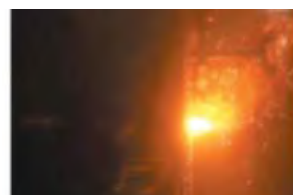
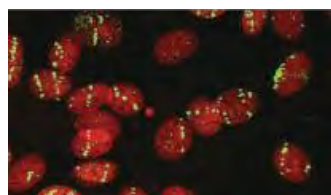


**Fukui International Human Resources Development Center
for Atomic Energy (FIHRDC)/
The Wakasa Wan Energy Research Center (WERC)**

Application Guide

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



JFY2019

THE
WAKASA WAN
ENERGY
RESEARCH
CENTER



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**FIHRDC/WERC Accepting Program for Overseas Researchers/Research Students of
Atomic Energy JFY2019**

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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 2, 2019 - March 31, 2020

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 8-14) 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 25, 2019

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 3 - 7, 2019**

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

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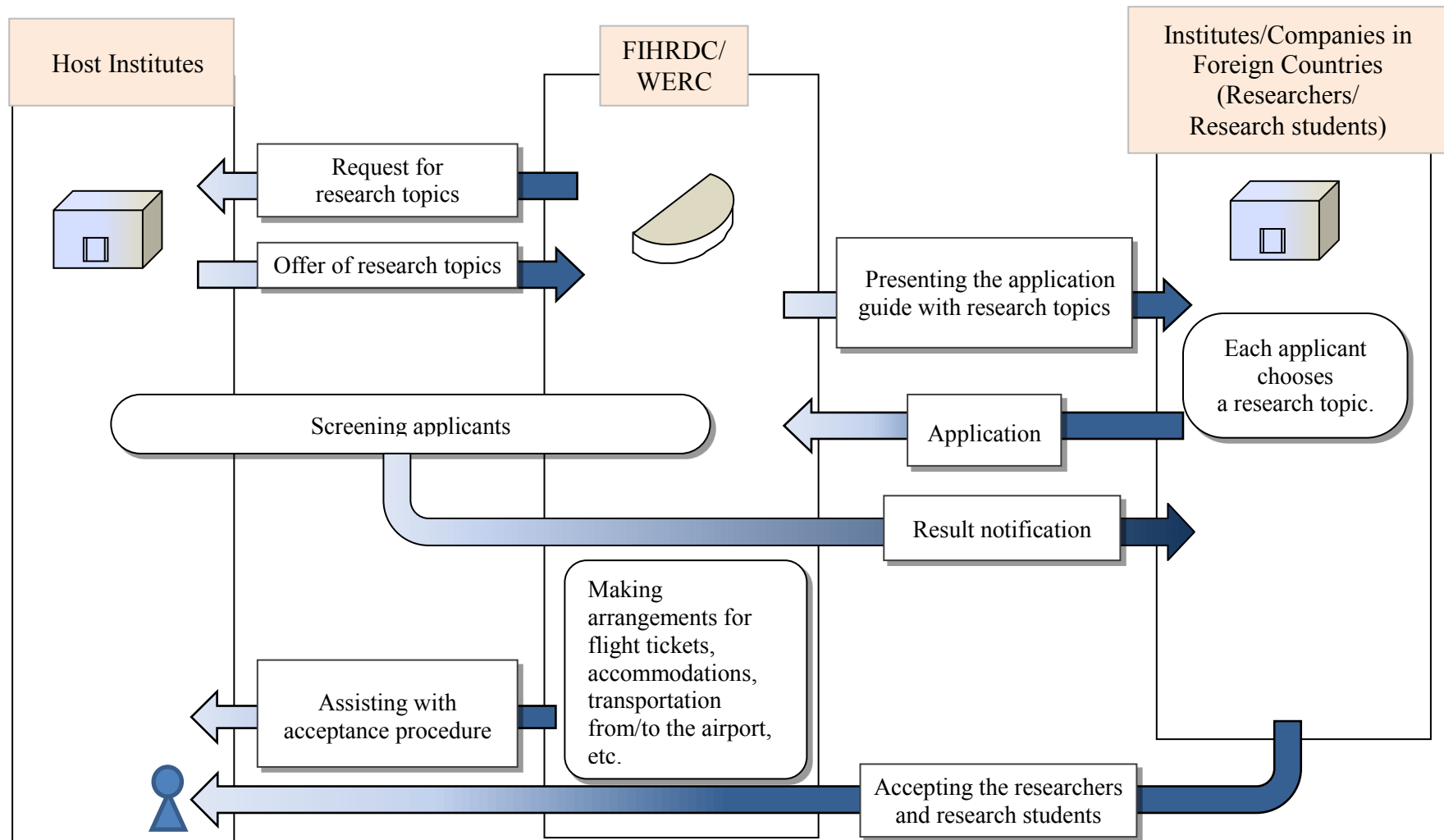


Figure 1 System of the FIHRDC/WERC Accepting Program

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	- 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.	The WERC arranges and decides the transportation subject to the travel schedule.
2. Accommodation fees in Japan	- The accommodation fees during the R/S's stay in Japan. - Costs associated with the pertaining contracts are fully borne by the WERC.	- 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.	- 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.	- 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	- 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.	- 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>	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/
Institute of Nuclear Safety System, Incorporated (INSS) URL: http://www.inss.co.jp/english.html

Table 3 Research topics

【For BOTH Researchers and Research Students】

Application Code	Eligible Person	Host Institute	Research Period
RS1	Researchers and Research Students	RINE-UF	3 months (From September 2, 2019 to March 31, 2020)
Research Topic: Thermal Conductivity Estimation of Fully Ceramic Microencapsulated Pellets with ZrO₂ as Simulated Particles			
Abstract: Thermal conductivity of fully ceramic microencapsulated (FCM) fuel estimation is important to provide accurate prediction of fuel performance and safety aspect of nuclear fuel. ZrO₂-SiC or ZrCO(ZrO₂+ZrC)-SiC pellets with FCM fuel concept are fabricated using SPS, and characterize using laser flash analysis to measure thermal conductivity. Maxwell-Eucken model modified by considering the parameter of matrix-particle interaction is applied to simulate the measured thermal conductivity of ZrO₂-SiC or ZrCO(ZrO₂+ZrC)-SiC pellets.			

Application Code RS2	Eligible Person Researchers and Research Students	Host Institute RINE-UF	Research Period 3 months (From September 2, 2019 to March 31, 2020)
Research topic: Experiments and simulations for corrosion of structural materials			
Abstract: Corrosion of structural materials is an unavoidable problem which is difficult to predict in every plant with its long-term operation. In case of nuclear reactor, the stress corrosion cracking in the stainless steel of internal structures sometimes arises under the influence of welding or neutron-radiation. This study aims at predicting the corrosion rate in the stress affecting environment by the numerical simulations. When a stress is applied to the materials, the oxide film is damaged and therefore its corrosion resistance decreases. This study unveils the electrochemical property of stainless steel with the effect of stress by the novel mechano-electrochemical experiments. The electrochemical property obtained from this experiments is modeled as a stress-dependent polarization curve, and it is used in the stress/corrosion interaction simulation which has been developed in this study. From the results of these experiments and simulations, we address the mechanism of stress-assisted local corrosion with the oxide film damage by the microscopic stress concentration.			

Application Code RS3	Eligible Person Researchers and Research Students	Host Institute RINE-UF	Research Period 6 months (From September 2, 2019 to March 31, 2020)
Research Topic: Environmental radiation monitoring in normal situation and in nuclear emergency situation			
Abstract: The Fukushima nuclear accident had a new appreciation of the importance of monitoring radiation. In order to detect abnormalities in emergency, the measurement data from a usual time needs to be accumulated. When surrounding countries will have atomic power from now on not to mention the country which introduces atomic power, it is an indispensable measure in order to protect national health. In this research, the student learns about what kind of measure was taken after the disaster and learns radiation monitoring over 50 years in Japan. Through the data analysis of from normal and emergency situation, the student will learn about the importance of continuous radiation monitoring. Moreover, the present condition of radiation use in Japan can also be added into the theme by visiting some facilities.			

Application Code RS4	Eligible Person Researchers and Research Students	Host Institute RINE-UF	Research Period 3 - 6 months (From September 2, 2019 to March 31, 2020)
Research topic: Design and analysis of a Th-Pu fueled small scale PWR for commercial ship propulsion			
Abstract: Nuclear power is commonly used for military ships such as aircraft carriers and submarines. Nuclear power is also attractive for commercial ships. In this work, a small-scale PWR using thorium-plutonium fuel will be designed and analyzed. Necessary skills: knowledge of nuclear reactor physics; basic knowledge of computer simulation. Experience with nuclear reactor simulation software is desirable but not necessary. Key words: nuclear reactor physics, nuclear reactor design, PWR, numerical simulation, small and medium sized reactor			

Application Code RS5	Eligible Person Researchers and Research Students	Host Institute RINE- UF	Research Period 3 - 6 months (From September 2, 2019 to March 31, 2020)
Research topic: Investigations of SN neutron transport theory with the IGA method			
Abstract: In our laboratory we have developed a novel approach for the simulation of neutron transport in arbitrary geometry based on the IGA method. In this work, the simulation method will be investigated with the following goals: reduced calculation time; increased accuracy; increased stability. Necessary skills: basic knowledge of differential equations, basic programming skills, experience with FORTRAN or similar computer language, knowledge of mathematics and numerical simulation Key words: Neutron transport theory, neutron diffusion theory, differential equations, Finite Element Method, numerical simulation			

Application Code RS6	Eligible Person Researchers and Research Students	Host Institute FUT	Research Period 6 months (From September 2, 2019 to March 31, 2020)
Research topic: Study of PVA-KI Gel Dosimeter			
Abstract: In recent years, use of radiation beams or particle beams have been put to practical use for cancer therapy. In cancer radiation therapy, visualization of radiation patterns is absolutely necessary for precisely evaluating the dose distribution. In this study, I developed a new type of gel dosimeter using a doped polyvinyl alcohol (PVA) based solution. We irradiated different gel samples with X-rays from a Hitachi MBR-1520R-3 source under different configurations to test the gel performance. We used UV-VIS spectrometry to measure the absorbance of transmitted light through the gel. The absorbance had a peak in the vicinity wavelength of 490nm. The results confirmed the absorbance to be proportional for increasing applied dose. In summary, a color transition gel was developed for use in detecting irradiation dose from X-rays. This technique has potential application for visualization of dose during medical procedures.			

Application Code RS7	Eligible Person Researchers and Research Students	Host Institute WERC	Research Period 4 months (From September 2, 2019 to February 28, 2020)
Research topic: Improvement of DC current transformer utilizing negative resistance circuit for a beam monitor of a synchrotron			
Abstract: We have developed a current transformer (CT) utilizing negative resistance circuit for the monitor of the synchrotron beam. The CT is often used for the beam study of the synchrotron, however, has some problems in the stability of the lower cut-off frequency determined by inductance and resistor. For the easy install of the CT to the beam line, a pair of half-split core have been used. This yields such reduction of inductance of core-coil as to make the lower cut-off frequency unstable. We try to improve the stability of the lower cut-off frequency by using "non-split" core. The researcher shall also make a negative resistance circuit.			

Application Code	Eligible Person	Host Institute	Research Period
RS8	Researchers and Research Students	WERC	3 months (From September 2, 2019 to February 15, 2020)
Research topic: Short term effects of DDR inhibitors on an irradiated Arabidopsis seedlings			
Abstract: This theme investigates a short term (within a day) effects of DDR (DNA damage response) inhibitors on irradiated Arabidopsis seedlings, using DNA γH2AX (a marker of DNA double strand break) localization, EdU incorporation (S-phase marker), and aberrant mitotic figures as indexes. Research scholar will be able to learn about · method of plant preparation for ion beam irradiation · immunofluorescent staining of plant tissue · how to use a laser confocal microscope · how to process image data			

Application Code	Eligible Person	Host Institute	Research Period
RS9	Researchers and Research Students	WERC	2 months (From November 1, 2019 to December 28, 2019)
Research topic: Acceleration of nitrogen beam by the injection of nitrogen hydride negative ion to the tandem accelerator			
Abstract: The $1\text{H}(15\text{N}, \alpha)$ reaction is used for the selective analysis of hydrogen. In order to accelerate nitrogen beam by use of tandem accelerator and reduce the beam radius to microbeam size, the researcher shall perform the feasibility study of the utilization of nitrogen hydride negative ion NH_x^-. The researcher shall also experience the maintainance and startup of the ion source.			

【For Researchers ONLY】

Application Code R1	Eligible Person Researchers	Host Institute INSS	Research Period 3 - 6 months (From September 2, 2019 to March 31, 2020)
Research topic: Estimation of material strength by small punch test technique			
Abstract: In the small punch test, a small disc specimen, of which diameter is 8 mm and thickness is 0.5 mm, is fractured by indenting a hard ball. The objective of this study is to develop a test procedure for estimating material strength properties, such as yield and tensile strengths and stress-strain curve. It is expected that more mechanistic estimation can be achieved incorporating numerical simulating the small punch test by finite element analysis. The developed technique can be used for estimating the material strength of actual plant. In particular, it is possible to quantify degree of neutron irradiation of reactor pressure vessel steel or thermal embrittlement of ferritic steel at weld or cast austenitic stainless steel.			

Application Code R2	Eligible Person Researchers	Host Institute WERC	Research Period 2 months (From September 2, 2019 to December 27, 2019)
Research topic: Improvement of efficient high energetic ion beam delivery techniques			
Abstract: We are 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. During the coming period in the financial year of 2019, 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. 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. Notice: Because our accelerator is not for electrons but for ions, research topics on electron or X-ray beam is not acceptable in our facility.			

【For Research Students ONLY】

Application Code S1	Eligible Person Research Students	Host Institute WERC	Research Period 3 - 5 months (From September 2, 2019 to December 27, 2019)
Research topic: Development of a time-of-flight detector for electron			
Abstract: 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), a momentum analysis system for electron of Sr-90 in the air was developed by using an electro-magnetic coil. The purpose of this work is development of a time-of-flight (TOF) detector for the energy measurement of electrons. Applicants who join this program are preferred to have experiences of radiation work and radiation detectors such as plastic scintillator, NaI, etc.			

Application Code S2	Eligible Person Research Students	Host Institute WERC	Research Period 3 - 5 months (From September 2, 2019 to December 27, 2019)
Research topic: Development of a data acquisition system for ion beam analysis			
Abstract: Ion-beam analysis such as, Particle Induced X-ray Emission (PIXE), Rutherford Backscattering Spectroscopy (RBS), Elastic Recoil Detection Analysis (ERDA), usually uses one detector for measuring elements. However, it is necessary for multi detectors for simultaneous measurements and improvement of solid angle. To measure multi signals from detectors, we use a Digital-Signal-Processing (DSP, waveform analysis system). This program aims for development of a control system for DSP using TCP/IP transmission, and software development for data analysis. This program requires experiences of Linux/Unix and C/C++.			