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|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|---------|-----------------------|-------|-------|----------------------------|-----------------------|
| Course Name/Kode: <b>ILT 540 Radiation Detection Systems</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |      |         | ADVANCED TECHNOLOGIES |       |       |                            |                       |
| Semester                                                     | Teaching and Learning Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |      |         |                       |       |       | Credit                     |                       |
|                                                              | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | App. | Lab. | Project | Homework              | Other | Total | Credit                     | ECTS Credit           |
| <b>1-2</b>                                                   | 42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |      |         | 100                   | 46    | 188   | <b>3</b>                   | <b>7.5</b>            |
| Language                                                     | Turkish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |      |         |                       |       |       |                            |                       |
| Compulsory/<br>Elective                                      | Elective                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |      |         |                       |       |       |                            |                       |
| Prerequisites                                                | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |      |         |                       |       |       |                            |                       |
| Course Content                                               | Fundamentals of radiation physics. Interactions of radiation with matters. Radiation units. Radiation Detectors (ionization chambers, proportional counters, Geiger Mueller detectors, inorganic and organic scintillation detectors, semiconductor detectors, strip detectors). General properties of radiation detectors. Electronics of detectors. Signal processing and data analysis. Application of particle detectors..                                                                    |      |      |         |                       |       |       |                            |                       |
| Course Objectives                                            | <p>The objectives of course shall be to enable students to:</p> <ul style="list-style-type: none"> <li>to teach the interactions of radiation with matters, which are used in many areas of nuclear research like medicine, industry, agriculture and archeology,</li> <li>to learn out the types of detectors used to detect radiation,</li> <li>to find out their properties, application areas and design,</li> <li>to learn the necessary information about radiation measurements</li> </ul> |      |      |         |                       |       |       |                            |                       |
| Learning outcomes and competences                            | <ul style="list-style-type: none"> <li>Ability to inform people who work in areas of radiation</li> <li>Ability to present oral and written forms in her/his field</li> <li>Ability to rapidly distinguish the true an required knowledge,</li> <li>Ability to do analyze of results</li> <li>Ability to work at TAEK, TUBITAK-UME, and research groups, universities, research centers in advanced level, people who specialize in these subjects.</li> </ul>                                    |      |      |         |                       |       |       |                            |                       |
| <b>Textbook and /or References</b>                           | <ol style="list-style-type: none"> <li>Physics&amp;Engineering of Radiation dedection<br/>Syed Naeem Ahmed, Queen’s University, Kingston, Ontario (2007).</li> <li>Radiation dedection and Measurement, Gnell F. Knoll (2000)</li> <li>Particle dedectors, Claus Grupen and Boris Shwartz (2008)</li> </ol>                                                                                                                                                                                       |      |      |         |                       |       |       |                            |                       |
| <b>Assessment Criteria</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |      |         |                       |       |       | <i>If any, mark as (X)</i> | <b>Percentage (%)</b> |
|                                                              | <b>Midterm Exams</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |      |         |                       |       |       | X                          | 30                    |
|                                                              | <b>Quizzes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |      |         |                       |       |       |                            |                       |
|                                                              | <b>Homeworks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |      |         |                       |       |       | X                          |                       |
|                                                              | <b>Projects</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |      |         |                       |       |       |                            |                       |
|                                                              | <b>Term paper</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |      |         |                       |       |       | X                          | 20                    |
|                                                              | <b>Laboratory Work</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |      |         |                       |       |       |                            |                       |
|                                                              | <b>Other</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |      |         |                       |       |       |                            | 10                    |
|                                                              | <b>Final Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |      |         |                       |       |       | X                          | 40                    |
| <b>Prepared by</b>                                           | Doç. Dr. Sema Bilge Ocak                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |      |         |                       |       |       |                            |                       |
| <b>Week</b>                                                  | <b>Subject</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |      |         |                       |       |       |                            |                       |
| 1                                                            | <b>Radiation, radiation sources and properties of radiation, ionization and non-ionization radiations, radiation units.</b>                                                                                                                                                                                                                                                                                                                                                                       |      |      |         |                       |       |       |                            |                       |
| 2                                                            | <b>Interactions of radiation with matters, the minimum and maximum energy transfer, mean ionization.</b>                                                                                                                                                                                                                                                                                                                                                                                          |      |      |         |                       |       |       |                            |                       |
| 3                                                            | <b>General properties of radiation detectors</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |      |         |                       |       |       |                            |                       |
| 4                                                            | <b>Ionization chambers</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |      |         |                       |       |       |                            |                       |
| 5                                                            | <b>Geiger Mueller detectors</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |      |         |                       |       |       |                            |                       |

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|----|------------------------------------------------------|
| 6  | <b>Inorganic and organic scintillation detectors</b> |
| 7  | <b>Midterm Exam</b>                                  |
| 8  | <b>Photodetectors</b>                                |
| 9  | <b>Semiconductor detectors</b>                       |
| 10 | <b>Other solid-state detectors</b>                   |
| 11 | <b>Puls processing and data analysis</b>             |
| 12 | <b>Linear and logic puls functions</b>               |
| 13 | <b>Electronics of detectors</b>                      |
| 14 | <b>Application of particle detectors</b>             |