Module Handbook

Module Name:	Nuclear Applications and Instrumentation
Module Level:	Bachelor
Abbreviation, if applicable:	FI3141
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	third year
Module coordinator(s):	
Lecturer(s):	
Language:	Bahasa Indonesia
Classification within the curriculum:	~~General Studies~~ / ~~Major Subject~~ / Elective Studies
Teaching format / class hours per week during the semester:	2 hours lectures
Workload:	2 hours lectures, 4 hours individual study per week, 16 weeks per semester, and total 96 hours a semester
Credit Points:	2
Requirements:	FI 2203 Modern Physics
Learning goals/competencies:	1. Ability to classify types of nuclear application in research and industry 2. Ability to explain how nuclear battery works 3. Ability to explain in specific nuclear application in oil and gas industry 4. Ability to explain nuclear application in medicine 5. Ability to discuss and explain application of nuclear instrumentation in medical and industries 6. Ability to classify and analyze the characteristics and sources of radiations 7. Ability to classify and analyze various nuclear detectors 8. Ability to demonstrate and analyze nuclear pre amplifier and amlifier circuit 9. Ability to analyze discriminator, timing circuit, scaler, and ratemeter 10. Ability to analyze working principle, circuit, and characteristics of SCA and MCA 11. Ability to plan an RBL about nuclear application in industry and instrumentation application in industries and medical field 12. Ability to implement RBL about nuclear application in industry and nuclear instrumentation application in industries and medic al fields according to appropriate time frame
Content:	Introduction: explanation of nuclear applications in general, Review of nuclear applications for electricity production: nuclear fission and fusion reactors. The introduction of nuclear batteries and its classification. Nuclear applications in research and industry: production of radioisotopes, radioisotope and radiation use in research and industry, applications for the tracer, material affects of radiation, radiation affects the material, particle accelerators. Nuclear applications in the oil and gas industry. Nuclear applications in health care: diagnostic imaging, radioimmunoassay, diagnostic radiotracer, and radiation therapy. In addition, the role of nuclear instrumentation in daily life, nuclear instrumentation evolution; nuclear radiation: classification, radiation interation, radiation sources; Nuclear Detector: working principle, type of detectors and their characteristics; nuclear pre-amplifier: working

	principle, characteristics, sample circuits and their analysis; nuclear amplifier: working principle, characteristics, sample circuits and their analysis; Discriminators: working principle, sample circuits and their analysis; Single Channel Analyzers: working principle, sample circuits and their analysis; Timing Circuits, Scalers, Timers, Ratemeters: working principle, sample circuits and their analysis, Multi Channel Analyzer(MCA): working principle, characteristics, sample circuits and their analysis, spectrum analysis; nuclear instrumentation for medical and industry: NDT for pipe leakage, welding quality analysis, obect detection, X-ray, MRI, CT-scan, gamma camera, etc.
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, and research based learning.
Forms of Media:	Slides and LCD projectors, blackboards, lab.
Literature:	1. Kenneth Shultis and Richard E. Faw, Fundamentals of Nuclear Science and Engineering, 2, , CRC Press (Taylor & Francis Group), 2008 2. Djebbar Tiab and Ecle C. Donaldson, : Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties, 2, Gulf Professional Publisher – Elsevier, 2004 3.) S.R. Cherry, J. A. Sorensen, M. E. Phelps, Physics in Nuclear Medicide, 3, Saunders, 2003 4. Knoll, G.F., Radiation Detection and Measurement, 3, ohn Wiley and Sons, 2000 5. P.W. Nicholsons, Nuclear Electronics, 3, Hohn Wiley, 1998 6. Schultis, J.K., and Faw, R.E., Fundalmentals of Nuclear Science and Engineering, , CRC Press, 2008
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