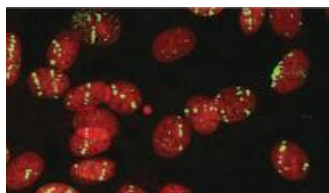


**Fukui International Human Resources Development Center
for Atomic Energy (FIHRDC)/
The Wakasa Wan Energy Research Center (WERC)**

Application Guide

FIHRDC/WERC Accepting Program for
Overseas Researchers/Research Students of
Atomic Energy



JFY2018

 THE
WAKASA WAN
ENERGY
RESEARCH
CENTER



URL: For FIHRDC, <https://fihrdc.werc.or.jp/>
For WERC, <http://www.werc.or.jp/>
E-mail: international@werc.or.jp
TEL: +81-(0)770-24-7272
FAX: +81-(0)770-47-6228

AQUATOM 2F, 2-2-4 Kagura-cho, Tsuruga, Fukui 914-0063, Japan

**FIHRDC/WERC Accepting Program for Overseas Researchers/Research Students of
Atomic Energy JFY2018**

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1. Introduction

FIHRDC/WERC Accepting Program for Overseas Researchers/Research Students of Atomic Energy has been managed by the Fukui International Human Resources Development Center (FIHRDC) in the Wakasa Wan Energy Research Center (WERC) in Fukui prefecture. The FIHRDC accepts overseas researchers and research students who major in nuclear safety technology or nuclear application technologies. The FIHRDC supports their activities through arrangement for flight tickets, accommodation and administrative procedures, and others.

The system of this program is illustrated in Figure 1 (Page 6).

Related organizations are described below:

[Fukui Prefecture]

Fukui Prefecture is known as an advanced area in nuclear energy. Nearly 30% of the nuclear power plants of Japan are located in the prefecture. Along with various types of nuclear reactors, there are a significant number of nuclear related facilities: training facilities, universities and institutes conducting diverse studies on nuclear safety technology and application technology.

In October 2013, the Fukui prefectural government and the International Atomic Energy Agency (IAEA) entered into “the Practical Arrangements on cooperation in the areas of nuclear energy, nuclear safety, and nuclear sciences and applications”.

[WERC]

WERC was established in the context of the Energy Research and Development Centralization Plan of the Fukui prefectural government. The center is a regional based institute to support local industries as well as to conduct research and development on cancer treatment and selective breeding by using its accelerator.

[FIHRDC]

FIHRDC was set up in the WERC in April 2011 to contribute to nuclear safety and the development of human resources in the field of nuclear energy. The center not only deals with this program but also offers training courses for those engaged in nuclear related fields from home/abroad and coordinates international conferences on the themes related to nuclear energy.

2. Purpose and Objective

This program purposes to encourage universities, research institutes and hospitals in the Fukui prefecture to build networks and mutual collaboration with overseas counterparts. The FIHRDC/WERC accepts overseas researchers and research students of atomic energy and supports their studies to accomplish the purpose as well as to contribute to the global activities for nuclear safety and applications of atomic energy.

3. Eligibility

This program accepts the researchers/research students. The applicants must meet the following requirements.

[Researchers]

1. A PhD holder or equivalent. A person who has already conducted some researches in the related subjects at an institute, a university, or any other organization in their home country for several years after Doctorate degree, or who has an equivalent/ a higher performance in research even if they do not hold the degree.
2. A person who engages in research regarding nuclear safety technology and nuclear application technologies in their home country.
3. A person who is expected to contribute to the improvement in nuclear safety technology or nuclear application technologies after returning to home country.
4. A person who has enough foreign-language skills, in English and/or Japanese, so as not to pose a problem in research activities.
5. A person who is physically and mentally in good health so as not to pose a problem in research activities in Japan.

Note: If a person with an equivalent level qualification to a PhD applies for a research topic for 'research students', that is, its application code in Table 3 (Page 12) starts with S, and if there is no one else applicable to the topic, then the WERC regards this applicant as a 'research student' in this program.

[Research students]

1. A student who is enrolled in a master's/ doctoral program or equivalent in their home country.
2. A person who engages in research regarding nuclear safety and application technology in their home country.
3. A person who is expected to contribute to the improvement in nuclear safety technology and nuclear application technologies after returning to home country.
4. A person who has enough foreign-language skills, in English and/or Japanese, so as not to pose a problem in research activities.
5. A person who is physically and mentally in good health so as not to pose a problem in research activities in Japan.

4. Definitions

[Researchers]	Conduct research on chosen topics with the collaborative researchers of the host institute in the Fukui prefecture
[Research students]	Conduct research on chosen topics under the guidance by the supervisor and other equivalents of the host institute in the Fukui prefecture.

5. Number to be accepted

Approximately 5 persons in total

6. Research period

All researches on this program shall be completed in three to six months in the term of in September 3, 2018 - March 29, 2019

Note: An individual research period is to be determined considering the research topic and the situations of the researcher/research student.

7. Expenses borne by the WERC

The expenses borne by the WERC are listed in Table 1 (Page 7).

8. Host institutes

The hosting institutes are listed in Table 2 (Page 8).

9. Application procedure

1. Choose your research topic

Select ONE research topic from the research topics shown in Table 3 (Pages 8-13) that corresponds to your research area and promises certain outcomes.

2. Complete the application form (Appendix 1)

Fill out the application form.

Note: An incomplete application may be rejected. However, the WERC accepts any spacing adjustment /copying of the form to fill all the required information.

3. Obtain official reference letter (Appendix 2)

Ask your appropriate superior, such as the head of your organization and your professor, to complete an official reference letter.

4. Obtain the medical certificate (Appendix 3)

Undertake a medical examination at a medical institution and ask the institution to complete a medical certificate.

5. Fill in the candidate's statement form (Appendix 4)

Put the date signed and your signature on the statement form.

6. Send the application forms to the WERC

Combine the completed papers for Appendix 1 - 4 with an official cover letter in the name of YOUR ORGANIZATION by following the form in Appendix 5. Then, please send the set of application forms in either digital or paper formats to the contact person of the WERC either by e-mail or by post.

Note: The cover letter with your name only is invalid.

10. Application deadline

March 23, 2018

11. Screening

The WERC takes the process of selection in contact with host institutes.

<Criteria of Screening >

1. The applicant's research activity with the host institute meets the purpose and objectives of this program.
2. The motivation of the applicant is appropriate for conducting their research under this program.
3. The applicant satisfies the eligibility requirements for this program.

12. Notification

The WERC is to notify the applicants of the screening results by e-mail or by post if e-mail access is not available. Only successful applicants will receive an admission letter and other necessary documents. The WERC will not respond to individual inquiry concerning the screening process/results.

The results are notified to the applicants in **June 4 - 8, 2018**

13. Obligations of researchers and research students

You should apply for this program with prior consent to the obligation items 1-19 informed as follows. In the case that the researcher or the research student (hereinafter referred to as the R/S) will not fulfill the obligation, then the admission shall be cancelled and the WERC will take certain measures for it; for example, stopping and/or reclaiming the payment borne by the WERC.

1. The WERC cannot accept applicant's withdrawal from admission after the result notification
2. The recipient of the admission letter shall give a written pledge on this program.
3. The R/S must follow the rules and regulation of the host institute during your research activities concerning entry into controlled areas, facility use, experiments, working time (including office service, holidays), intellectual property rights, etc. R/S shall give a written pledge as required.
4. The R/S shall follow the WERC's instructions concerning administrative procedures, flight travel, accommodation arrangements, and transportation between the designated airport in Japan and the Fukui prefecture. For instance, the R/S has to submit the stubs of boarding pass of his/her flight tickets to the WERC.
5. The R/S shall not commit any act of injustice, negligence or other improper behaviors.
6. The R/S must not engage in any business activities other than research, regardless of reward type.
7. The R/S shall not commit any human rights infringements such as racial discrimination, gender discrimination, sexual harassment, academic harassment, power harassment, abuse, neglect, etc.
8. The WERC will not take any responsibilities or defray the costs incurred from any activity of the R/S's that has no relation to this program. For example, if any family member and/or friend visit Japan to see the R/S, the WERC will NOT pay for any costs incurred from this matter such as flight tickets, accommodation fees, local transportations, etc.
9. The R/S shall not take any accompanying persons along him/herself to stay together in the accommodation provided by the WERC.
10. The R/S's personal travel should be approved by the host institute.
11. In principle, the WERC will not permit the R/S's temporary return or overseas travel during the research period in Japan. However, for an unavoidable reason, the R/S

- must obtain approvals by the host institute and the WERC in advance. The cost pertaining to the travel shall be fully borne by the R/S, though.
12. When the R/S decides to discontinue the research owing to an unavoidable reason, they must obtain an approval by the WERC in advance.
 13. When ascertained the research not to be completed within the planned period, the R/S must report it immediately to the host institute and the WERC in order to receive their instructions.
 14. Upon completion of the research, the R/S shall submit a final report on performance, verified by the host institute, in the official form to the WERC before leaving Japan.
 15. The R/S must not use the information gained through the research for any purpose other than improvement in nuclear safety technology and nuclear application technologies.
 16. If the R/S will take the procedure for intellectual property rights including industrial property rights and copyright concerning any invention and/or design based on his/her research, he/she must let the WERC know it immediately as well as submit an official form to report it within 30 days from the end of the fiscal year concerned.
 17. If the R/S gains revenues from producing the results of the given research on a commercial basis and/or exercising the intellectual property rights of them, the WERC may require them to reimburse a certain amount of the grant paid, in full or in part.
 18. If the R/S will not obey the instructions written in this application guide and/or given by Chairman of the WERC, the WERC shall annul or change the R/S's contract with this program. If the WERC has already paid any cost pertaining to the R/S's activity under this program, then the R/S must refund the cost to the WERC.
 19. The R/S shall compensate by him/herself for all damage/loss/injury claims. Either the WERC or the host institute has no liability for the claims.

14. Protection of personal information

Personal information given in the application forms is strictly controlled and implemented only for the execution of the WERC's duty. However, the pertinent information of the admitted researchers/research students* can be presented through the public media such as newspapers, the official website of the WERC, and others.

* Name, occupation, organization that they belongs to, research themes/summaries, research performance reports, etc.

15. Contact

Tatsufumi YAMAGUCHI (Mr.)
 Manager,
 Fukui International Human Resources Development Center for Atomic Energy/
 Wakasa Wan Energy Research Center
 AQUATOM 2F, 2-2-4, Kagura-cho, Tsuruga, Fukui, Japan, 914-0063
 TEL +81-770-24-7272 FAX +81-770-47-6228
 E-mail: international@werc.or.jp

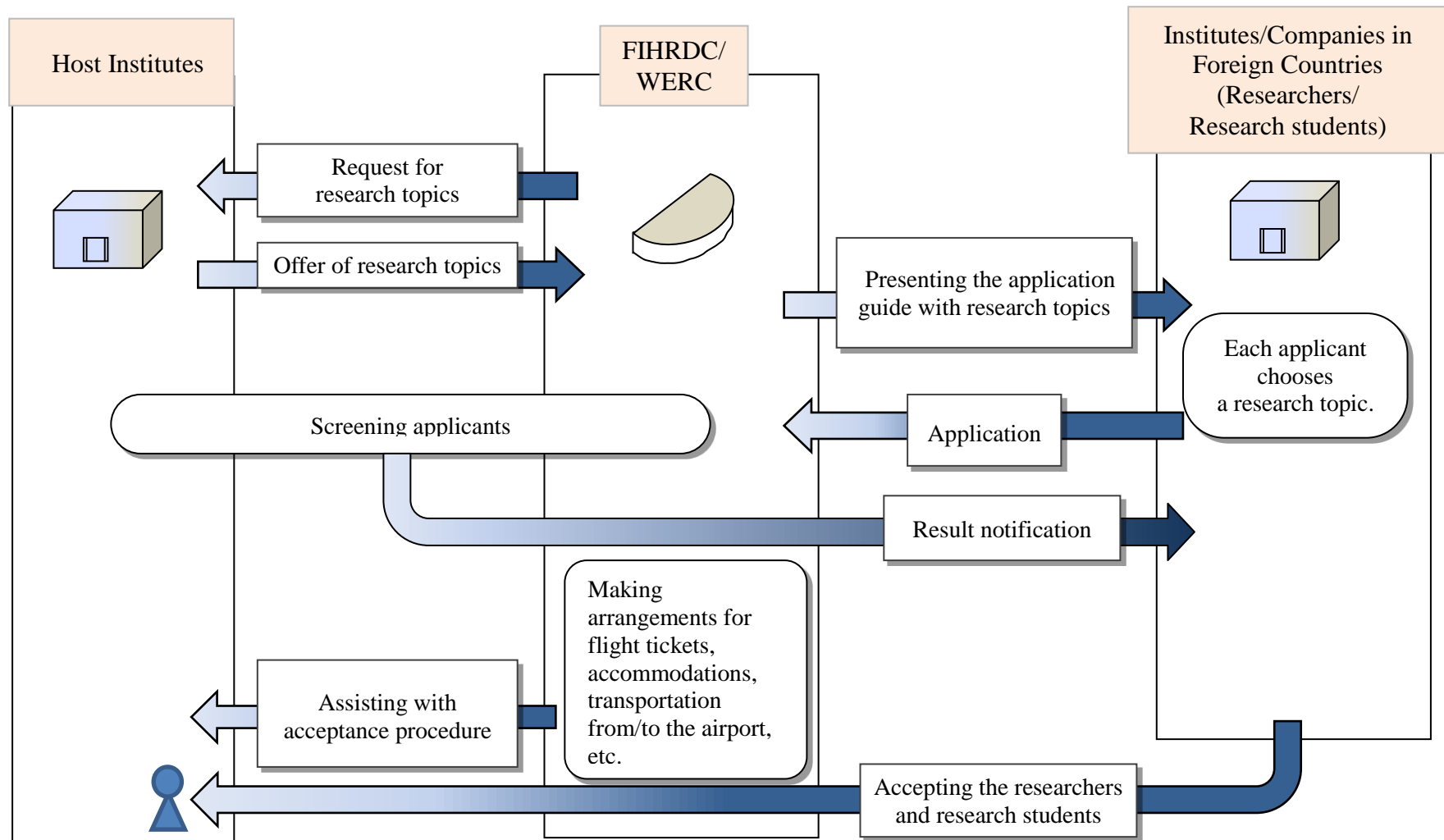


Figure 1 System of the FIHRDC/WERC Accepting Program

Table 1 Expenses borne by the WERC for this program*

Items	Contents	Requirements/Notes
1. Travel costs		
A. Flight ticket	An economy-class round-trip air ticket between the international airport in the R/S's home country and Japan	<ul style="list-style-type: none"> The travel costs between the R/S's home to the nearest airport shall be paid on the R/S's own expenses. The WERC will decide the flight and pays for the ticket.
B. Transportation cost between the airport in Japan and the Fukui prefecture	'Picking-up' minibus. Or railway tickets between the airport in Japan and the closest station of the host institute.	<ul style="list-style-type: none"> The WERC arranges and decides the transportation subject to the travel schedule.
2. Accommodation fees in Japan	<ul style="list-style-type: none"> The accommodation fees during the R/S's stay in Japan. Costs associated with the pertaining contracts are fully borne by the WERC. 	<ul style="list-style-type: none"> The hotel rates are paid only when the R/S has to stay nearby the Japanese airport due to travel schedule. The WERC will select an accommodation type in the Fukui prefecture and near the airport. The WERC will select a single room apartment with essential furniture including the kitchen and the Internet for the accommodation. New furniture and expendable suppliers and materials shall be paid on the R/S's own expenses.
3. Commutation costs	Fare for a commuter pass in public transportation between the accommodation and the host institute.	<ul style="list-style-type: none"> Commutation costs shall not be paid if the distance between the accommodation and the host institute/organization is less than 2.0 km. Taxis are not included in public transportation.
4. Medical examination fees	Necessary medical examinations, if the host institute requires.	<ul style="list-style-type: none"> Expenses for issuing the medical certificate required for application shall be paid by the R/S. The WERC also defrays the cost for specific medical examination in case of entry into a radioactive controlled area for the purpose of the R/S's research. It includes Ionizing Radiation Registry health exam. The WERC also defrays the cost for medical examination if it is necessary in Japan.
5. Overseas Travel Insurance	The travel accident insurance for the R/S's stay in Japan	<ul style="list-style-type: none"> The WERC decides items of insurance coverage. <u>Please note that Overseas Travel Insurance here does NOT cover any accidents in the course of the flight journey.</u> Therefore, it is the R/S's liability for contracting with the insurance for the flight journey.
6. Living Expense Support	The support allowance in cash, 4,000JPY per day will be paid during the researcher's and research student's stay in Japan pertaining to this program.	<ul style="list-style-type: none"> This allowance shall cover the days from entry into Japan up to departure from Japan. The allowance shall be paid monthly at the beginning of each month after being paid for the month of the entry. If the duration of stay changes, this allowance shall be adjusted to the actual duration of stay even after payment.
7. Academic expenses	Entrance and tuition fees if required. However, this is applicable <u>only for RESEARCH STUDENTS.</u>	<ul style="list-style-type: none"> The WERC will directly pay the academic expenses to the host institute before accepting the research student.

* The host institute shall defray the necessary costs for research such as the use and purchase of experimental equipment or reagents, in principle. However, the R/S must pay on their own expenses for the research equipment and/or materials to be their property.

Table 2 List of host institutes

The Wakasa Wan Energy Research Center (WERC) URL: http://www.werc.or.jp/enenews/pdf/pamphlet_english.pdf
Research Institute of Nuclear Engineering, University of Fukui (RINE-UF) URL: http://www.rine.u-fukui.ac.jp/eng/index
Fukui University of Technology (FUT) URL: http://www.fukui-ut.ac.jp/ut/en/

Table 3 Research topics

【For BOTH Researchers and Research Students】

Application Code	Eligible Person	Host Institute	Research Period
RS1	Researchers and Research Students	FUT	2 months (From October 1, 2018 to February 1, 2019)
Research Topic:			
Study of Iodine Collection by Microwave Discharge Technique under Atmospheric Pressure			
Abstract:			
<p>In the event of a nuclear plant accident where the nuclear fuel has been damaged, radioactive iodine gaseous species can be released into the nuclear plant environment. However, extracting the iodine in a controlled manner to recover it and remediate the environment would require a more rigorous process. In this work, a microwave generated plasma is generated the iodine molecules (I₂) from iodine compounds (CsI, KI etc.). An Argon gas based microwave generated plasma is used as the ionization chamber. The characteristics of the plasma and the iodine species is observed. Different forms of iodine (gas, liquid, solid) are released from the plasma zone downstream of the microwave chamber. The released gaseous species are capture in a filter system and the characteristics of the iodine species are identified. The results indicate that I₂, I⁻, and I₃⁻ species are observed. The technique works well at ionizing the iodine species at relatively low powers and allowing them to be captured by a standard cotton filter. These results suggest that a microwave based technique may be useful for environmental cleanup activities of radioactive species such as iodine. The technique can be used to address contaminated material as well as treat the gas phase environment.</p>			

Application Code RS2	Eligible Person Researchers and Research Students	Host Institute FUT	Research Period 2 months (From October 1, 2018 to February 1, 2019)
Research topic: Study of Magnetic Separation Method for Radioactive Contaminant			
Abstract: <p>Since the accident happened in The Fukushima Daiichi Nuclear Power Station, a scattered radiological decontamination and decommissioning technology are attracting a lot of attention. Radioactive contaminants called crud generated by corrosion of piping metal material are in the reactor cooling water and causes radioactivity rise. The removal of crud in the nuclear power plant will become one of the more requisite elemental technologies of the decommissioning from now on. Removal of the cruds is important not only in operating nuclear reactors but also in nuclear reactors in decommissioning work. However, the effective technique to remove the crud which is applicable at high-temperature area around the nuclear power plant does not exist. Therefore, we focused on the magnetic property of the target cruds which are paramagnetic/antiferromagnetic substance and high gradient magnetic separation (HGMS) was proposed as a nuclear power plant crud removal method. In this research, we aim to investigate the applicability of high gradient superconducting magnetic separation system for removing crud in reactor coolant.</p> <p>Area of specialization / Magnetic force control technology</p> <ul style="list-style-type: none"> ▪ Removal of the paramagnetic scale (and/or crud) in the power plant, ▪ Volume reduction of the Cs contaminated soil, Clay minerals which adsorbed Cs are separated utilizing the difference magnetic susceptibility by high gradient superconducting magnetic separation (HGMS). 			

Application Code RS3	Eligible Person Researchers and Research Students	Host Institute WERC	Research Period 4 months (From September 3, 2018 to March 29, 2019)
Research Topic: Calibration of Position Monitors of Synchrotron using a Beam			
Abstract: <p>Position monitors are used for the measurement of the beam orbit in a synchrotron. The type of the monitor consists of electrodes located inner wall of a beam duct. Position of the beam is measured with the image charge induced by the beam.</p> <p>Calibration of the position monitor is performed by applying pulse signal between the electrodes before the installation to the synchrotron. But the output of the monitor after the installation may be different from the one just at the installation because of the change of the electrostatic characteristic of the cabling and connection condition and/or loss of the gain of the amplifier. It is necessary to recalibrate the position signal by the detection of the accelerated beam under operation state of the accelerator.</p> <p>The output signal of the position monitor is determined by the beam charge, the beam position, the response function and the amplifier gain. It is assumed that the response function depends on only the geometry of the pickup electrodes and can be evaluated by the calculation. For the variation of the output of the monitor so as to represent the change of the beam position and charge, the amplifier gain can be determined by using the non-linear least square method ^[1].</p> <p>[1] K. Sato et al., Proceedings of PAC95, p2482 (1995).</p>			

【For Researchers ONLY】

Application Code R1	Eligible Person Researchers	Host Institute RINE-UF	Research Period 6 months (From October 1, 2018 to March 29, 2019)
Research topic: Environmental radiation monitoring in normal situation and in nuclear emergency situation			
Abstract: <p>The importance of radiation monitoring was reaffirmed by the Fukushima Daiichi Nuclear Accident. In order to detect abnormal event in emergency situation, it is necessary to accumulate measured data and experiences from normal situation. It is an indispensable effort to protect the health of the citizens in surrounding countries which has no nuclear power plant, as well as in countries that introduce nuclear power.</p> <p>In this research, trainee will learn about the status of radiation monitoring over 50 years in Japan, analysis of data obtained, and what kind of efforts has been done after Fukushima accident. Also, depending on the interest, they can include some subjects about the current situation of radiation use and/or disaster prevention in Japan.</p>			

Application Code R2	Eligible Person Researchers	Host Institute RINE- UF	Research Period 6 months (From October 1, 2018 to March 29, 2019)
Research topic: Measurement of nuclear fragmentation reactions for therapeutic particle beam			
Abstract: Charged particle therapy is one of external beam radiotherapy using highly energetic protons and carbon ions for cancer treatment. These incident particles are producing secondary particles in patient body, and will give uncontrollable additional dose around targeted tumor. In this program, the trainee will participate in the experiment at accelerator, measure those secondary particles using nuclear track detection technique, and estimate additional dose, during learning about the basic of medical physics.			

Application Code R3	Eligible Person Researchers	Host Institute RINE- UF	Research Period 6 months (From September 3, 2018 to March 29, 2019)
Research topic: Performance evaluation of a Small Modular Reactor (SMR) for ship propulsion			
Abstract: Environmental regulations with respect to the exhaust gas emission of merchant ships are becoming stricter. Nuclear power could provide an alternative approach to power large merchant ships. In our laboratory a small-scale PWR for ship propulsion is under investigation. In this research the physical parameters and the thermal hydraulic of the reactor are investigated. A core design will be prepared to allow safe and economical operation of the reactor during the lifetime of the ship. Required knowledge / skills: nuclear reactor physics, thermal hydraulics, PWR, computer simulation, basic programming skills (FORTRAN / Python / Octave). The research should lead to at least one publication in an international, peer-reviewed scientific journal.			

Application Code	Eligible Person	Host Institute	Research Period
R4	Researchers	RINE- UF	6 months (From September 3, 2018 to March 29, 2019)
Research topic: Creation and validation of a JENDL-4.0 based cross section library for DRAGON			
Abstract: DRAGON is part of the Version5 software system, which is an open source software package for the reactor physics analysis of nuclear reactors. In recent years, the nuclear data processing system NJOY has become available as open source software. In this research, NJOY will be used to create cross section libraries for DRAGON based on JENDL-4.0. The generated cross section libraries will be benchmarked against available experimental data. Required knowledge / skills: nuclear reactor physics, nuclear physics, nuclear cross sections, numerical mathematics, basic programming skills (FORTRAN / Python / Octave). The research should lead to at least one publication in an international, peer-reviewed scientific journal.			

Application Code	Eligible Person	Host Institute	Research Period
R5	Researchers	RINE- UF	6 months (From September 3, 2018 to March 29, 2019)
Research topic: Benchmarking of an SN-transport code based on Isogeometric Analysis (IGA)			
Abstract: The Isogeometric Analysis (IGA) is an innovative way to perform calculations based on the Finite-Element Method (FEM) in arbitrary geometry. In our laboratory a neutron transport code based on IGA is under development. In this research our code will be benchmarked against available experimental benchmarks. Required knowledge / skills: nuclear reactor physics, transport theory, numerical mathematics, computer simulation, basic programming skills (FORTRAN / Python / Octave). The research should lead to at least one publication in an international, peer-reviewed scientific journal.			

Application Code R6	Eligible Person Researchers	Host Institute WERC	Research Period 2 months (From September 3, 2018 to December 20, 2018)
Research topic: Improvement of efficient high energetic ion beam delivery techniques			
Abstract: <p>The Wakasa Wan Energy Research Center (WERC) is carrying out various research topics including biology, medical, and space applications. For the space application, one of our motivations, the applicant is expected to simulate beam for more efficient high energy beam delivery for irradiation examinations for semiconductor devices.</p> <p>During the coming period in the JFY2018, the applicant is expected to carry out calculation and estimation of beam modulation by Monte Carlo simulation method with calculation of beam delivered by our accelerator to our experimental setup.</p> <p>The applicant is expected to have a knowledge and an experience in radiation science, of which physics or nuclear engineering is preferred, and also is expected with an experience in computer simulation.</p>			

【For Research Students ONLY】

Application Code S1	Eligible Person Research Students	Host Institute WERC	Research Period 3 months (From September 3, 2018 to December 28, 2018)
Research topic: Development of a few MeV monochromatic energy electron source (Part 2)			
Abstract: <p>Sr-90 checking sources are often used for test of radiation detectors. Electrons from the checking sources have continuous energy distributions unlike in the case of gamma sources. To investigate the responsivity of radiation detectors, it requires a monochromatic energy source. In the Wakasa Wan Energy Research Center (WERC), an electromagnetic coil is used for the monochromatic energy sorting of Sr-90.</p> <p>A momentum analysis system for electron of Sr-90 in the air was developed at WERC in JFY2107. In JFY 2018, the WERC is upgrading the system with high energy resolution. Applicants who join this program are preferred to have experiences of radiation work and radiation detectors such as plastic scintillator, NaI, etc.</p>			