**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 skills  B1. 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.Lectures  C 2.Tutorials  C 3.Homework and assignments  C 4.Tests and Exams  C 5.In-class questions and discussions  C 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) | Teaching  Method (Article 11) | Unit/Module or Topic Title | ILOs (Article l0) | Hours | Week | |
| 1-3 | 1-7 | Elementary particles | A1,A2,A3, B1 | 4  3theo.  1 tut. | 1 | |
| 1-3 | 1-7 | Atomic structure and Isotopes | ,B1,B2 | 4  3theo.  1 tut. | 2 | |
| 1-3 | 1-7 | Nuclear Binding energy | ,B1,B2,B3 | 4  3theo.  1 tut. | 3 | |
| 1-3 | 1-7 | Mass and energy | ,B1,B2,B3,B4 | 4  3theo.  1 tut. | 4 | |
| 1-3 | 1-7 | Atomic excitation x Radiation | B1,B2,B3 ,B4,B5 | 4  3theo.  1 tut. | 5 | |
| 1-3 | 1-7 | Nuclear stability and Radioactive | B1,B2,B3,B4,B5,B6 | 4  3theo.  1 tut. | 6 | |
| 1-3 | 1-7 | RadioactiveCalculation | B1,B2,B3,B4,B5,B6,B7 | 4  3theo.  1 tut. | 7 | |
| 1-3 | 1-7 | Nuclear Reaction | B1,B2,B3,B4,B5,B6,B7,B8 | 4  3theo.  1 tut. | 8 | |
| 1-3 | 1-7 | Radioactive series | B1,B2,B3,B4,B5,B6,B7,B8,B9 | 4  3theo.  1 tut. | 9 | |
| 1-3 | 1-7 | Radioactive equilibrium | B1,B2,B3,B4,B5,B6,B7,B8,B9,B10 | 4  3theo.  1 tut. | 10 | |
| 1-3 | 1-7 | Nuclear reaction energy | B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11 | 4  3theo.  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 | 4  3theo.  1 tut. | 12 | |
| 1-3 | 1-7 | Cross – section for nuclear reaction | B1,B2,B8,B11,B13,B14 | 4  3theo.  1 tut. | 13 | |
| 1-3 | 1-7 | Nuclear attenuation | B1,B5,B8,B13,B14 | 4  3theo.  1 tut. | 14 | |
| 1-3 | 1-7 | Thermal neutrons | B1B2B3,B4,B5,B15 | 4  3theo.  1 tut. | 15 | |
| 1-3 | 1-7 | Nuclear fission | B1,B2,B3,B4,B5,B8, B11,B13, B16 | 4  3theo.  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 | 4  3theo.  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 | 4  3theo.  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 / 1990  Others:  .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, guest  Lectures , 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 Engineering  University of Baghdad | 14.Course Instructors | |