# KFUPM Nuclear Summer Training Program: Development, Implementation and Outcomes

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### **1. Introduction**

The KFUPM (King Fard University of Petroleum and Minerals) Nuclear Summer Training Program was conducted from 8 July to 2 August 2024, in response to a request from K.A.CARE in Saudi Arabia. As the Saudi Arabia prepares for nuclear power project, the demand for highly skilled professionals with practical experience in NPP operations has increased.

To meet this need, the Korea Atomic Energy Research Institute (KAERI) developed and implemented a four-week intensive training program combining theoretical lectures, hands-on simulator exercises, technical visits and group projects. This paper evaluates the program's effectiveness based on participant feedback and provides insights for future nuclear training programs.

#### 2. Program Development and Implementation

### 2.1 Program Objectives

The KFUPM Summer Training Program was designed to provide an in-depth understanding of NPP systems from an operational perspective. The primary goal was to equip participants with both theoretical knowledge and hands-on expertise to prepare them for future roles in the nuclear industry. Furthermore, the program fostered international collaboration and professional networking among future nuclear experts.

### 2.2 Curriculum

The training comprised 140 hours over four weeks, structured as shown in Table 1. The program was structured to balance theoretical knowledge, hands-on exercises, interactive discussions and on-site visits. Group projects were integrated into the curriculum to reinforce theoretical knowledge through applicationbased learning. Students were divided into three groups, each assigned topics related to nuclear power plant systems, emergency response protocols, and reactor safety measures. The projects included researching assigned topics, preparing presentations, and engaging in structured discussions to refine their findings before final presentations.

Modules	Subjects	Delivery	Hour
Nuclear Technology	Korean experience in self-reliance of nuclear program	Lecture	1.5
	Nuclear reactor system	Lecture	1.5
	Nuclear fuel cycle	Lecture	1.5
	Research reactor	Lecture	1.5
	SMR and SMART	Lecture	3
	Gen-IV reactors in Korea	Lecture	1
	Nuclear safety and regulation	Lecture	1.5
	Visit KAERI facilities (HANARO, RIPF, ATLAS, SMART-ITL)	On-site	4.5
	KINAC	On-site	4
Radiation Technology	Radiation technology application	Lecture	1.5
	ARTI	Tech. Visit	3
	KIRAMS	Tech. Visit	2.5
NPP System	KAERI NPP simulator	Hands-on	10.5
	KINS simulator	Hands-on	11
	Research reactor simulator	Hands-on	1.5
	SNU SMR simulator	Hands-on	3
	KHU Research reactor experiment	Hands-on	6
	KEPCO-E&C APR 1000 VR & 3D	On-site	4.5
	Visit KHNP Saeul NPP, Doosan enerbility KEPCO-NF, KEPCO- KPS and KFE	Tech. Visit	7.5
Waste Management	Radioactive Waste Management	Lecture	1.5
	Spent fuel management	Lecture	1.5
	Decommissioning of nuclear facility	Lecture	1
	Visit KAERI facility: KURT	Tech. Visit	1.5
	KORAD	Tech. Visit	2
Group Projects	Group work and research	Group Work	8
	Presentation preparation	Group Work	5
	Presentations and feedback	Group Work	2
Cultural Activities	Learning Hangeul	Activities	2
	Culture experience	Activities	6
Program Arrangement	Opening and orientation	Arrangement	1
	Closing and Assessment	Arrangement	2
	Transport and etc.	Arrangement	35.5
Total			140

Table 1. Curriculum of the training program

### 2.3 Participants and Instructors

The program hosted 18 participants consisting 14 students from the mechanical and chemical engineering departments of KFUPM along with 3 faculty members. A total of 91 instructors from KAERI and external institutions provided lectures and training. One dedicated mentor guided the group projects through research, discussions and presentation preparations.

### 2.4 Program Implementation and Outcomes

The Program was conducted over four weeks, from July 8 to August 2, 2024, incorporating theoretical lectures, hands-on simulator exercises, on-site & technical visits, and group projects. Training sessions were held at KAERI including HANARO and research facilities. Technical visits included KINS, KIRAMS, KINAC, KHNP, KFE, KEPCO-E&C, KEPCO-NF and KEPCO-KPS along with SNU and KHU. The KAERI learning management system (LMS) supplemented the training materials and engagement.

The program was structured into 17 hours of classroom lectures, 32 hours of simulator-based exercises and experiments, 13 hours of on-site visit and 16.5 hours of technical visits. Participants engaged in 15 hours of group projects, which concluded with final presentations. Additionally, two cultural activities, including Gyeongju's historical sites provided cultural immersion. The program concluded with a final assessment and a participant survey to evaluate satisfaction and learning outcomes.

## 3. Evaluation and Survey Results

The effectiveness of the KFUPM Nuclear Summer Training Program was assessed through a structured survey consisting of 74 questions. A total of 13 out of 14 students (92.8%) participated in the survey, providing insights into their experiences and learning outcomes. The survey evaluated key areas such as overall satisfaction, knowledge improvement, hands-on training effectiveness, technical visits, group activities, and cultural experiences.

The program received an overall satisfaction rating of 4.22 out of 5, reflecting a highly positive reception. Knowledge enhancement and networking opportunities were particularly well-rated at 4.54, indicating the program's success in fostering both technical expertise and group project. Pre- and post-training assessments revealed a 39.6% increase in participants' knowledge, particularly in NPP simulator exercises.

Hands-on training components were rated highly, with an importance score of 4.53 and satisfaction score of 4.41, demonstrating the value of practical learning experiences. Technical visits had mixed reviews; while KSTAR and Doosan Enerbility received high satisfaction scores, some sites did not meet expectations. Group projects and cultural activities were wellreceived, with the Gyeongju historical tour being the most memorable experience for participants.

### 4. Discussion

## 4.1 Program Strengths

The program was highly effective in providing knowledge and hands-on training, as evidenced by an overall satisfaction rating of 4.22. The strongest aspect was knowledge improvement, which saw a 39.6% increase, particularly in simulator training and emergency operation procedures. Practical training was rated highly in both importance (4.53) and satisfaction (4.41), indicating that participants valued the hands-on experience. Group projects and networking opportunities were also well-received, with a rating of 4.54, reflecting their effectiveness in fostering collaboration and deeper learning.

## 4.2 Areas for Improvement

While the program was well-structured, some areas required refinement. Technical visits, though rated 3.92 in importance, received a slightly lower satisfaction score of 3.68, suggesting that certain sites did not fully meet participants' expectations. Pre-training assessments should be introduced to better tailor content to participants' knowledge levels. Communication between K.A.CARE and KFUPM should be strengthened to optimize content delivery and logistics. Additionally, logistical considerations such as meal options and scheduling could be improved to enhance participant comfort and engagement.

#### 5. Conclusions

The KFUPM Nuclear Summer Training Program successfully enhanced participants' knowledge and practical skills, particularly through hands-on exercises. The structured group projects and final presentations proved to be an effective educational tool, allowing students to consolidate their learning and demonstrate problem-solving abilities. Future iterations should focus on refining program content, improving logistical arrangements, and enhancing engagement based on participant feedback. These improvements will ensure the program continues to be a valuable educational initiative for the development of nuclear professionals in Saudi Arabia.

#### REFERENCES

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