

UST Research Reactor

Welcome to The Future



جامعة العلوم والتكنولوجيا الأردنية

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الدكتور نضال الزعبي - رئيس قسم الهندسة النووية

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Nuclear Engineering Department

- The establishment of a Nuclear Engineering department at JUST is another step in Jordan's efforts to develop its nuclear infrastructure, and to introduce nuclear power as part of its energy mix.
- The program is designed to fulfill Jordan's needs for nuclear engineers and scientists



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Undergraduate Curriculum

- Careers in nuclear power
 - Design, building, construction of Jordan's first Nuclear Power Plant
 - Operation of Nuclear Power Plant
- Regulatory positions with the government
- Nuclear applications
 - Radiation applications Medical, industrial & others
 - Radiological and environmental
- Continue to nuclear research and graduate work



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Current Situation

- Among all Arab eastern counties (Jordan, SA, UAE, Yemen) counties that declared interest in developing nuclear power program in the last year, none have a research reactor
- Current situation would make the development of
 - Infrastructure
 - Human resources
 - Nuclear knowledge
 - Reduce the chances of success of any program

Very difficult



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PURPOSE OF THE REACTOR

- Multi-purpose Research and Training Reactor
- Focuses its activities on
 - Education
 - Nuclear power training and research
- Expands its activities to
 - Nuclear medicines and industrial isotopes production
 - Research in biological, pharmaceutical, material, mineral exploration, archeological, and other scientific fields



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THE REACTOR

- Heart around which the Nuclear Engineering instructional program will be organized
- Nuclear engineering courses will be related in a very practical and realistic manner to the actual operation of the reactor
- Problems of shielding, criticality, control rods, temperature feedback, reactivity can be observed in the reactor, providing students with an enormously valuable experience
- Educating and training students in many other scientific fields
- Initial design, construction and operation of the reactor and its auxiliary systems providing a golden research opportunity for nuclear scientists, engineers and students



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PROPOSED REACTOR

- Multi purpose reactor located in a university
- The most important features
 - Safety the reactor must be inherently safe
 - Ease of use; full proof that a child can operate it without screwing things up
 - Fulfill the purpose it is being constructed for
- The proposed research reactor for Jordan University of Science and technology is an open pool reactor with a power above 2 MW and upgradeable to 5 MW with pulsing capability.



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Capabilities vs. Power

Reactor Use / Utilization	Research Reactor Thermal Power Level				
	30 kW	250 kW	1 MW	2MW	>10 MW
Education	*	*	*	*	*
Training	*	*	*	*	*
Isotope production			*	*	*
Transmutation effect				*	*
Neutron Activation Analysis			*	*	*
Neutron Radiography /		*	*	*	*
Neutron Capture therapy		*	*	*	*
Material structure				*	*
Geochronology				*	*
Positron source				*	*
Instrument and Calibration		*	*	*	*
Material irradiation				*	*
Nuclear Fuel					*



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University of Science and Technology

- The Top Engineering and Science university in Jordan
- Located about 70 km north of Amman
- 17000 students
- 10 Departments of Engineering
- 6000 Engineering students
- Nuclear Center in its original plans
- 30,000 m² site for a research reactor and labs



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Nuclear Engineering Course Requirements

<i>Course No.</i>	<i>Course Name</i>	<i>CH</i>
NE 101	Basics of Nuclear Engineering & Technology	1
NE 201	Fundamentals of Nuclear Engineering	3
NE 203	Ethics & the Development of Nuclear Techno	2
NE 301	Introduction to Nuclear Engineering I	3
NE 302	Introduction to Nuclear Engineering II	3
NE 310	Radiation Detection & Measurement I	2
NE 311	Radiation Detection & Measurement II	2
NE 312	Radiation Detection & Measurement Lab I	1
NE 313	Radiation Detection & Measurement Lab II	1
NE 323	Radiation Protection	3
	Total	21



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<i>Course No.</i>	<i>Course Name</i>	<i>CH</i>
NE 435	Environmental Radioactivity	3
NE 441	Nuclear Heat Transfer	3
NE 451	Nuclear Reactor Theory	3
NE 452	Nuclear Reactor Analysis	3
NE 453	Nuclear Engineering Experiments	3
NE 454	Nuclear Power Plant Systems and Operations 1	3
NE 490	Engineering training	3
NE 511	Monte Carlo simulation and reactor modeling	3
NE 512	Radiation Interactions and Shielding	3
NE 522	Nuclear Materials	3
NE 559	Nuclear Reactor Design	3
NE 561	Nuclear Fuel Management	3
NE 591/2	Senior Project I & II	4
	Total	40

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Technical Electives

<i>Course No.</i>	<i>Course Name</i>	<i>CH</i>
NE 501	Waste Management	3
NE 531	Nuclear Reactor Safety	3
NE 541	NPP I&C	3
NE 549	Special Topics in Nuclear Engineering	1-4
NE 555	Nuclear Power Plant Systems and Operations II	3
ME 536	Energy Conversion	3
ME 538	Water Desalination	3



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