizzes.D 2.Homeworks.D 3.Student engagement during lectures. |

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| 11. Course Structure |
| Assessment Method (Article 12) | TeachingMethod (Article 11) | Unit/Module or Topic Title | ILOs (Article l0) | Hours | Week |
| 1-3 | 1-7 | Elementary particles | A1,A2,A3, B1 | 43theo.1 tut. | 1 |
| 1-3 | 1-7 | Atomic structure and Isotopes | ,B1,B2 | 43theo.1 tut. | 2 |
| 1-3 | 1-7 | Nuclear Binding energy  | ,B1,B2,B3 | 43theo.1 tut. | 3 |
| 1-3 | 1-7 | Mass and energy | ,B1,B2,B3,B4 | 43theo.1 tut. | 4 |
| 1-3 | 1-7 | Atomic excitation x Radiation | B1,B2,B3 ,B4,B5 | 43theo.1 tut. | 5 |
| 1-3 | 1-7 | Nuclear stability and Radioactive  | B1,B2,B3,B4,B5,B6 | 43theo.1 tut. | 6 |
| 1-3 | 1-7 | RadioactiveCalculation  | B1,B2,B3,B4,B5,B6,B7 | 43theo.1 tut. | 7 |
| 1-3 | 1-7 | Nuclear Reaction | B1,B2,B3,B4,B5,B6,B7,B8 | 43theo.1 tut. | 8 |
| 1-3 | 1-7 | Radioactive series  | B1,B2,B3,B4,B5,B6,B7,B8,B9 | 43theo.1 tut. | 9 |
| 1-3 | 1-7 | Radioactive equilibrium  | B1,B2,B3,B4,B5,B6,B7,B8,B9,B10 | 43theo.1 tut. | 10 |
| 1-3 | 1-7 | Nuclear reaction energy  | B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11 | 43theo.1 tut. | 11 |
| 1-3 | 1-7 | Mechanism of radioactive nuclei for α ,β and ˠ -rag  | B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12 | 43theo.1 tut. | 12 |
| 1-3 | 1-7 | Cross – section for nuclear reaction | B1,B2,B8,B11,B13,B14 | 43theo.1 tut. | 13 |
| 1-3 | 1-7 | Nuclear attenuation | B1,B5,B8,B13,B14  | 43theo.1 tut. | 14 |
| 1-3 | 1-7 | Thermal neutrons  | B1B2B3,B4,B5,B15  | 43theo.1 tut. | 15 |
| 1-3 | 1-7 | Nuclear fission | B1,B2,B3,B4,B5,B8, B11,B13, B16  | 43theo.1 tut. | 16 |
| 1-3 | 1-7 | Activity of fission product ,Interaction of ˠ-rag with materials . | B1,B2,B3,B4,B5,B8, B11,17 | 43theo.1 tut. | 17 |
| 1-3 | 1-7 | Charged particle (α,β and fission product )with matter | B1,B2,B3,B4,B5,B6,B8,B9,B11,B12, B13,B16 ,B17,B18 | 43theo.1 tut. | 18 |

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| 12. Infrastructure |
| Text Books:1.Introdudion to Nuclear Engineering , john R . lamarsh 3rd edition , Addison . wedge .1980.2.Nuclear Reactor Engineering Samuel Glasstone and Alexander sesonske , 5rd edition , van Nostrandpeinhold company 1991.References:1-Foundation of Nuclear Engineering Thomas comas Connolly , john wily and sons 1978. 2-Introduetion to atomic and Nuclear physics H. semat and J.R. Albright , 5rh edition , Fleteher and son ltd , 1972 . 3- مدخل الى الهندسة النووية د قدامة الملاحو د حامد الباهلي /الطبعة الاولى / بغداد / 1990Others:.Notebook prepared by the instructor of the course..Collection of sheets of solved and unsolved problems and Exams sheets | Required reading:· CORE TEXTS· COURSE MATERIALS· OTHER |
| 1.Available websites related to the subject . | Special requirements (include for example workshops, periodicals, IT software, websites) |
| Extra lectures by foreign guest lecturers. | Community-based facilities(include for example, guestLectures , internship , field studies) |

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| 13. Admissions |
|  | Pre-requisites |
| 20 | Minimum number of students |
| 30 | Maximum number of students |
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| **Dr. Maysar A,Salim**Lecturer College of EngineeringUniversity of Baghdad | 14.Course Instructors |