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**NUCLEAR ENERGY AGENCY
COMMITTEE ON RADIATION PROTECTION AND PUBLIC HEALTH**

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**CRPPH SPONSORED SURVEY OF UNIVERSITY LEVEL
EDUCATION PROGRAMMES IN RADIATION PROTECTION**

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INTRODUCTION

One of the challenges which has always faced the radiation protection community is the adequate education and training of its personnel. This was highlighted during the January 1993 CRPPH-sponsored Workshop, "Radiation Protection on the Threshold of the 21st Century":

It was observed that the level of effort and resources devoted to radiation protection appears to be decreasing in many countries. This trend, which affects radiation protection laboratories and scientists, is seen with concern, because it could eventually have detrimental effects on the standards of protection and economic and social consequences, due to the progressive loss of needed expertise and facilities.¹

One of the questions that this observation raises is that of education: how, in various countries, do radiation protection professionals receive their education and how many trained personnel are produced? Some preliminary work in this area has shown that not all countries offer university degrees specifically in radiation protection, and rare is the exchange of students and faculty members between universities in different countries. This may affect the number of professionals available in the future, and the scope of their perspectives.

To address this problem, and to foster a broader exchange of ideas and research in radiation protection, the CRPPH agreed that it would be useful to survey Member countries on the education of radiation protection professionals. The intent of this survey is to provide an information database for students wishing to pursue an education in radiation protection, and by faculty members wishing to broaden their research perspective through sabbatical periods at other universities.

The survey was first conducted in 1996, and its results were distributed widely within the NEA community and participating universities. As it was recognised that the status of programmes at many universities can change rapidly, it was agreed that the survey would be periodically re-issued, updated and re-published. During its March 2000 meeting, the CRPPH authorised the re-issuing of the survey, the results of which are published here.

It is recognised that many short courses exist in all areas of radiation protection. Most are intended as refresher courses for radiation protection professionals, or as introductory radiation protection courses for those disciplines for whom radiation protection is not a primary responsibility (engineers, job planners, equipment buyers, contract administrators, etc.). This survey was not intended to address these types of courses. Rather, it addresses the university-level programmes which produce radiation protection professionals.

The survey results are presented here, listed by country and by university. It is encouraging to note that there are currently 66 universities offering some sort of radiation protection degree-level programme. Survey updates will be produced every three to four years.

¹. Conclusion 2.3

A copy of the survey form is attached as an Annex to this document. This questionnaire should be used to inform the NEA of any suggested additions or changes.

The information concerning programmes at American universities has been compiled by the American Health Physics Society's Academic Education Committee (AEC). The AEC maintains and periodically publishes a comprehensive list of health physics academic programmes. For an American programme to be listed, it must have at least one full-time faculty member serving as programme director. Programmes in medical physics are listed only if they include a degree component and/or faculty research interest in the area of medical health physics. The programme descriptions are followed by a list of undergraduate and graduate fellowships/scholarships for which health physics students may be eligible. As award amounts and application deadlines are always subject to change, students are encouraged to contact the institutions directly for further information.

AUSTRALIA

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1. University of South Australia
2. Queensland University of Technology

University of South Australia
School of Applied Physics
University of South Australia
The Levels
Poorala, South Australia 5095

Contact: **Mr. David Paix**
Tel: +(61) 8 343 3040

Degrees granted: MSc in Medical and Health Physics
PhD in Medical and Health Physics

Faculty: **Dr. Alun H. Beddoe**, Associate Professor
Mr. David Paix, Senior Lecturer
Dr. John Patterson

Visiting faculty financial assistance: No information provided

Faculty Research Areas:

- Radiation monitoring devices for uranium miners
- In-vivo neutron activation analysis
- Radiation therapy treatment planning

Students: 15 MSc and PhD students in the Programme (1993)

Queensland University of Technology
 School of Physics
 GPO Box 2434
 Brisbane QLD 4001
 AUSTRALIA

Contact person: **Dr. T. van Doorn**, Senior Lecturer, School of Physics
Tel: +617 864 2591 **Fax:** +617 864 1521 **e-mail:** t.vandoorn@out.edu.au

Degrees Granted: Master of Applied Science, Med. Pys. (~6 Diplomas granted per year)

Faculty: Full-time teaching/research (4 members)
 Part-time teaching/research (2 members)
 Full-time research (1 member)
 Part-time research (3 members)

note: above numbers include those working in the area of non-ionising

Research Areas:

- Radiological impact assessment of contaminated sites
- Environmental transport of radioactivity and studies related to erosion and sedimentation
- Radiological exposure due to radioactivity carrying aerosols in a mineral sands processing plant
- Use of nuclear track detectors for measurement of radon in buildings
- Development of new dosimeters for assessment of harmful UV
- Environmental UV dose modelling
- Spectroradiometry calibration of UV sources
- Effects of ozone depletion prediction
- Efficacy of shade structures
- Evaluation of gel dosimetry for clinical radiotherapy treatment planning

Students:	full-time	part-time
undergraduate		
masters	6	3
doctorate	2	
other		

Student financial assistance:

Scholarships: National & Corporate:		Contact: Research Student Office
		QUT, +617 864 2932
Fellowships:	National	Contact: Office of Research
		QUT, +617 864 2932
Teaching:	Yes	Contact: School of Physics
Assistantships		QUT, +617 864 2325

**Visiting faculty
financial
assistance:**

Adjunct professor

The appointment of an adjunct professor is designed to enrich QUT's educational programme by involving distinguished and talented professionals and academics in teaching and research activities. A proforma for the nomination of adjunct professors is detailed in Appendix 11.

The number of adjunct professors appointed in any year will be determined within the context of the annual budget.

An adjunct professor is involved in activities such as:

- undergraduate and postgraduate teaching
- participation in seminars with advanced students and staff
- discussion with school staff on course, subject area, and unit structure, content and development
- participation in workshops, seminars, University lectures, continuing education programmes or conferences (through the Division of Research and Advancement) for the general public or specific outside group
- participation in school research programmes.

Adjunct professors are expected to have a marked influence on the activities of the faculty in which they serve. With this in mind, the period of residence and type of attendance are flexible. Full-time attendance for at least half a semester is suggested.

For the period of appointment, adjunct professors may be granted the following benefits and privileges:

- salary at professional level
- an appropriate return airfare for appointees
- an accommodation allowance of \$300 per week
- full use of the facilities of a school including office space and telephone
- full use of QUT facilities including libraries and computing facilities
- workers' compensation insurance protection.

Appointment

An adjunct professor will be appointed by Council on the recommendation of the Vice-Chancellor advice from the appropriate dean of faculty.

Research facilities:

- UV laboratory with spectrodaiometer, radiation monochromator, badge dosimetry readers and solar simulators
- low level gamma and alpha counting laboratory
- access to whole body counting facility
- radioisotope laboratory with TLD system

CANADA

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1. McMaster University

McMaster University
Physics and Astronomy
1280 Main Street West
Hamilton, Ontario
L8S 4M1 Canada

Contact person:

D.R. Chettle, Professor, Co-ordinator Health and Radiation Physics

Tel: +1 (905) 525 9140 (ext.: 27340)

Fax: +1 (905) 546 1252

e-mail: chettle@mcmaster.ca

Degrees Granted:

Undergraduate (~10 per year) and Masters (~3 per year)

Undergraduate Programmes

- a) *Honours Medical and Health Physics, admission is to level II, following successful completion of appropriate courses from level I Natural Sciences*

Level I

Physics 1A06 **MECHANICS, ELECTRICITY AND MODERN PHYSICS** Lectures and laboratory work on mechanics, electricity, atomic and nuclear physics. Primarily intended for students proceeding in the physical sciences.

Math 1A03 **CALCULUS I**
Differential calculus, the definite integral, techniques of integration, partial derivatives, applications, with some emphasis placed on theory.

Math 1AA3 **CALCULUS II**
The continuation of MATH 1A03. Topics will include applications of the integral, sequences and series, power series, differential equations.

Math 1B03 **LINEAR ALGEBRA I**
Vectors, matrices, determinants, vector spaces, complex numbers, with applications.

Biology 1A06 **ADAPTATION IN THE BIOLOGICAL WORLD**
A course in introductory Biology which stresses the adaptation of form and function at the levels of molecules, cells, organisms and populations.

Chemistry 1A06 **INTRODUCTORY CHEMISTRY**
First term: An introduction to inorganic chemistry; molecular structure and equilibrium. Second term: An introduction to organic chemistry and kinetics. The laboratory is designed to illustrate the lecture material and co-ordinates with it.

Computer Science 1MA3 INTRODUCTION TO COMPUTER PROGRAMMING
 Organisation and characteristics of computers; introduction to packages; algorithmic development, stepwise refinement, modularisation, searching and sorting methods, problem solving; data types, arithmetic/logical expressions, looping, arrays, subprograms, input/output, style, and program testing.

Level II

Biochemistry 2E03 ELEMENTARY BIOCHEMISTRY
 (or Biochem 3G03 and Biochem 3GG3 in level III)
 A treatment of the basic areas of biochemistry, including physiological biochemistry. Designed for students who do not intend to pursue biochemistry.

Chemistry 2D03 INTRODUCTORY ORGANIC CHEMISTRY
 (or Chem. 2006)
 An introduction to the chemistry of monofunctional aliphatic and aromatic compounds.

Math 2E03 INTRODUCTION TO MODELLING
 General features of modelling. Examples from chemistry, physics, biology and economics are treated by a variety of elementary methods. Computer packages are used when appropriate.

Math 2G03 INTERMEDIATE CALCULUS
 Differential calculus of several variables, multiple integrals, line and surface integrals.

Math 2003 DIFFERENTIAL EQUATIONS
 Ordinary differential equations with constant coefficients, series solutions, special methods; Laplace transforms, Fourier series; introduction to partial differential equations.

Physics 2B06 ELECTRICITY AND MAGNETISM
 Electrostatics, D.C. and A.C. circuits, the magnetic field; Faraday's law of induction; Maxwell's equations.

Physics 2G03 MECHANICS OF A PARTICLE
 Vectorial treatment of the mechanics of a particle in three dimensions. Special Relativity.

Physics 2H03 THERMAL PHYSICS
 Introduction to heat and the kinetic theory of gases.

Biology 2B03 CELL BIOLOGY
 Basic treatment of cell structure and function, including transport and chemical signals; adaptation of structure and function in specialised cells.

Level III

- Math 3C03 **MATHEMATICAL PHYSICS I**
 Linear algebra and eigenvalue problems; partial differential equations, orthogonal functions, Fourier series, Legendre functions, spherical harmonics.
- Physics 3H04 **INTERMEDIATE LABORATORY**
 Experiments in atomic and neutron physics, optics and spectroscopy, mechanics.
- Physics 3N03 **PHYSICAL OPTICS**
 Interference; Fraunhofer and Fresnel diffraction; Maxwell's equations and the electromagnetic character of light; polarisation and double refraction; interference of polarised light; selected topics in modern optics.
- Physics 3003 **MODERN PHYSICS**
 Phenomenological basis for quantum physics, topics from atomic and photon physics; wave phenomena; Schrodinger equation for one dimensional systems.
- Physics 3Q03 **INTRODUCTORY QUANTUM MECHANICS**
 Operator algebra. The Schrodinger equation. The square well, harmonic oscillator, barriers, perturbations, transition matrix elements, and selected three dimensional problems.
- Physics 3R03 **COMPUTATIONAL MEDICAL PHYSICS**
 A problem-based introduction to the use of numerical methods in medical physics.
- Physics 3T03 **RADIOACTIVITY AND RADIATION INTERACTIONS**
 Radioactivity and radiation phenomenology; interaction of radiations with matter, dosimetry, tracer methods, radiation in medicine, biological effects, radiation levels and regulations, radiation protection.

Level IV

- Biology 4U03 **RADIATION BIOLOGY AND RADIATION BIOPHYSICS**
 The effects of radiation on biological material at the molecular, cellular, tissue and whole organism level. Applications of radiation in medicine and toxicology.
- Engineering
 Physics 3X03 **HUMAN PHYSIOLOGY**
 Basic introduction and working knowledge of the human body. Includes study of the cellular level of organisation.
- OR
- Engineering
 4X03 **CONCEPTS IN BIOMEDICAL ENGINEERING**
 Engineering and physical science approach to human physiological systems; cardiovascular system, with specific organ circulations, respiratory systems, overall integration and control.

- Physics 4A03 SPECIAL TOPICS
Independent study of the scientific literature, including the preparation of seminars and reports on assigned topics.
- Physics 4D06 DIGITAL LOGIC AND COMPUTER SYSTEMS
The design and use of digital logic systems and their application to data acquisition and control techniques. The project-oriented laboratory involves both hardware and software.
- Physics 4E03 NUCLEAR PHYSICS
Nuclear masses and stability; radioactivity and nuclear reactions; elementary nuclear models.
- Physics 4K03 SOLID STATE PHYSICS
Crystal structure and binding; lattice vibrations; electron energy bands; metals and semiconductors; magnetism.
- Physics 4R03 RADIATION AND RADIOISOTOPE METHODOLOGY
Lectures and laboratory work in the techniques and theory of the measurement of radiation. Topics include radioactivity and radioactive decay, solid state dosimetry, principles of radioactive detectors, counting statistics and data reduction, advanced multidetector systems.
- Physics 4T03 INTRODUCTION TO MEDICAL PHYSICS
Basic concepts in radiology, nuclear medicine, radiotherapy, physiological measurements and laser applications.

A total of 6-12 units of electives (3 units = 1 semester course) are taken during the programme

b) Honours Medical and Health Physics Co-op

This programme has the same content as Honours Medical and Health Physics except

- (i) Students undertake two work placements of approximately one month each: one starts after 2½ years of the academic programme have been completed; the second starts after 3½ years of the academic programme.
- (ii) Physics 4A03 is replaced by Physics 3101 plus Physics 4101.
- (iii) The programme takes 5 years, rather than four years and the order in which some courses are taken is altered to accommodate the co-op work placements.

c) *Engineering Physics - Nuclear Engineering (this is a recognised area within Engineering Physics, rather than a formal programme). The following courses are particularly relevant.*

- Eng Phys 3D03 PRINCIPLES OF NUCLEAR ENGINEERING
Introduction to fission and fusion energy systems. Energetics of nuclear reactions, interactions of radiation with matter, radioactivity, design and operating principles of fission and fusion reactors.
- Eng Phys 4D03 NUCLEAR REACTOR ANALYSIS

Introduction to nuclear energy; nuclear physics and chain reactions; reactor statics and kinetics; multigroup analysis, core thermalhydraulics; reactor design.

Eng Phys 4L03 NUCLEAR REACTOR THERMALHYDRAULICS

Introduction to two phase flow and nuclear reactor thermalhydraulics systems. Condensation and boiling phenomena and heat transfer mechanisms. Two phase flow apparatus and diagnostics techniques. Modelling of two phase flow by homogeneous and separated flow models.

Eng Phys 4N03 PRINCIPLES OF FUSION ENERGY

Fusion phenomena and the plasma state; reaction analysis; Coulomb scattering; field effect trajectories; magnetic field configurations; particle transport; energy viability; burn cycles; inertial confinement; muon catalysed fusion.

Eng Phys 4U04 MODERN AND APPLIED PHYSICS LABORATORY

Selected advanced experiments in two areas of applied physics, chosen from among; lasers and electro-optics; solid state electronics; nuclear engineering.

Graduate Programmes

a) Health and Radiation Physics - M.Sc.

In this programme students are required to complete six courses. They then sit a written comprehensive examination. This is followed by a project which is expected to last four months. In practice, students frequently take 12-16 months to complete the programme.

The required courses are:

Biology 6U03 RADIATION BIOLOGY AND RADIATION BIOPHYSICS

The effects of radiation on biological material at the molecular, cellular, tissue and whole organism level. Applications of radiation in medicine and toxicology.

Physics 6R03 RADIATION AND RADIOISOTOPE METHODOLOGY

Lectures and laboratory work in the techniques and theory of the measurement of radiation. Topics include radioactivity and radioactive decay, solid state dosimetry, principles of radioactive detectors, counting statistics and data reduction, advanced multidetector systems.

Physics 771 ISOTOPES IN-VIVO

Discussion of how various practical aspects of the production and in-vivo use of radioactive isotopes impact upon radiation doses of people who work with radioisotopes and people to whom radioactivity is administered either by design or by accident. Discussion of the regulatory processes involved in the production and in-vivo use of radiochemicals.

Physics 772 MEDICAL HEALTH PHYSICS

Health Physics aspects of ionising and non-ionising forms of radiation commonly used in medicine. Includes ultraviolet, visible, infrared, radiofrequency/microwave, ultrasound, diagnostic x-rays, radiation therapy.

Physics 775 ADVANCED RADIATION PHYSICS

Mathematical analysis of the radiation field; interaction coefficients, survey of interactions, radiation transport, electromagnetic and hadronic cascades, exposure, dose, kerma, dose equivalent, micro-dosimetry, interface dosimetry, cavity theory, shielding theory.

Physics 776 PRINCIPLES OF RADIATION PROTECTION

Dose limitation, stochastic and non-stochastic effects, collective dose equivalent, effective dose equivalent, internal exposures, committed dose equivalent, cost-benefit analysis, sources of radiation, environmental monitoring, waste management, instrumentation, facility designs, applied health physics.

b) Physics and Astronomy (Medical Physics) M.Sc., Ph.D.

In this programme, students are required to complete a minimum of four courses for the M.Sc., plus they undertake research which they present in the form of a thesis. Students usually take about 20-24 months to complete the programme.

Three courses are required:

Biology 6U03 RADIATION BIOLOGY AND RADIATION BIOPHYSICS

The effects of radiation on biological material at the molecular, cellular, tissue and whole organism level. Applications of radiation in medicine and toxicology.

Physics 6R03 RADIATION AND RADIOISOTOPE METHODOLOGY

Lectures and laboratory work in the techniques and theory of the measurement of radiation. Topics include radioactivity and radioactive decay, solid state dosimetry, principles of radioactive detectors, counting statistics and data reduction, advanced multidetector systems.

Physics 775 ADVANCED RADIATION PHYSICS

Mathematical analysis of the radiation field; interaction coefficients, survey of interactions, radiation transport, electromagnetic and hadronic cascades, exposure, dose, kerma, dose equivalent, micro-dosimetry, interface dosimetry, cavity theory, shielding theory.

For a fourth course, students frequently choose one of Physics 771, 772, 776, listed above or

Physics 774 MEMCAL IMAGING

The theory of medical imaging is covered by a detailed examination of the principles of image formation, image reconstruction from projections and image evaluation. This is complemented by experiments in Positron Tomography, Single Photon Emission Computed Tomography, X-ray Computerised Tomography and Magnetic Resonance Imaging.

At the Ph.D. level, students are required to complete a minimum of a further four courses beyond the M.Sc. level. They have to pass an oral comprehensive examination, usually about 21 months after registering in this Ph.D. programme. Also, of course, they have to undertake research which is defended as a thesis. Completion times for Ph.D.'s are variable, but 3 to 4 years post M.Sc. is typical.

c) Engineering Physics M.Eng., Ph.D.

The following courses relate to nuclear engineering

Eng Phys 6D03 NUCLEAR REACTOR SYSTEMS ANALYSIS

Release and utilisation of energy from nuclear process; steady state and dynamics of chain reactions; neutron distributions and nuclear fuel cycle analysis; systems analysis of alternative nuclear energy concepts (e.g. hybrids, spallation breeders etc.). The McMaster University Nuclear Reactor will be used as a demonstration facility, and a field trip to a nuclear power installation will be undertaken.

Eng Phys 6L03 INTRODUCTION TO REACTOR THERMOHYDRAULICS

Introduction to thermal hydraulics loops in power stations; two phase flow modelling; two-phase flow diagnostic techniques; and transient thermal fluid flows.

Eng Phys 6N03 PRINCIPLES OF FUSION ENERGY

Nuclear kinetics; reaction analysis; Coulomb scattering; field effect trajectories; magnetic field configurations; particle transport; energy viability; burn cycles; inertial confinement; muon catalysed fusion.

Eng Phys 702 ADVANCED NUCLEAR ENERGY

General matter-energy transformations and their dynamics; reaction viability and sustainability; breeding and multiplication, advanced fusion fuel cycles; fusion sustainment by magnetic, inertial, and catalytic processes; small and direct energy conversion nuclear batteries, nonlinear reaction dynamics; mathematical reactor parameterisation .

Eng Phys 711 FUSION PHYSICS

Fusion reactions and kinetics; introductory plasma physics; distribution effects; energetics and reaction chaining; magnetic field topologies; inertial confinement and nuclear hydrodynamics; fusion catalysis and aneutronic processes; non-linear nuclear reaction dynamics; fusion-fission symbiosis.

Eng Phys 712 NUCLEAR REACTOR ANALYSIS I

Neutron distributions; multigroup neutron diffusion; reactor statics and kinetics; depletion and breeding analysis.

Eng Phys 713 NUCLEAR REACTOR ANALYSIS II

Time dependent analysis of neutron multiplying media; point kinetics; space-time analysis; depletion, breeding and conversion; reactivity effects. Nuclear energy transport; characterisation of reactor thermalhydraulic processes; selected solution formulations and applications in simulation; system dynamics; component design analysis.

Eng Phys 715 ADVANCED NUCLEAR REACTOR THERMALHYDRAULICS

Advanced topics of current interest in the area of fission and fusion nuclear reactor primary heat transport system, system safety and the transitional operations.

Eng Phys 716 CANDU HEAT TRANSPORT SYSTEM DESIGN

Thermalhydraulic design and analysis of the primary heat transport of CANDU nuclear reactors, emphasising the main characteristics. System equations are developed from fundamental heat and mass transfer conservation equations.

Eng Phys 731 PARTICLE/ENERGY TRANSPORT AND DYNAMICS

Analysis of particle-photon transport and dynamics in various media; discrete/continuous transport effect; integrated classification of case specific transport formulations; reaction characterisations associated with neutral/charged particles; non-linear dynamical equations and methods of analysis.

Faculty: Full-time teaching/research faculty (4)
Part-time teaching/research faculty (8)
Full-time research faculty (2)
Visiting faculty (1)

Research Areas:

- in vivo elemental analysis of toxic metals: Pb, Cd, A1, U
- body composition (water, protein, fat) using nuclear analytical probes
- development of radiation protection (educational) materials for electronic media
- high speed digital and analogue systems for nuclear pulse processing
- radio labelled monoclonal antibodies for diagnosis and therapy
- quantitation of functional imaging in positron emission tomography
- dosimetric models for photodynamic therapy
- quantitative fluorescence and absorption spectroscopy to characterize chemicals in vivo time resolved and frequency domain methods for optical imaging
- electron dosimetry at interfaces: computation and experiment
- study of DNA repair deficiencies using viral, cell culture and recombinant techniques
- neutron microdosimetry below 100 keV
- microdosimetry related to cellular and molecular level radiation damage
- characterisation of risk and treatment of metabolic bone disease
- imaging control systems for laser based thermal cancer therapy
- modelling reactor core physics and thermalhydraulics
- real time fault detection in reactor operation systems
- general fitness of emerging nuclear energy system in the long term

Visiting faculty financial assistance:

- hooker Distinguished Visiting Professor
- bilateral exchange programmes have been negotiated between Canada and a number of other nations
- individual faculty members at McMaster can sometimes provide partial support for visiting faculty from their research funds

Students:	full-time	part-time
undergraduate	18	-
masters	15	1
doctorate	10	3
other ²		150

Student financial assistance: Scholarships: Nationally sponsored: yes
Regionally sponsored: yes
Fellowships: Nationally sponsored: yes

Scholarships and Fellowships are available to Canadian citizens and residents on a competitive basis from the: Natural Sciences & Engineering Research Council

Scholarships & Fellowships Division
350 Albert Street
Ottawa ON K1A 1H5 Canada

Scholarships are also available to residents of the province of Ontario from:
Ontario Graduate Scholarship Program
Student Affairs
Ministry of Education and Training
P.O. Box 4500
4th Floor, 189 Red River Road
Thunder Bay ON P7B 6G9 Canada

Student teaching assistantships: yes
Student research assistantships: yes
Student teaching assistantships and research assistantships are administered through McMaster University School of Graduate Studies in association with the Department of Physics and faculty research supervisors

Professional Certification:

- there is no “professional certification” in radiation protection in Canada
- our Health & Radiation Physics programme is patterned after training criteria for certification in other jurisdictions within the OECD, particularly in the comprehensive examination

². Non-specialist faculty, students and staff requiring training in radiation protection and radioisotope handling.

CZECH REPUBLIC

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1. Czech Technical University

Czech Technical University
Faculty of Nuclear Science and Physical Dosimetry
Czech Technical University
115 19 Prague 1
Brehova 7
CZECH REPUBLIC

Contact:	Dr. J. Sabol Tel: +42 (2) 231 51 12
Degrees Granted:	Engineering Degree (BS & MSc Equivalent) in Nuclear Engineering, specialisation in Dosimetry and Application of Ionizing Radiation PhD in Dosimetry and Application of Ionizing Radiation
Faculty:	Dr. Chchak , Department Chairman Dr. J. Sabol , Associate Professor Dr. Hamak , Associate Professor 3 Senior Assistant Professors
Faculty Research Areas:	<ul style="list-style-type: none">• Mixed neutron-gamma dosimetry• Evaluation of environmental radioactivity and radiation fields• Reasurements of doses in radiology and radiotherapy• Radiation damage and high dose measurement• Radiation transport using Monte-Carlo methods• Solid state and chemical dosimetry• Nuclear instrumentation• X-ray fluorescence analysis• Evaluation and monitoring of radon in the environment and in dwellings• Mocrodosimetry and Nanodosimetry
Visiting faculty financial assistance:	no information provided
Students:	500 students in the Faculty of Nuclear Sciences and Physical Engineering (FNSPE), no specification as to number in Dosimetry Speciality
Student financial assistance programme:	no information provided
Research facilities:	no information provided

FRANCE

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1. Institut National des Sciences et Techniques Nucléaires (INSTN)
2. Université Joseph Fourier

Université Joseph Fourier
 National Institute for Nuclear Sciences and Technology
 Centre de Recherches du Service de Santé des Armées
 Institute for Nuclear Safety and Protection
 CHU - Unité de Concertation
 BP 217
 F-38043 Grenoble CEDEX 09
 FRANCE

Contact person: **Dr. Kolodie**
Tel: 33 (16) 7628 4071 **Fax:** 33 (16) 7654 1782

OR

Contact person: **M. Charles**
Tel: 33 (16) 7628 4071 **Fax:** 33 (16) 7888 5101

Degrees Granted: Masters in Radiation Protection (~ 15 per year)

Curricula: Engineer,
 4 years University graduates in physics, chemistry, & biology
 2 years University graduates
 5 years professional experience in radiological protection

Faculty: The course involves approximately fifty full-time or part-time teachers originating from various fields of expertise

Research Areas:

- Dosimetry for various types of ionizing radiation
- Biological effects: deterministic and Stochastic
- Non-ionizing radiations: physical aspects and biological effects
- Operational radiological protection: occupational aspects, public exposure, medical exposure, ALARA approach
- Safety and radiological protection
- Management of accident situations

Financial Assistance: May be sought from the International Atomic Energy Agency (IAEA) or the European Union (EU)

Students:	full-time	part-time
undergraduate	-	-
masters	10	-
doctorate	-	-
other	5	-

Student financial assistance programmes: Fellowships nationally sponsored and corporately sponsored

Research facilities:

- Laboratories of CEA and IPSN, EdF and COGEMA
- Various French hospitals

**Professional
Certification:**

Formal “Professional Certification” is not compulsory in France

However professionals are closely associated to:

- the definition of the educational content
- the evaluation of the students level

National Institute for Nuclear Sciences and Technology
 Radioprotection Department
 CEA-SACLAY
 F-91191 Gif-sur-Yvette Cedex
 FRANCE

Contact person: **Daniel Nolibé**, Head of Radioprotection Education Department
Tel: 33 (1) 6908 8909 **Fax:** +33 (1) 6908 5753
e-mail: tomasik@instndir.cea.fr

Degrees Granted: Undergraduate degree (25/30 Diplomas granted per year)

Curricula: Undergraduate degree
 for holders of technician diploma (physics, chemistry, radiological protection)
 for holders of first university degree
 professionals of technical areas (Radiological protection, chemistry, physics)
 and standardised entry examination with a minimal acceptance result of 10/20

Faculty: Full-time teaching/research faculty (5 members)
 Full-time research faculty (21 members)

- Research Areas:**
- Dosimetry for various types of ionizing radiation
 - Biological effects: deterministic and stochastic
 - Non-ionizing radiations: physical aspects and biological effects
 - Operational radiological protection: occupational aspects, public exposure, medical exposure, ALARA approach
 - Safety and radiological protection
 - Management of accident situations

Financial Assistance: May be sought from the IAEA

Students:	full-time	part-time
undergraduate	30	-
masters	-	-
doctorate	-	-
other	-	-

Student financial assistance programmes: Fellowships nationally sponsored and corporately sponsored

Research facilities:

- Research reactors
- Reprocessing fuel
- Waste and effluent processing
- Neutron sources
- Hot cells

For the practical training:
all laboratories of CEA, EdF, IPSN, COGEMA.

Professional Certification:

Formal “Professional Certification” is not compulsory in France

However professionals are closely associated to:

- the definition of the educational content
- the evaluation of the students level

GERMANY

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1. Dresden University of Technology

Dresden University of Technology
 Physics Department
 Institute of Radiation Protection Physics
 Mommsenstrasse 13
 D-01069 Dresden
 GERMANY

Contact person: **Prof Dr. Birgit Dörschel,**
Tel: +49 351 463 2566 **Fax:** +49 351 463 7040
E-mail: Doerschel@physik.tu-dresden.de

Degrees Granted: Master (MSc) (3-4 Diplomas granted per year)
 Doctor (PhD) (1-2 Diplomas granted per year)

Curricula: *Master degree*

Pre-requisition: basic courses in general physics (2 years) with examinations
 basic knowledge in nuclear physics

Courses:	Radiation Protection Physics I (Fundamentals)	60 hours
	Interaction of radiation with matter	60 hours
	Radiation Protection Physics II (Measuring Technique)	60 hours
	Experimental Exercises	120 hours
	Calculational Exercises	60 hours
	Special lectures (Students' choice)	30 hours

Diploma examination in Radiation Protection Physics

Diploma thesis: 1 year

Doctor degree

3 years scientific work in the Institute of Radiation Protection Physics

Doctor thesis

Doctor examination (rigorousum)

Faculty: Full-time teaching faculty (4)
 Part-time teaching faculty (1)
 Full-time research faculty (4)
 Part-time research faculty (3)
 Visiting faculty: (1)
 Other faculty (3)

Research Areas:

- Description of radiation sources and radiation fields
- Study of radionuclides in the environment and within the human body (e.g. radon and decay products)
- Study of interaction of radiation with matter, especially physical effects in detector materials, shieldings, biological tissue (e.g. thermoluminescence, formation of etched tracks etc.)
- Estimation of the radiation exposure to individuals and environment
- Physical fundamentals for the reduction of the exposure
- Cellular action of radiation

Visiting faculty financial assistance: Arrangements via the DAAD (Deutscher Akademischer Austauschdienst = German Academic Exchange Service)
Address: DAAD, Kennedyallee 50, D-5300 Bonn

Financial Assistance: May be arranged via the DAAD (Deutscher Akademischer Austauschdienst = German Academic Exchange Service)
Address: DAAD, Kennedyallee 50, D-5300 Bonn

Students:	full-time	part-time
	undergraduate	-
masters	6	-
doctorate	4	-
Post-Doctrate	-	1
Other	-	-

Student financial assistance programmes: Scholarships: nationally sponsored all arrangements vis DAAD (see above)
Fellowships: nationally sponsored

- Research facilities:**
- tandem accelerator (protons, deuterons, heavy ions)
 - various radionuclide sources
 - laboratories for evaluation of solid state detectors (e.g. image analysing systems for SSNTD's, TL readers etc.)
 - laboratories for gamma spectrometry

Professional Certification: The lectures and exercises in radiation protection physics are acknowledged, therefore the procedure to obtain the "professional certification" is shortened considerably for those who graduated in radiation protection physics at our university

GREECE

INDEX

1. Athens University
2. Democriton University of Thrace
3. University of Patras

Athens University
Department of Medical Physics, School of Medicine
Athens University
115 27 Athens
GREECE

- Contact:** **Professor C. Proukakis**, M.D., Ph.D.
Tel: +(301) 77 93 273 **Fax:** +301 77 93 273 **Eml:** egiak@cc.uoa.gr
- Faculty:** **C. Proukakis**, Professor
K. Ntalles, Associate Professor
D. Sotirio Associate Professor
E. Georgiou, Associate Professor
J. Malamitsi, Associate Professor
A. Serefoglou, Assistant Professor
A. Louizi, Lecturer
S. Kottou, Lecturer
E. Yiakoumakis, Lecturer
Full-time Teaching /Research Faculty (7)
Part-time Teaching/Research Faculty (2)
- Visiting Faculty**
Financial Assistance: Financial assistance is available through the Athens University, the General Secretariat of Research and Technology and through the Post-graduate course budget.
- Degrees:** MSc in Medical Physics
- Students:** 25 Students at Masters Level
6 Students at Doctorate Level
- Student Financial Assistance:** Financial assistance is available to students through nationally sponsored scholarships, fellowships and student research assistantships.
- Research Facilities:**
- 2 TLD dosimetry systems
 - Radiology quality control instruments
 - Radon system measurements
 - Whole body counting system / Bone densitometry system
 - Radiology machines
- Research Areas:**
- Survey of Radon and construction of Radon dosimeter
 - Management of Telemedicine Services for Primary Health Care
 - Factors affecting Osteoporosis
 - Radiation protection in diagnostic radiology
- Professional Certification:**
- 2 year, full-time Msc course in Medical Physics
 - 9 months hospital training (Nuclear Medicine, Radiology, Radiotherapy Dept.)
 - Written exams in Ministry of Health for Professional Certification in Radiation Protection.

Democriton University of Thrace
Department of Medicine
Laboratory of Medical Physics
681 00 Alexandroupolis
GREECE

Contact: **Professor Photios A. Anninos**
Tel: (0551) 25 292

Faculty: **Professor Photios A. Anninos**

Degrees: MSc in Medical Physics
PhD in Medical Physics

Students: There are currently 10 MSc and PhD students in the program.

The department was founded in 1988.

Faculty Research Areas:

- Theoretical Neural Models
- Non-linear Analysis in chaos
- Biomagnetic measurements using SQUID technology for determining normal and abnormal functions in CNS structures

University of Patras
Faculty of Health and Sciences/Medicine
Department of Medical Physics
GR-26000 Rio - Patras

Contact person: **Professor Vassilis Proimos,**
Tel: +30 061 997 620 **or** 997 781 **or** 997 758

Degrees Granted: - 1 Post-graduate education programme in Medical physics
Department of Medicine and Physics
supported by the Department of Computer Engineering, the Institute of
Computer Technology and the University Hospital

This programme is open to 10 students holding a BS in Physics
with adequate knowledge of English, mathematics and electronics
Entrance examinations are required

The duration of the programme is four semesters leading to an MSc degree in
Medical Physics and optionally to a Ph.D. degree (minimum two more
semesters are required for the PhD thesis work).

The programme is financially supported by governmental funds.

Degrees Granted: - 2 Joint post-graduate programme in Medical Physics - Radiophysics

This programme leads to an MSc degree in Medical Radiation Physics and
optionally to a Ph.D. with additional work of at least two more semesters
degree.

The following institutions participate in this programme:

- University of Athens (Department of Medical Physics)
- University of Ionnina (Department of Medical Physics)
- University of Thraki (Department of Medical Physics)
- Greek Atomic Energy Commission (Institute of Radiation Physics)
- Nuclear Research Centre "Democritos"
- University of Thessaloniki (will join the programme in the near future)

The programme is financially supported by governmental funds.

The programme is scheduled to run every three years and is open to 10-20
students.

Candidates must hold a BS in Physics and are admitted after successfully
passing entrance examinations in Physics, Mathematics and English.

The duration of the programme is five semesters:

- two semesters of theoretical lectures and laboratory work
- two semesters in service training in Hospitals and
- one semester for thesis work.

Lecturers come from all participating programme institutions

Address: Medical Physics Department
School of Medicine
Mikras Asias 75
Goudi 115 27 GR

Contact person for further information:

Prof. Charalambos Proukakis,
Tel: +30 01 779 3273

Graduates from both programmes or from equivalent studies abroad can get the professional licence of “Medical Radiation Physics” issued by the Ministry of Health taking successfully the relevant examination

ICELAND

Iceland does not offer University degrees specifically in radiation protection.

Most of the radiation protection professionals in Iceland have a degree in physics or related fields that includes some courses on radiation protection and on the job training.

ISRAEL

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1. Ben-Gurion University of the Negev

Ben-Gurion University of the Negev
Nuclear Engineering Department
P.O. Box 653
Beer-Sheva, 84105
ISRAEL

Contact: **Professor A. Kushilevski**
Department Head

Faculty: **Professor A. Kushilevski**, Department Head

Other faculty not specified

Degrees: Nuclear Engineering degrees (Some Courses in Radioprotection)
Level(s) (BS MS, PhD) not specified

Students: No information provided

Financing No information provided

**Faculty
Research
Areas:** No information provided

ITALY

INDEX

1. Università degli Studi di Firenze
2. Università degli Studi di Genova
3. Università di Bologna
4. Università di Milano

Universita' degli Studi di Firenze
 Dip. fisiopatologia Clinica
 Scuola di Specializzazione in Fisica Sanitaria
 Dipartimento di Fisiopatologia Clinica
 Viale Morgagni, 85
 I - 50134 Firenze
 ITALIA

Contact person: **Salvtore Romano**, Prof. Medical Physics
Tel: +39 (55) 437 6332 **Fax:** +39 (55) 437 7290
e-mail: salrom@cesit1.unifi.it

Degrees Granted: MSc degree (average of 5 per year)

Faculty: Full-time teaching/research faculty (10)

Research Areas:

- design of a calorimeter for dosimetry in radiotherapy
- heavy particles dose distribution: an experimental and Monte Carlo study on inhomogeneous systems
- FTIR spectroscopy of biological samples (normal and malignant cells and tissues)
- Photodynamic therapy of surface tumours
- laser induced pain threshold study
- normal and leukaemic lymphocytes discrimination by endogenous fluorescence
- photoplethysmography

Students:	full-time	part-time
undergraduate	-	-
masters	15	-
doctorate	-	-
other	-	-

Student financial assistance programmes: Scholarships:nationally sponsored

Research facilities: Lab and equipment facilities available to the students are present in many independent administration structures. They are mainly:
 Dept of Clinical Physiopathology (University of Florence)
 Dept of Physics (University of Florence)
 Health Physics Service (Hospital)
 Medical departments (both university and hospital)
 Institutes of applied optics and optoelectronics (INO, CNR)
 Some industries (ex. EsaOte Biomedica)

Equipment:

Basic Physics (e.g. radiation detectors, transducers, radiation and ultrasound sources)

Nuclear equipment (e.g. 3 MeV linac)

Diagnostic equipment (e.g. gamma-camera, X-ray tubes, TAC NMR, ultrasound)

Therapeutic equipment (e.g. Co60, Linacs, brachithery, radionuclides, lasers)

Radiation monitoring equipment (e.g. TLD, photographic, ionisation chambers, ...)

**Professional
Certification:**

The lectures and exercises in radiation protection physics are acknowledged, therefore the procedure to obtain the “professional certification” is shortened considerably for those who graduated in radiation protection physics at our university

Universita' degli Studi di Genova

Departmento di Fisica

via Dodecaneso 33

16146 Genova

- Contact person:** **S. Vitale**, Professor
Tel: +39 10 353 62229 **Fax:** +39 10 313 358
e-mail: vitale@genova.infn.it
- Degrees Granted:** average of 4 degrees granted per year in radiation protection
- Faculty:** full-time teaching/research faculty: 5
full-time research faculty: 1
- Research Areas:**
- low activity measurement
 - air, food, water analysis
 - environmental contamination
 - air pollution studies with PIXE analysis
 - Montecarlo cal for shielding and dosimetry
- | Students: | full-time | part-time |
|------------------|-----------|-----------|
| undergraduate | - | - |
| masters | 20 | - |
| doctorate | - | - |
| other | - | - |
- Student financial assistance programmes:** None
- Research facilities:** Inside department:
low level spectrometers (HpGe + NaI, Si detectors)
neutron dosimetry - Rodon meas station
- Outside department:
20 MeV electron accelerator
TAC
NMR
whole body counter
camera SPECT
- Professional Certification:** No

Universita' di Bologna
 Physics and Medical Faculty
 Dipartimento di Fisica
 Viale Berti Pichat 6/2
 40127 Bologna

Contact person: **G. Maltoni**, Professor of Health Physics
Tel: +39 51 630 5127 **Fax:** +39 51 247 244
e-mail: maltoni@bo.infn.it

Degrees Granted: Undergraduate degree
 Master degree (20-25, Biosistem Physics for the Physics degree)
 Other: (15)

Faculty: full-time teaching/research faculty: 6
 part-time teaching/research faculty: 1

see also art. 110 commas 4/5/6 (supplemento ordinario G.V.) or the DL 17
 March 1995 no. 230

Research Areas:

- new detectors for millimetric neutron dosimetry
- personal spectrometer for aerosol dosimetry
- non ionising radiation and defects at cell level
- radon concentration and air exchange
- personnel contamination in nuclear medicine
- absorbed dose in radio diagnosis and radiotherapy to workers and patients
- E.M fields and impact on population

Students:	full-time	part-time
undergraduate	80	-
masters	60	-
doctorate	4	-
post-doctorate	1	-
other	-	-

Student financial assistance programmes:

- Scholarships: nationally sponsored 3 per year post graduate
- Fellowships: none
- Premi di Studio (study prize) by ENEA

Research facilities:

- University laboratories - research equipment
- Hospital facilities: health physics services radiology, radiotherapy and nuclear medicine facilities
- Environmental and personal monitoring research laboratories at ENEA and C.N.R.

**Professional
Certification:**

The scuola di specializzazione in fisica sanitaria is intended to provide the preparation needed to pass the national test for “qualified expert for radiation physical protection” up to the third level. The scuola is also qualified equivalent to two years of training at special radiation laboratories required for the third level of expertise.

At present the school lasts 2 academic years, in the near future it will be modified to 4 years the school leads to the title of “specialist” for future organisations in other faculties.

(See art. 110 of the DL230, 17/3/95)

Universita' di Milano
 Dipartimento di Fisica
 Via Celoria, 16
 20133 Milano

Contact person: **Ettore Fiorimi**, Full Professor
Tel: +39 2 239 2300 **Fax:** +39 2 70609512
e-mail: fiorimi@milano.jhfn.it

Degrees Granted: Scuola di Specializzazione: 14

Curricula: Laurea in Fisica or Ingegneria and qualifying examination

Faculty: full-time teaching/research: 1
 part-time teaching/research: 2
 part-time research: 4
 visiting: 1

Research Areas:

- Radiation Protection at Accelerators
- Radiation Protection with Radioactive Sources
- Radiation Protection in Radiotherapy
- Radiation Protection in Laser Surgery
- Radiation Protection in Radiodiagnostics

Students:	full-time	part-time
undergraduate	-	-
masters	7	-
doctorate	-	-
other	-	-

Student financial assistance programmes: Scholarships nationally sponsored

Research facilities: Radon measuring apparatuses
 X-ray spectrometers (HAJ and GE)
 Neutron activation analysis
 General dosimetry systems

Professional Certification: The Scuola di Specializzazione give the title of "Specialista in Fisica Sanitaria"

Attendance at the schools is considered by law equivalent to the two years of "Tirocinio" requested for the higher level degree (III) of "Exerto Qualificato"

JAPAN

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1. Kanazawa University
2. Kyoto University
3. Kyushu University
4. Nagoya University
5. Oita University of Nursing and health Science
6. Tohoku University
7. Tokyo University

Kanazawa University
 Department Teaching Radiation Protection
 Low Level Radioactivity Laboratory
 Faculty of Science
 Wake, Tatsunokuchi,
 Ishikawa 923-1224
 Japan

Contact person: **Kazuhisa Komura**, Professor
Tel: +81 761 51 4440 **Fax:** +81 761 51 5528
E-mail: komurak@po.incl.ne.jp

Masayoshi Yamamoto, Associate Professor
Tel: +81 761 51 4440 **Fax:** +81 761 51 5528
E-mail: pluto@llrl.ku-unet.ocn.ne.jp

Degrees Granted: Undergraduate 1~2 (Degree in Radiochemistry)
 Master 1~2 (Master in Radiochemistry)
 Other

Faculty: Full-time teaching/research faculty: 2
 Part-time teaching/research faculty: 1

Visiting Faculty Financial Assistance None

Research Areas: Measurement of natural and artificial radionuclides in environmental samples

- Airborne dust
- Precipitation (monthly rain)
- Soil
- sea and lake sediment
- Vegetables

Monitoring of airborne radon (Rn)
 Neutron induced radionuclides by JCO criticality accident
 Environmental neutron measurement
 Development of low level analysis

Students:	Radiochemistry	
	full-time students	part-time
undergraduate	3	
masters	2	
doctorate	3	
Post-Doctorate	2	2

Student financial assistance programmes:	Scholarships	Corporately sponsored	Yes
	Student Teaching Assistantships		Yes
	Student Research Assistantships		Yes

Research facilities:

- γ -ray counting system
 - 4 ordinary Ge detectors
 - 4 extremely low background Ge detectors (Underground Laboratory)
- β -ray low background liquid scintillation counter
- Extremely low background si- β -ray counting system (underground laboratory)
- α - ray spectrometer 12 set (si-detector)
- Underground laboratory (270 mwe-depth at copper mine)

Kyoto University
 Research Reactor Institute
 Noda, Kumatoricho
 Sen-nan-gun
 Osaka Prefecture
 590-04, JAPAN

- Contact person:** **Dr. Masahiro Saito**, Professor
Tel: +81 724 51 2427 **Fax:** +81 724 51 2623
E-mail Saito@rri.kyoto-u.ac.jp
- Degrees Granted:** Master degree
 Doctorate
- Faculty:** Programme in the Graduate Course in the Faculty of Agriculture
- Degrees Granted:** Undergraduate No
 Master (Agricultural Science) Yes 1 (Average number of Diplomas)
 Doctor (Agricultural Science) Yes 0.5
- Curricula:** Environmental Radiation Control (Lecture)
 Experimental Radiation Engineering (Lecture)
 Seminar in Environmental Radiation control
 Laboratory course in Environmental Radiation Control
- Faculty:** Full-time teaching : 5
 Part-time teaching : -
- Research Areas:** a) Dosimetry of tritium taken up by animal bodies.
 b) Development of new technology to detect the trace amount of tritium originated from various aquatic systems.
 c) Qualification and modeling of the dynamic behaviour of radionuclides released from the nuclear facilities.
 d) The physical and chemical behaviour of radon and its progeny in the indoor and outdoor environments.
 e) The standardisation of radon and its progeny measurements using the concrete building.
 f) The attachment process between radon progeny and aerosol particles.
 g) Neutron spectroscopy with special interest in epithermal neutrons obtained from nuclear reactors.
 h) Effects of ionizing radiation on biological macromolecules.

Visiting Faculty Assistance: Several financial arrangements are available. These include the foreign researchers invitation programme of the Kyoto University Foundation and the Exchange of persons programme of the Japan Society for the Promotion of Science. The persons who wish to be assisted financially need to contact with the host laboratory chief well before application

Students:		full-time	part-time
	Undergraduate level	None	
	Master's Level	2	
	Doctorate Level	None	
	Post-Doctorate level	None	
Student Financial Assistance Programmes	Scholarships:	Nationally sponsored	Yes
		Regionally sponsored	No
		Others	No
	Fellowships:	Nationally sponsored	Yes
		Professional Society Sponsored	Yes, but occasionally
	Student Research Assistantships	Yes	

Research Facilities: The following research facilities are available for training and teaching purposes:

Indoor Radiation Monitors

1) Gamma-ray area monitors

These monitors are placed in the area where the dose due to external radiation occasionally exceeds the regulation level.

2) Neutron area monitors

These monitors are settled in the research reactor rooms of KUR and KUCA to measure neutron dose.

3) Dust monitors

To monitor the air concentration of anthropogenic radioactivity, the aerosols in the exhaust gas from reactor and radiation facility buildings are collected and measured for alpha, beta and gamma emitter.

4) Monitoring system for effluent water

Several water monitors are used to observe the radioactivity level in the coolant water of the reactor and the waste water from radiation facilities.

5) Hand-foot-mouth monitors

The workers in the area controlled for radiation safety purpose are individually monitored for their possible body and cloth contamination at the entrance.

The data obtained by the above monitoring system are transmitted to the central control room and linked to various alarm system.

Environmental Radiation Monitoring Facility

1) Monitoring posts

At five sites located at the border zone of KURRI, monitoring posts are settled to observe and record the external gamma-ray dose rate continuously.

2) Monitoring stations

At four sites, i.e. Wada, Shimogawaraya, Ichiba and Hineno, in the vicinity of KURRI, gamma-ray monitors equipped with data recorders and data transmission systems are settled. The monitoring data are transmitted to the central observatory by a telemeter system.

3) Central meteorological observatory

Observation data on various meteorological factors such as wind direction, wind speed, and solar radiation are accumulated and utilised to estimate the external and internal radiation dose due to airborne radioactivities either chronically or accidentally released from nuclear and radiation facilities.

4) Low background gamma-ray emitter analysis system

The quantity of environmental radioactivities contained in various field samples including soil, aerosols, vegetables, surface water, sea water, river and lake sediments are determined by using a gamma-ray emitter analysis equipped with a Ge-detector.

5) Whole body counter

This equipment is used to estimate the body burden and distribution of radioactivity taken up by human body accidentally or chronically.

Professional Certification:	The training and teaching programme in the laboratory aims to give enough techniques and knowledge to the students to fulfil the demand for the national professional certification of senior engineer of radiation and radioactivity handling for academic and industrial purposes as well. However, persons who wish to obtain national certification for their jobs must pass the certification test made by the governmental authority.
Faculty:	Research Reactor Institute, Division for Nuclear Safety, Chair of Radiation Control.
Financial Assistance:	No

Kyushu University
 Department of Applied Quantum Physics and Nuclear Engineering
 Fukuoka
 812-8581, JAPAN

Contact person: **Kenji ISHIBASHI**, Professor
Tel: +81 092 642 3765 **Fax:** +81 092 642 3800
E-mail: kisibasi@nucl.kyushu-u.ac.jp

Degrees Granted: Undergraduate YES (~33 per year)
 Master YES (~12 per year)
 Doctor YES (~ 6 per year)

Curricula: *(The digit corresponds to the credit point for each curriculum)*

1. Undergraduate Course, total 132 credits for graduation
 - Basis of Nuclear Physics 2
 - Nuclear Physics 2
 - Radiation Detection 2
 - Nuclear Electronics 2
 - Nuclear Electronics Engineering 2
 - Nuclear Chemical Engineering 2
 - Radiation Safety and Nuclear Instrumentation 2
 - Nuclear Engineering Experiments 4
 - Nuclear Engineering Seminars 2
 - Related curricula
2. Master Course, total 30 credits for graduation
 - Advanced Nuclear Instrumentation 6
 - Advanced Radiation Detection and Protection Engineering 6
 - Related curricula
 - Master Thesis
3. Doctor Course, Total 10 credits for graduation
 - Advanced Nuclear Engineering 4
 - Related curricula
 - Doctor Thesis

Faculty: Full-time teaching/research faculty: ~12 members
 Part-time teaching/research faculty: ~ 2 members
 Full-time research faculty: ~ 2 members
 Part-time research faculty: ~ 2 members
 Visiting faculty: ~ 2 members

Visiting Faculty Financial Assistance Financial supports applicable are as follows:
 – Fund of Japan Society for Promotion of Science
 – Fund of Graduate School of Engineering, Kyushu University

- Research Areas:**
- ^{14}C radioactivity in nature
Dr. G. Wakabayashi and **Dr. T. Okai**, (2 graduated students)
 - Neutron dosimeters for environmental monitoring
Dr. M. Matoba and **Dr. Y. Uozumi**, (1 foreign researcher and 1 graduated student)
 - Cosmic-ray based neutron dosimetry
Dr. Y. Uozumi and **Dr. M. Matoba**, (1 foreign researcher and 1 graduated student)
 - ^3H radioactivity in atmosphere
Dr. T. Okai, and 3 co-operative researchers
 - Radiation dose in nature
Dr. K. Ishibashi and **Mr H. Arima** (1 graduated student)

Financial Assistance: Mainly the support of the ministry of education and culture, Japan

Students:	full-time	part-time
undergraduate	6	34
masters	2	10
doctorate	1	5
other	1	-

Student financial assistance programmes: Scholarships nationally sponsored
corporately sponsored
Fellowships nationally sponsored
corporately sponsored
Student teaching assistantships

Research facilities:

1. Radioactive Isotope Laboratory, 1 100 m²
2. Laboratory of quantum irradiation and analysis, ^{60}Co irradiation, 100 m²
3. Laboratory of high resolution radiation detection, 600 m²
4. many α , β , γ counters and dosimeters
5. neutron counters and dosimeters
6. liquid scintillation counter (4 sets)
7. non-critical assembly system for neutron experiments
8. high resolution position counter system

Unfortunately, now, financial support for the research facility from the ministry of education and culture, Japan, decreases and decreases in this field. If this situation does not change, we may not continue this type of teaching training and research in the future.

Professional Certification: There are no possibilities to obtain the professional certification in radiation protection in this department. But many students succeed to pass national examination of professional certification in radiation protection, after obtaining many credits of curricula for radiation protection.

Nagoya University
 Graduate School of Engineering
 Department of Nuclear Engineering
 Furo-cho, Chikusa-ku,
 Nagoya 464-8603
 Japan

Contact person: **Tokao Iida**, Professor
Tel: +81 52 789 3781 **Fax:** +81 52 799 3782
E-mail: t-iida@nucl.nagoya-u.ac.jp

Degrees Granted: Undergraduate 3~4
 Master 3~4
 Doctor 1~2

Faculty: Full-time teaching/research faculty: 3
 Part-time teaching/research faculty: 2

Research Areas:

- Evaluation of lung dose due to ^{222}Rn , ^{220}Rn and their daughters
- Behaviour of radioactivity in the soil
- Environmental radioactivity and radiation
- Behaviour of radioactivity in the atmosphere

Students:	full-time	part-time	
undergraduate	4		
masters	4		
doctorate	2	2	
Student financial assistance programmes:	Scholarships	Nationally sponsored Regionally sponsored	Yes Yes
	Fellowships	Nationally sponsored	Yes
	Student Teaching		Yes
	Assistantships		

Research facilities:

- Radioanalytical chemical laboratory
- 3.75 van de graafaccelerator
- ^{60}Co irradiator

Oita University of Nursing and Health Sciences
 Department of Health Sciences
 2944-9 Notsuharu
 870-1201 Oita-ken
 JAPAN

Contact person: **Michiaki Kai**, Professor
Tel: +81 97 586 4435, **Fax:** +81 97 586 4387
e-mail: kai@oita-nhs.ac.jp

Degrees Granted: Undergraduate Yes
 Master No
 Other No

Curricula: Radiological Health

Faculty: Full-time teaching/research faculty: 3

Research Areas:

- Mathematical modeling in carcinogenesis for risk assessment based on epidemiological data and experimental data
- Relation between acute myeloid leukemia and chromosome aberration
- Dose estimation of medical exposure using measurement and computer simulation: newborns and infants; mammography
- Optimisation of chest radiography for keeping balance between patient dose and image quality for diagnosis
- Development of a real-time hand dose monitor for personnel in interventional radiology
- A deliberation of risk characterization of radiation risk and other environmental risk

Visiting Faculty none

Financial Assistance:

Students:		
	full-time	part-time
undergraduate	-	-
masters	-	-
doctorate	-	1
post-doctorate	1	-

Student financial assistance: None

Research facilities: X-ray irradiator with 350 kV max.

Professional Certification: None

Financial Assistance: Grant-in-Aid for Scientific Research from Japanese Ministry of Education, Science and Culture

Tohoku University
 Department of Quantum Science and Energy
 Engineering, Cyclotron and Radioisotope Centre
 Aoba, Aramaki, Aoba-ku, Sendai
 JAPAN

Contact person: **Takashi Nakamura**, Ph.D Professor,
Tel: +81 22 217 7805, **Fax:** +81 22 217 7908
e-mail: nakamura@cyric.tohoku.ac.jp

Degrees Granted: Undergraduate 3
 Master 2
 Other (PhD) 1

Faculty: Full-time teaching/research faculty: 3
 Part-time teaching/research faculty: 3

Research Areas:

- Development of new-type gamma-ray dosimeter and neutron dosimeter in wide energy range
- Long-term cosmic-ray neutron measurement on the ground
- Development of high-energy neutron spectrometers for use in charged-particle and photon mixed field
- Neutron production of thin and thick targets bombarded by high energy heavy ions
- Induced radioactivities in air, water and concrete by high energy neutrons
- Induced radioactivities in several metals by high energy heavy ions
- Neutron spallation cross-section measurements
- Neutron dosimetry using tissue-equivalent proportional counter
- Deep penetration experiment through concrete and iron of accelerator-produced neutrons
- Shielding design study of high energy accelerator facilities

Visiting Faculty none

Financial Assistance:

Students:	full-time	part-time
undergraduate	4	1
masters	6	2
doctorate	3	2
post-doctorate	1	0

Student financial assistance programmes: Nationally sponsored scholarships
 Nationally sponsored fellowships
 Student Teaching Assistantships
 Student Research Assistantships

Research facilities:

- AVF cyclotron (k=130) at Cyclotron and Radioisotope Centre
- Radioactive material and radioisotope facility at Cyclotron and Radioisotope Centre
- Dynamitron Accelerator at Fast Neutron Laboratory, Faculty of Engineering

Professional Certification:

None

The University of Tokyo
 Research Centre for Nuclear Science and Technology
 Yayoi 2-11-16, Bunkyo-ku
 113-0032 Tokyo
 JAPAN

Contact person: **Dr. Toshiso KOSAKO**, PhD
Tel: +81 3 5841 2922, ext: 3502 **Fax:** +81 3 3818 8625
e-mail: kosako@koslabwa.rcnst.u-tokyo.ac.jp

Degrees Granted: Undergraduate No
 Master Yes (1 examination, thesis)
 Other Yes (2)

Faculty: Full-time teaching/research faculty: 3
 Part-time teaching/research faculty: 0
 Full-time research faculty: 0
 Part-time Research Faculty 2
 Visiting Faculty 0
 Other Faculty 0

Research Areas:

- Radiation safety for reactors, accelerators and radioactive wastes
- Radiation shielding for reactors and accelerators
- Dosimetry for radon
- Dosimetry for whole body counter

Financial Assistance: none

Students:	full-time	part-time
undergraduate	3	6
masters	-	-
doctorate	-	-
other	-	-

Student financial assistance programmes: Corporately sponsored scholarships
 Corporately sponsored fellowships

Research facilities:

- Subcritical assembly
- Co-60 irradiation facility
- Cs-137 irradiation facility
- Neutron irradiation facility
- Graphite neutron standard pile
- X-ray irradiation device
- Low-level counting devices
- Whole body counting facilities
- Tandetron accelerator

Professional Certification: None

KOREA

INDEX

1. Seoul National University
2. Kyung Hee University
3. Cheju National University
4. Hanyang University
5. ChoSun University
6. Korea Advanced Institute of Science and Technology

Seoul National University
 Department of Nuclear Engineering
 56-1 Shinaim-dong
 Kwanak-ku
 Seoul 151-742,
 KOREA

Contact person: **Kang, Chang Sun**, Professor
Tel: +82 2 880 7203 **Fax:** +82 2 889 2688 **e-mail:** cskang@plaza.snu

Choi, Hee Dong, Professor
Tel:+82 2 880 7205 **Fax:** +82 2 889 2688 **e-mail:** choihdg@gong.snu.ac.kr

Degrees Granted: Masters in Radiation Protection (2<3 per year)
 Other (<2 per year)

Faculty: Full-time teaching/research faculty (2)

Research Areas:

- radioisotope transport out of the radwaste disposal site
- PSA applications in radwaste disposal
- tritium transport in a PHWR plant
- sitting study of independent spent-fuel storage
- internal exposure due to H-3 intake
- derivation of designs criteria for radwaste disposal facilities
- design guidance to meet the criteria of ALARA for the next generation reactor

Financial Assistance: Not offered yet

Students:

	full-time	part-time
undergraduate	-	-
masters	5	-
doctorate	10	1
post-doctorate level	1	-
other	-	-

Student financial assistance programmes:

- Scholarships corporately sponsored
- Fellowships corporately sponsored

Research facilities: Van de Graaf type linear accelerator
 Various radiation detection and measurement equipment including Ge (Li), scintillators, etc..

Professional Certification:

1. National Registered Professional Engineer for Radiation Protection
 State requirements:
 1 year's experience in radiation protection after bachelor's degree
2. License for Radiation Protection Supervisor
3. General license for Radiation Protection
4. Special license for Radiation Protection for medical workers

Kyung Hee University
 Department of Nuclear Engineering
 1 Seocheon-Ri, Kihung-Eub
 Yongin-Kun Kyunggi-Do
 449-701 KOREA

Contact person: **Won-Keun Lee**, Professor
Tel: 82 2 280 2560 **Fax:** 82 2 282 1541

Degrees Granted: Msc Radiation Protection (approx 2 per year)

Faculty: 2 full-time teaching/research faculty members in radiation protection
 2 members in the visiting faculty

- Research Areas:**
- “Theoretical calculation of dose conversion factor for photons of the extremity dosimeters”,
 Professor: Won-Keun Lee
 Student: Kwang-Pyo Kim
 - “Development of precise beta dosimeter response to Accident”
 Professor: Won-Keun Lee
 Student: Chun-Hyung Cho

Financial Assistance: Payment provided for classes to the Visiting Faculty

Students:	full-time	part-time
undergraduate	-	-
masters	2	-
doctorate	-	-
other	-	-

Student financial assistance programmes: Student Teaching Assistantships
 Student Research Assistantships

Research facilities:

Laboratory: 2 rooms
 Research reactors: AGN-201 (Aero-jet General Nuclear, model 201)
 Amplifier general purpose: 2 EA
 Area radiation monitor: 1EA
 Multichannel analyser: 1EA
 Chart recorder: 1EA
 Complete spectrometry: 1EA
 Function generator: 1EA
 Nuclear testing kit: 2EA
 Oscilloscope: 5EA
 Logarithmic pico-ammeter: 1EA
 Transformer and power supply: 2EA
 Portable survey meter: 10EA
 Wheatstone bridge: 3EA
 Scaler (counter and timer): 3EA
 Pocket dosimeter: 10EA
 Pico ampere source: 1EA
 Vamp area monitor: 1EA
 High voltage supply: 3EA
 G/M system (intermediate): 2EA

Professional Certification:

1. Radio Isotope General Management License
Junior and Senior can take an exam for this license
2. Supervisor License for Radioisotope Management
Someone who has more than one year's professional experience can take an exam for this license

Cheju National University
 Department of Nuclear and Energy Engineering
 1 Ara-dong, Cheju-si, Cheju-do
 690-756 KOREA

Contact person: **Jae-Woo Park**, Associate Professor
Tel: 82 2 64 54 3645 **Fax:** 82 2 64 52 9276
e-mail: jwpark@cheju.cheju.ac.kr

Degrees Granted: Undergraduate degree in Radiation Protection (~10 per year)

Curricula: Undergraduate degree
 Introduction to Nuclear Engineering I, II
 Radiation Detection
 Radiation Detection Laboratory
 Radioisotopes application
 Nuclear Chemical Engineering
prerequisites
 General entry examination

Faculty Full-time Teaching/Research Faculty (2 faculty members)

Research Areas: There has been virtually no research activity except education in the Department over the past three years.

Financial Assistance: There is no financial assistance provided by the University or Department. However some financial support may be arranged through application to the Korean government agencies such as Korean Science & Engineering Foundations

Students:	full-time	part-time
undergraduate	10	-
masters	-	-
doctorate	-	-
other	-	-

Student financial assistance programmes: None

Research facilities: Radioisotopes application centre (IAEA-funded facility)
 Liquid scintillation counting system
 Multi channel gamma-ray spectropy system
 X-ray generator
 Hang-foot monitor
 G-M counters
 Survey Meters (GM type, Scintillation type)

Professional Certification: Certificate for Radioisotopes handling (ordinary license)
 Certificate for Radioisotopes handling (supervisor license)
 The above 2 certificates are often required by the national authority for certain jobs such as NDT's and other radioisotopes handling companies

Hanyang University
Nuclear Engineering Department
17 Hangdang, Seongdong
Seoul, Republic of KOREA

Contact person: **Lee Jai-Ki**, Associate Professor
Tel: 82 2 290 0466 **Fax:** 82 2 290 0533

Degrees Master in Radiation Protection (~4 per year)
Granted: PhD in Radiation Protection (~0.5 per year)

Curricula: There are neither the official requirement in curriculum nor prerequisites for entry into the programme. Documents will be evaluated by the admission committee for foreign applicants.

Graduation requirements are as follows:

requirements	MS	Ph.D.
preliminary exam	oral presentation	oral presentation
qualifying exam	yes*	yes*
Thesis	required	required
papers	n/a	2 as prime authors

* problems with the fundamental courses in nuclear engineering

Faculty: Full-time teaching/research faculty (2)
Part-time teaching/research faculty (2)

Research Areas:

- Radiation protection philosophy and principles
- Implementation of the ICRP recommendations to national regulatory programme and to protection practices
- Quantitative optimisation of protection
- Shielding design and analysis of spent fuel shipping casks
- Risk assessment and perception
- Radiation field characterisation using Monte Carlo calculations
- Atmospheric dispersion and exposure pathway analysis
- Determination of response function for external exposure
- Application of fuzzy logic to radiation protection
- Simulation of detector responses using Monte Carlo techniques
- Development of dose algorithm for personnel dosimeters
- Development of internal dose algorithm
- Assessment of effectiveness of environmental monitoring programmes around nuclear facilities
- Measurements of natural radiation

Financial Assistance:	University programme is not well-established. A grant programme is available through the Korea Science and Engineering Foundation (KOSEF);															
	<ul style="list-style-type: none"> - duration: short term (a few weeks) or long term (6 ~ 12 months) - support: air fares and living expenses 															
	Additional support may be available through participation in research projects.															
Students:	<table border="1"> <thead> <tr> <th></th> <th>full-time</th> <th>part-time</th> </tr> </thead> <tbody> <tr> <td>undergraduate</td> <td>N/A</td> <td>-</td> </tr> <tr> <td>masters</td> <td>8</td> <td>1</td> </tr> <tr> <td>doctorate</td> <td>2</td> <td>3</td> </tr> <tr> <td>other</td> <td>-</td> <td>-</td> </tr> </tbody> </table>		full-time	part-time	undergraduate	N/A	-	masters	8	1	doctorate	2	3	other	-	-
	full-time	part-time														
undergraduate	N/A	-														
masters	8	1														
doctorate	2	3														
other	-	-														
Student financial assistance programmes:	Scholarships corporately sponsored Fellowships corporately sponsored Student teaching assistantships Student research assistantships															
Research facilities:	Counting laboratory equipped with typical radiation counting systems Am-Be neutron sources. Advanced facilities (whole body counter, research reactor, irradiation facilities) are available at the national laboratories															
Professional Certification:	All radiation works should be supervised by an authorised Radiation Safety Officer (RSO) elected for the organisation/operation. A certificate given by the government is required to be elected as RSO. Two types of certificates - type I and type II (higher level) - are issued to the applicants when he/she passes the written examination (in Korean) and finished the designated training course (also given in Korean). Graduate students having at least one year of experience in radiation work can apply for the examination.															

ChoSun University
Nuclear Engineering Department
375 Seasuck-dong, Dong-Gu, Kwongju
501-759 KOREA

Contact person:	Soon Kwan Chung , Associate Professor Tel: 82 62 230 9166 Fax: 82 62 232 9218		
Degrees Granted:	Undergraduate degree in Radiation Protection (~50 per year) Masters (~3 per year)		
Faculty:	1 Full-time teaching/research faculty		
Research Areas:	<ul style="list-style-type: none"> • Measurement of personal exposure dose by film badge dosimeter • Development of Digital/Analog multi-purpose radiation protection detection monitor • Control and instrumentation of radiation monitoring system • Development of environmental radioactivity analysis technology 		
Financial Assistance:	n/a		
Students:		full-time	part-time
	undergraduate	50	-
	masters	2	1
	doctorate	-	-
	other	-	-
Student financial assistance programmes:	Scholarships corporately sponsored Student teaching assistantships Student research assistantships		
Research facilities:	Radiation Detection and Measurement Laboratory Nuclear and Radio-Chemistry Laboratory Radiation and Radioisotope Laboratory and Equipment Multi-channel Analyser HPGE Detector and Lead shield Low Background and Counting System		
Professional Certification:	n/a		

Korea Advanced Institute of Science and Technology
 Department of Nuclear Engineering
 373-1, Kusong-dong, Yusong-gu
 Taejon 305-701 KOREA

Contact person: **Gyuseong Cho**, Associate Professor
Tel: +82 (42) 869 3821 **Fax:** +82 (42) 869 3810 **Email:** gscho@kaist.ac.kr

Degrees Granted: NE 202 Applied Nuclear Physics for Nuclear Engineering
/ Curricula: NE 341 Nuclear Chemistry
 NE 343 Health Physics
 NE 431 Radiation Measurement and Instrumentation
 NE 445 Radiation Protection and Shielding
 NE 541 Radioactive Waste Management
 NE 561 Advanced Radiation Detection
 NE613 Neutron and Radiation Transport Theory
 NE 641 Isotope Separation

Faculty: 4 members in the Full-time teaching/Research Faculty

Research Areas:

- Numerical calculation of radiation transport
- Theoretical studies on radioisotope transport in the air and underground
- Studies on waste treatment in general
- Environmental radiation monitoring system
- Design of solid state radiation detectors for X-ray gamma and charged particles

Visiting Faculty 3 year (maximum) full support fund for foreign professor (2000 - 2002)

Financial

Assistance:

Students:

	full-time	part-time
undergraduate	3	
masters	10	5
doctorate	4	4

Student financial assistance programmes: Scholarships nationally/corporately/professional society sponsored
 Fellowships corporately sponsored
 Student Teaching/Research Assistantships
Research facilities: X-ray irradiation system
 Radiation detection systems (Gelli, MLA etc.)
 Radiochemical handling facilities
 Computer room

Professional Certification:

- Renewal of contents of regular courses related to radiation protection.
- Support of personal dose history record for some students who participate in radiation measurement project.

LUXEMBOURG

Luxembourg offers no full University programme in any scientific domain and there is no possibility to achieve an academic degree in the field of radiation protection.

NETHERLANDS

No University Level Degree Programme

POLAND

INDEX

1. Technical University Poznan
2. Warsaw University of Technology

Technical University Poznan
Radio and Photochemistry Dept.
Technical University Poznan
60-965 Poznan
POLAND

- Contact:** **Wieslaw Goraczko, PhD**
Tel: +48 061 66 52 565 **Fax:** +48 061 66 52 571
Eml: Goraczko@sol.put.poznan.pl or Wiesgora@friko.onet.pl
- Degrees:** Undergraduate / Master / Other (an average of 10 of each per year)
- Faculty** Full-time Teaching (20)
Full-time Research (20)
Other Faculty (20)
- Students:** 20 full-time students at undergraduate level
10 full-time students at master's level
5 full-time students at doctorate level
6 full-time students at post-doctorate level
5 full-time students (Other)
- Student Financial Assistance:** Nationally sponsored Scholarships and Fellowship as well as other types of financial assistance are available to students.
- Research Facilities:** Counting laboratories - Radiochemistry
- Photochemistry
- Research Areas:**
- Secondary emission from bio-chemical structures after irradiation of ionizing radiation;
 - Chemical and physical changing of structures of irradiation compounds (i.e. humic acid, glycine, thyrosine, tryptoman, etc.).
 - Design of photochemistry apparatus
 - Applying tracer methods to engineering processes
 - Radio-degradation of chemical compounds

Warsaw University of Technology
Faculty of Electronics
Warsaw University of Technology
ul. Nowowiejska 15/19
00-665 Warszawa
POLAND

Contact: **Zdzislaw Pawlowski**, D.Sc., Professor
Department Head
+(48) 22 25 13 63

Faculty: **Zdzislaw Pawlowski**, D.Sc., Professor
Department Head

Degrees: Nuclear and Medical Electronics degrees
level(s) (BS, MS PhD) not specified

Students: No information provided

Financing: No information provided

**Faculty
Research
Areas:** No information provided

SPAIN

INDEX

1. CIEMAT (Institute of Energy Studies)
2. University of Santander

CIEMAT
(Institute of Energy Studies)
Av. Complutense, 22
28040 Madrid

Contact person: **Ma Luisa Marco**
Tel: +34 91 346 6292 **Fax:** +34 91 346 6005 **e-mail:** marco@ciemat.es

Degrees Granted: Undergraduate degree average 2 per year
Master degree average 22 per year
Other

Curricula: Technician
University degree

Faculty: full-time teaching/research faculty 6
part-time teaching/research faculty 30
visiting faculty 5

Research Areas:

- Master of Nuclear Energy
- Post-graduate educational course in Radiation Protection
- Characterisation of medium and low activity wastes by radiochemist, spectrometric and physique-chemist methods
- Radiation Protection Course for NPP's
- Radioactive Waste Management
- Radiation protection to operate X-rays facilities for medical diagnosis
- Experimental haematology
- Measurements of the radionuclides by gamma spectrometry
- Radiation protection to manage X-rays facilities for medical diagnosis
- Measurements of the radioactivity in environment samples
- Operators of the radioactivity facilities course
- Supervisors of the radioactivity facilities course
- Techniques in TLD dosimetry

Students:	full-time	part-time
undergraduate	400	-
masters	20	-
doctorate	200	-
other	-	-

Student financial assistance programmes: Scholarships corporately sponsored
professional society sponsored
Fellowships corporately sponsored

**Research
facilities:**

Radiochemist laboratories
Semiconductor detectors
Scintillation detectors (Alpha and Gamma)
Radiation monitors
X-rays equipment
Flow gas counters
Multichannel equipment
Radioactive sources
Personal computers

**Professional
Certification:**

Qualified experts of radiation protection
Post-graduate educational course in radiation protection
Supervisors of radioactive installations
Operators of radioactive installations

Universidad de Cantabria
 Catedra fisica medica
 Depto. Ciencias Medicas y Quirurgicas
 Facultad Medicina
 c/o Herrera Oria s/u
 39011 Santander

Contact person: **Jesus Soto Torres**, Catedratico Fisica Medica
Tel: +34 942 20 19 74 **Fax:** +34 942 201 903
e-mail: sotoj@med.unican.es

Degrees Granted: Cursos Operadores Y supervisores de Instalaciones Radiactivas
 Eventualmente de Radiodiagnostico

Faculty: Full-time teaching/research faculty 5

Research Areas:

- Estudio de radiacion y radiactividad ambientales efectos de bajas dosis de radiacion

Students:	full-time	part-time
undergraduate		
masters	no information	
doctorate	provided	
other		

Student financial assistance programmes:

Research facilities: Laboratorio de preparacion de muestras
 Monitores de radiacion cadena espectrometria gamma con Ge Hp
 Contador de Flujo de Gas
 Contadores de Centelleo alfa
 Cadena espectrometria gamma con ina (tl)
 Contadores de radon

Professional Certification: Licenciatura en Medicina (nuevo plan estudios):
 1st curso : Fisica Medica
 2nd Curso : Instrumentacion en Diagnostico
 4th Curso : Radioproteccion

SWEDEN

INDEX

1. Linköping University
2. Stockholm University
3. Lund University

Linköping University
 Department of Radiation Physics
 Faculty of Health Sciences
 Linköping University
 S-58185 Linköping

Contact person: **Eva Lund**, Assistant Professor
Tel: +46 13 223 460 **Fax:** +46 13 224 749
e-mail: eva.lund@raf.liu.se

Degrees Granted:
Faculty: Full-time teaching/research faculty (1)
 Part-time teaching/research faculty (1)

Research Areas:

- Design and type testing of a dosimeter for measurement of the ambient dose equivalent
- Development of retrospective dosimetry based on ESR analysis of ??
- Optimisation of the relation between diagnostic information and radiation risks in X-ray examinations (computer modelling)
- Experimental studies of the angular dependence of the personal dose equivalent completed with Monte Carlo calculations
- Surveys of p?? absorbed doses and optimisation of x-ray techniques both for adults and children

Financial Assistance:
Research facilities:

TLD - readers
 ESR spectrometer (at the department of Physics and Measurements)
 X-ray equipment
 Cs-irradiation sources
 Ge-detector and software

Students:	full-time	part-time
undergraduate	-	-
masters	1	-
doctorate	-	1
post-doctorate	1	-
other	-	-

Student financial assistance programmes:

No information provided

Research facilities:

TLD - readers
 TSR spectrometer (at the dept. of Physics and Measurements)
 X-ray equipment
 Cs-irradiation sources
 Ge-defector and software

Professional Certification:

Stockholm University
 Medical Radiation Physics
 Department of Medical Radiation Physics
 Box 260
 S-171 76 Stockholm

- Contact person:** **Bo Nilsson**
Tel: +46 8 5177 2497 **Fax:** +46 8 34 35 25
e-mail bo.nilsson@radfys.ks.se
- Degrees Granted:** Master in Radiation Protection (average 4 per year)
- Faculty:** Radiation Physics including Radiation Protection
 Full-time teaching/research faculty (1)
 Part-time teaching/research faculty (1)
 Full-time research faculty (3)
 Part-time research faculty (5)
- Research Areas:**
- Research is performed in radiation physics, mainly towards the application in radiation treatment. However, in every use of radiation there is always a radiation protection consideration
 - Treatment optimisation using physical and biological objective functions
 - Ionisation chamber dosimetry, specially perturbation problems in photon and electron beams
 - Patient and personal doses in x-ray radiology
 - Development of a new circular gamma-camera for SPECT-investigations
 - Stopping power calculations for use in dosimetry using Monte Carlo methods
 - Neutron contamination problems in radiation treatment with high energy photons
- Financial Assistance:** Graduated researchers may obtain financial support through different research funds. There is however no special programme for funding visiting faculty members.
- Students:***
- | | full-time | part-time |
|---------------|-----------|-----------|
| undergraduate | 6 | - |
| masters | 6 | - |
| doctorate | 15 | - |
| other | - | - |
- * in radiation physics in general including radiation protection
- Student Financial Assistance Programmes:** Student Teaching Assistantships
 Student Research Assistantships
- Research facilities:**
- Radiation treatment sources: Linear electron accelerators, ⁶⁰Co-sources
 - Ge-detectors with multichannel analysers for low level activity counting
 - Proportional chamber for microdosimetric measurements
 - Gamma-cameras for in vivo activity measurements
- Professional Certification:**

Lund University
Radiation Physics Department, Lund
Radiation Physics Department
Lund University Hospital
S-221 85 Lund

Contact person: **Christer Samuelsson**, Associate Professor
Tel: +46 46 173 121 **Fax:** +46 46 127 249
e-mail: christer.samuelsson@radfys.lu.se

Degrees Granted: Undergraduate degree (6per year)
Master (6 per year)
Ph.D. (1 per year)

Faculty: Full-time teaching/research faculty (2)
Part-time teaching/research faculty (5)
Part-time research faculty (1)
Visiting faculty (1)

Research Areas:

- Retrospective radon monitoring using superficially implanted ^{210}Po
- Specific filtration of ^{137}Cs from urine as large scale “whole-body counter”
- Development of pulse-ionisation chambers for alpha spectrometry of large-area samples
- Development of fission track detection methods for low-level ^{239}Pu analysis
- Mobil gamma spectrometry for mapping of fallout and finding lost point sources
- In situ gamma spectrometry using HPGe detectors
- Bioassay analysis of low-level ^{239}Pu and ^{137}Cs activities in Chernobyl clean-up workers
- Radiopharmaceutical dosimetry research
- The use of the Monte Carlo technique to optimise and evaluate nuclear medicine imaging systems
- Optimising parameters for radionuclide therapy
- Radiobiological research on Auger electron emitters
- Radiopharmacology and tracer kinetic research
- Radiation protection research for medical employees

Financial Assistance: Every four years there is a 6-month sabbatical option for professors

No special funding for visiting scientists is available at Lund University

Students:	full-time	part-time
undergraduate	8	-
masters	8	-
doctorate	8	4
post-doctorate	1	-
other	-	-

Student financial assistance programmes:

Scholarships: Nationally Sponsored
Fellowships: Nationally and Regionally Sponsored

Research facilities:

- One counting lab for temporary installations
- One counting lab with a liquid scintillation counter, a sample changer NaI(Tl)-detector, and a HPGe-detector
- One permanent low-level lab with 20 alpha and two beta spectrometers
- One permanent low-level gamma spectrometry lab with 4 germanium detectors.
- One whole-body NaI(Tl)-spectrometer
- One lab for radon and radon daughter measurements
- One stainless steel walk-in room for radon/aerosol exposure experiments
- One low-level radiochemistry lab
- One gamma calibration facility
- Several medical accelerators are used outside patient-hours for education purposes
- Several medical X-ray facilities are used outside patient-hours for education purposes
- HOT-lab for intermediate radioactivity work
- Laboratories for aseptic work at the Medical Radiopharmaceutical Center
- Radiation biology laboratory (Department of Oncology)

Professional Certification:

None

SWITZERLAND

INDEX

1. Universität Bern
2. University Basel, Institut für Kernphysik
3. University Basel, Departement Medizinische Radiologie

Universität Bern
 Abt. für Medizinische Strahlenphysik
 Inselspital
 CH-3010 Bern
 SWITZERLAND

Contact person: **Dr. R. Mini**, phil. nat.
Tel: +41 31 632 24 29 **Fax:** +41 31 632 24 29

Degrees Granted: Other (1)

Faculty: Full-time teaching/research faculty (1)
 Part-time teaching/research faculty (1)
 Part-time research faculty (2)

- Research Areas:**
- Development of a clinical information system
 - Dynamic therapy with dynamic leaf-movement of a multi-leaf collimator system
 - Implementation of a Macro Monte Carlo (MMC) algorithm on a parallel computer for clinical use in radio-oncology
 - Stereotatic radiosurgery
 - Dose measurements in diagnostic radiology

Financial Assistance: None

Students:	full-time	part-time
undergraduate	-	1
masters	-	-
doctorate	-	1
post-doctorate	-	2
other	-	-

Student financial assistance programmes: Scholarships nationally sponsored
 Fellowships nationally sponsored

Research facilities: Betatron
 3 Linearaccelerators
 Counting Laboratories
 X-ray facilities
 Anthropomorphic Phantoms

Professional Certification: 14d course in radiation protection at PSI

University Basel
 Institut für Kernphysik
 Klingelbergstr. 82
 CH-4056 Basel
 SWITZERLAND

Contact person: **Dr. J. Jourdan**
Tel: +41 61 267 3689 **Fax:** +41 61 267 3784
e-mail: jourdan@ubaclli.unibas.ch

**Degrees
 Granted:**

Faculty:

Research Areas: No research in radiation protection

The facilities available are exclusively used to train physics, chemistry, and reactor operation students in reactor-physics, measurement and analysis of experiments using radioactive substances and radiation protection.

**Financial
 Assistance:** None

Students:		full-time	part-time
	undergraduate		
	masters		
	doctorate	None	
	other		

**Student
 financial
 assistance
 programmes:** None

**Research
 facilities:** AGN-211-P research reactor
 2 Counting laboratories equipped with various detection systems
 Geiger counters
 solid state detectors
 scintillation counters
 Ge, Si detectors

**Professional
 Certification:** licensed reactor operator
 licensed reactor operation supervisor
 licensed radiation protection technician

University Basel
 Radiological Physics
 Abt. für Radiologische Physik
 Departement Medizinische Radiologie
 Kantonsspital Basel
 CH-4031 Basel
 SWITZERLAND

Contact person: **J. Roth**, Ph. D. Professor
Tel: +41 61 265 31 41 **Fax:** +41 61 265 3135
Email: jroth@uhbs.ch

Degrees Granted: Undergraduate: No
 Master: No
 Other: 60 Diplomas granted per year

Faculty: Part-time teaching/research faculty : 4 Other faculty: 1

- Research Areas:**
- Calculation of doses in patient during nuclear medicine procedures
 - Doses in patient during radiodiagnostic procedures (e.g. chest, CT)
 - Neutron and photon doses around medical accelerators
 - Attenuation measurements (walls, new materials for aprons and gloves) during radiodiagnostic procedures
 - comparisons of algorithms for dose calculations, comparisons of dosimeters in radiodiagnostic
 - Whole body counting

Financial Assistance: None

Students:	full-time	part-time
undergraduate	-	1
masters	-	-
doctorate	-	2
post-doctorate	-	182
other	-	-

Student financial assistance programmes: Student Teaching and Student Research Assistantships are available.

Research facilities: whole body counter
 medical accelerators, after loading (1r-192)
 X-ray apparatus
 Co-60 source (only for research and training)
 different types of dosimeters; TLD

Professional Certification:

TURKEY

INDEX

University of Istanbul:

- NuclearPhysics, Science Faculty, Vezneciler Campus
- Nuclear Medicine, Istanbul Medical Faculty
- Nuclear Medicine, Cerrahpasa Medical Faculty
- Medical Radiation Physics, Oncology Unit, Istanbul Medical Faculty

University of Istanbul
 Department of Nuclear Physics
 Science Faculty
 Vezneciler Campus
 34459 Istanbul
 TURKEY

Contact person: **Adnan Taymaz**, Professor
Tel: +90 212 512 1264 **Fax:** +90 212 519 0834
e-mail: taymaza@istanbul.edu.tr

Degrees Granted: HP Degree Granted
 M.Sc. Medical and Radiation Physics
 Ph.D. Medical and Radiation Physics

Remote Delivery of Course: Under consideration

Curricula: course booklet available upon request

	M.Sc.	Ph.D.
HP Enrollment (Fall 1998)	14	3
HP Graduates (8/97 to 8/99)	8	2
HP Graduates (8/98 to 8/00)	5	2

Faculty: Full-time teaching/research faculty (5 members)
 Visiting faculty (5 members)

Professor Adnan Taymaz, Head of Department
Dr. Ali Girgin, Professor
Dr. Ali Tutay, Associate Professor
Dr. Nermin Kucer, Lecturer
Dr. Rahmi Kucer, Lecturer

Research Areas:

- Radiation monitoring devices for health Physics
- Neutron Activation Analysis
- Microdosimetric measurements
- Monte Carlo Simulation of charged particles in diagnosis and therapy (10 keV to 2 GeV)

Students:	full-time	part-time
M.Sc. Y 2000	12	3
Ph.D. Y 2000	5	1

Student financial assistance programmes: Nationally sponsored

Research facilities: Neutron activation facilities and Instrumentation facilities

Professional Certification: None

University of Istanbul
Nuclear Medicine
Istanbul Medical Faculty
Cerrahpasa Cad.,
34459 Istanbul
TURKEY

Contact person: **Sema Cantez**, Professor
Tel: +90 212 534 00 50, ext 1229

HP Degrees Granted: M.Sc. Medical Physics, Nuclear Medicine
Ph.D. Medical Physics, Nuclear Medicine

Remote Delivery of Course: None

Curricula: course booklet available upon request

	M.Sc.	Ph.D.
HP Enrollment (Fall 98)	30	8
HP Graduates (99)	18	6
HP Graduates (00)	12	4

Faculty: **Dr. Seer Inal**, Associate Professor, MD, Istanbul University
Dr. Adalet Isik, Associate Professor, MD, Istanbul University
Dr. Ayse Mudun, Associate Professor, MP Istanbul University

	full-time	part-time
M.Sc. Y 2000	32	13
Ph.D. Y 2000	7	2

Student financial assistance programmes: Nationally sponsored

Research facilities: Full research facilities

Professional Certification: None

University of Istanbul
Nuclear Medicine
Cerrahpasa Medical Faculty
Cerrahpasa Cad.,
34459 Istanbul
TURKEY

Contact person: **Ilhami Uslu**, Professor
Tel: +90 212 586 1604, ext 1229

HP Degrees Granted: M.Sc. Medical Physics, Nuclear Medicine
Ph.D. Medical Physics, Nuclear Medicine

Remote Delivery of Course: None

Curricula: course booklet available upon request

	M.Sc.	Ph.D.
HP Enrollment (Fall 98)	28	7
HP Graduates (99)	16	5
HP Graduates (00)	12	4

Faculty: **Dr. Cetin Onsel**, Professor, MD, Istanbul University
Dr. H.B. Sayman, Associate Professor, MD, Istanbul University
Dr. Kerim Sonmezoglu, Associate Professor, MD, Istanbul University
Dr. Mustaf Demir, Associate Professor, HP, Istanbul University
Dr. B. Kanmaz, Assistant Professor, HP, Istanbul University

	full-time	part-time
M.Sc. Y 2000	12	10
Ph.D. Y 2000	3	1

Student financial assistance programmes: Nationally sponsored

Research facilities: Full research facilities

Professional Certification: None

University of Istanbul
 Medical Radiation Physics, Oncology Institute
 Istanbul Medical Faculty
 Capa Cad.,
 34459 Istanbul
 TURKEY

Contact person: **Nejat Dalay**, Professor, **Gonul Kemikler**, Associate Professor
Tel: +90 212 531 3100, ext 1234 (3 lines)

HP Degrees Granted: M.Sc. Medical Physics, Nuclear Medicine
 Ph.D. Medical Physics, Nuclear Medicine

Remote Delivery of Course: None

Curricula: course booklet available upon request

	M.Sc.	Ph.D.
HP Enrollment (Fall 98)	36	17
HP Graduates (99)	11	5
HP Graduates (00)	12	6

Faculty: **Dr. Nejat Dalay**, Professor, MD, Istanbul University
Dr. Gonul Kemikler, Associate Professor, MP, Istanbul University
Dr. Hatice Bilge, Assistant Professor, MP, Istanbul University
Dr. Seyfettin Kuter, Associate Professor, MP, Istanbul University

	full-time	part-time
M.Sc. Y 2000	22	12
Ph.D. Y 2000	6	3

Student financial assistance programmes: Nationally sponsored

Research facilities: Full research facilities

Professional Certification: Renewal of contents of regular courses and radiation protection instrumentation

UNITED KINGDOM

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1. University of Surrey

University of Surrey
Department of Physics (Teaching Department)
Guildford GU2 5XH
UNITED KINGDOM

Contact person: **Mrs. S. Jenner** (MSc course Secretary)
Tel: +44 (1483) 259324 **Fax:** +44 (1483) 259 501
e-mail: s.jenner@surrey.ac.uk

Degrees Granted: MSc (~20 diplomas granted per year)
BSc in Physics with Environmental Protection
Msc in Radiation and Environmental Protection
(one year full time, two years part time)
Msc in Medical Physics
PhD in Radiation Physics

Curricula: course booklet available upon request

Faculty: Full-time teaching/research faculty (5 members)
Visiting faculty (10 members)

W. Gellently, Professor, Head of Department
Dr. W. B. Gilboy, Chairman of Course Board
Dr. R. C. Barrett, Reader
Dr. W.N. Catford, Lecturer
Dr. A. S. Clough, Senior Lecturer
Dr. E. J. Morton, Lecturer
Dr. N.M. Spyrou, Reader
D. P. M. Walker, Lecturer

Research Areas:

- Miniature spectrometry systems for sophisticated personal electronic dosimetry
- Extra-sensitive LiF TLD for verification of radiation therapy planning
- Design of amorphous silicon image sensors for low dose medical and industrial radiography
- Study of room temperature semiconductor radiation detector and spectroscopy systems
- Image processing for dose reduction in medical fluroscopy
- Monte-Carlo simulation of electron transport at low energies (< 100 keV)
- X-ray tube design
- High resolution (10 μm) three dimensional tomographic imaging of small objects (< 1cm^3)

Financial Assistance: IAEA, EPSRC and British Council are all potential sources of funding for visitors

Students:	full-time	part-time
undergraduate	-	-
masters	36	18
doctorate	4	2
other	-	-
Student financial assistance programmes:	Scholarships: Nationally/Regionally/Corporately and Professional Society sponsored	
	Fellowships: Nationally sponsored	
Research facilities:	Lead-lined room for X-ray system development	
	Pulsed laser and associated optical equipment for detailed study of semiconductor radiation devices	
	High accuracy electronics test fixtures for characterisation of semiconductor radiation detectors	
	Numerous X-ray tubes, including a microfocal X-ray source	
	Design tools for analogue and digital radiation instrumentation development	
Professional Certification:	n/a	

UNITED STATES

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<u>Program Name</u>	<u>Location</u>	<u>Degree Granted</u>		
1. Bloomsburg University	Pennsylvania	BS		
2. Clemson University	South Carolina		MS	PhD
3. Colorado State University	Colorado		MS	PhD
4. Dickinson College	Pennsylvania	BS		
5. Francis Marion University	South Carolina	BS		
6. Georgetown University	Washington, DC		MS	
7. Georgia Institute of Technology	Georgia		MS	PhD
8. Idaho State University	Idaho	BS	MS	PhD
9. Lakeshore Technical College	Wisconsin	AA		
10. Massachusetts Institute of Technology	Massachusetts		MS	PhD
11. Ohio State University	Ohio		MS	PhD
12. Oregon State University	Oregon	BS	MS	PhD
13. Purdue University	Indiana	BS	MS	PhD
14. Rensselaer Polytechnic Institute	New York	BS	MS	PhD
15. San Diego State University	California		MS	
16. Texas A&M University	Texas	BS	MS	PhD
17. Texas State Technical College	Texas	AA		
18. University of Cincinnati	Ohio		MS	PhD
19. University of Florida	Florida		MS	PhD
20. University of Kentucky	Kentucky		MS	
21. University of Massachusetts Lowell	Massachusetts	BS	MS	PhD
22. University of Michigan	Michigan	BS	MS	PhD
23. University of Missouri-Columbia	Missouri		MS	PhD
24. University of Missouri-Rolla	Missouri	BS	MS	PhD
25. University of Nevada Las Vegas	Nevada	BS	MS	
26. University of Pittsburgh	Pennsylvania		MS	PhD
27. University of Tennessee	Tennessee	BS	MS	PhD
Total Number of AA Programs:	2			
Total Number of BS only Programs	3			
Total Number of BS	13			
Total Number of MS only Programs	2			
Total Number of MS/PhD only Programmes	9			
Total Number of BS/MS/PhD Programmes	9			
Programs with a health physics emphasis:				
Nebraska Wesleyan University	Nebraska	BS		

1. BLOOMSBURG UNIVERSITY

Department of Physics

Telephone: (717) 389-4107 / Fax: (570) 389-2094

Program Director:

Dr. Jack G. Couch

Bloomsburg University

Physics Department

Bloomsburg, Pennsylvania 17815

Tel: (717) 389-4152, E-ml: jgcouc@planetx.bloom.edu

HP Degrees Granted:

B.S. in Health Physics

Remote Delivery of Course: None**BS****HP Enrollment (Fall 2001):** 10**HP Graduates (9/00 to 8/01):** 1**HP Graduates (9/99 to 8/00):** 2**Health Physics Faculty:** ($\geq 25\%$ FTE toward the HP program)

Jack G. Couch, Professor of Physics and Health Physics Program Director (717-389-4152); Ph.D. Texas A&M University 1966; Nuclear instrumentation, environmental radiation measurements, applied health physics.

Nathaniel Greene, Associate Professor of Physics.

Philip Koran, Assistant Professor of Physics.

Gunther L. Lang, Assistant Professor of Physics.

Other Information

The B.S. degree in health physics has a strong laboratory and instrumentation orientation. An off-campus internship in health physics is required. The Physics Department in which the B.S. health physics degree is offered has a total faculty of ten individuals.

2. CLEMSON UNIVERSITY

Department of Environmental Engineering and Science
Telephone: (864) 656-3276 / Fax: (864) 656-0672

Program Director:

Dr. Robert A. Fjeld
Rich Environmental Research Laboratory
Clemson Research Park
Clemson University
Clemson, South Carolina 29634-0919
Tel: (864) 656-1010
e-mail: fjeld@clemson.edu
website: <http://www.clemson.edu/ees>

HP Degrees Granted:

M.S. in Environmental Engineering and Science
Ph.D. in Environmental Engineering and Science

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2001):	11	4
HP Graduates (9/00 to 8/01):	4	1
HP Graduates (9/99 to 8/00):	7	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Robert A. Fjeld, The Jerry E. and Harriet Calvert Dempsey Professor of Waste Management; and Professor of Environmental Engineering and Science (864-656-1010); Ph.D. The Pennsylvania State University 1976; Environmental transport, dose and risk assessment, radioactive waste management. [email: fjeld@clemson.edu]

Timothy A. DeVol, Assistant Professor in Environmental Engineering and Science (864-656-1014); Ph.D. University of Michigan 1993; Radiation detection instrumentation, environmental measurements, environmental applications of nuclear techniques. [email: tim.devol@ces.clemson.edu]

Other Faculty:

Christos S. Christoforou, Assistant Professor of Environmental Engineering and Science

John C. Coates, Associate Researcher/Associate Professor of Environmental Engineering and Science

Alan W. Elzerman, Professor and Chair of Environmental Engineering and Science.

David L. Freedman, Assistant Professor of Environmental Engineering and Science.

C. P. Leslie Grady, Jr., Professor of Environmental Engineering and Science.

Tanju Karanfil, Assistant Professor of Environmental Engineering and Science.

Cindy M. Lee, Associate Professor of Environmental Engineering and Science.

CLEMSON UNIVERSITY (Continued)

Thomas J. Overcamp, Professor of Environmental Engineering and Science.

Fred J. Molz, III, SCUREF Distinguished Scientist; and Professor of Environmental Engineering and Science

Frank L. Parker, Eminent Scientist

Steven M Serkiz, Adjunct Assistant Professor

Other Information

Environmental Engineering and Sciences is a graduate-only department where students specialize in one of five focus areas. Health physics students select the environmental health physics focus area, which is concerned with environmental and waste management aspects of nuclear technologies and the nuclear fuel cycle. These aspects include environmental health physics; radioactivity measurement; hazardous, radioactive, and mixed waste treatment and disposal; risk assessment; and transport of radioactive contaminants in the environment. Currently active projects include (1) actinide transport mechanisms in the subsurface, (2) development of radiochemical detector for environmental applications, (3) development of on-line instrumentation for automated nuclear waste process monitoring, and (4) risk assessment. In addition, an internship program is available through which students may work on a variety of environmental restoration, waste management, environmental health physics and radiochemistry projects at Department of Energy facilities.

Student Financial Assistance:

Fellowships, Student Research Assistantships, Student Teaching Assistantships, DOE Internships (limited to U.S. citizens).

Research Facilities:

The Department of Environmental Systems Engineering is located in a 40,000 square foot office and laboratory facility in the Clemson Research Park. The laboratory building contains a counting laboratory, a radiation detection research laboratory, a radiochemistry laboratory, and a radiation detection research laboratory. Radiation detection instrumentation include eight high-purity germanium gamma-ray spectrometry systems (including one portable), several low-resolution NaI:Tl gamma-ray spectrometers, forty alpha spectroscopy systems, three alpha/beta discriminating liquid scintillation counters, one CdZnTe x-ray spectrometer, sixteen gas-flow proportional counters, a thermoluminescent dosimetry system, several neutron detectors, electret ion chambers, continuous radon monitors, and portable health physics instrumentation. Adjacent to the laboratory is the WMX Laboratory consisting of two state-of-the-art analytical laboratories, two high bay laboratories for scale-up projects, and a demonstration area. These facilities are specially designed for research and treatment technologies related to hazardous, radioactive, and mixed wastes. Please visit our web site at <http://www.ces.clemson.edu/ees> for more information on our department. Graduate school applications may be found at <http://www.grad.clemson.edu>.

3. COLORADO STATE UNIVERSITY
Department of Radiological Health Sciences
Telephone: (970) 491-5222 / Fax: (970) 491-0623

Program Director:

Dr. Thomas B. Borak
Department of Radiological Health Sciences
Colorado State University
Ft. Collins, Colorado 80523-1673
Tel: (970) 491-6450
e-mail: tborak@colostate.edu

HP Degrees Granted:

M.S. in Health Physics
M.S. in Radioecology
Ph.D. in Health Physics
Ph.D. in Radioecology

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2001):	3	8
HP Graduates (9/00 to 8/01):	2	1
HP Graduates (9/99 to 8/00):	3	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Thomas B. Borak, CHP, Professor (970-491-6450); Ph.D. Vanderbilt University 1969; Radiation physics, dosimetry. [email: tborak@cvmb.colostate.edu]

James S. Durham, Assistant Professor (970-491-0563); Ph.D. University of Illinois, 1987; Applied Health Physics, Skin Dosimetry [email: jsdurham@lamar.colostate.edu]

Shawki A. Ibrahim, Professor (970-491-1593); Ph.D. New York University 1980; Radiochemistry. [email: sibrahim@cvmb.colostate.edu]

John E. Pinder III, Associate Professor (970-491-0483); Ph.D. University of Georgia, 197; Transport and fate of radioisotopes in the environment, Remote Sensing; GIS. [jepinder@colostate.edu]

F. Ward Whicker, Professor (970-491-5343); Ph.D. Colorado State University 1965; Radioecology. [email: wwhicker@colostate.edu]

Other Faculty:

Joel S. Bedford, Professor of Radiation Biology.
Michael H. Fox, Professor of Radiation Biology.
Robert L. Ullrich, Professor of Radiation Biology

COLORADO STATE UNIVERSITY (Continued)**Visiting Faculty Financial Assistance:**

There are no standing financial assistance programs for visiting faculty. Occasionally there is support through existing research grants or international agencies such as IAEA, NATO, etc.

Student Financial Assistance:

Graduate research assistantships are available through funded research programs in the Department. Availability will vary depending on funding and enrollment. Currently there are research programs funded by DOE, NIH, NASA and ACS.

Research Facilities:

Low level counting laboratory, instrumentation and dosimetry laboratory, whole body counter, radioanalytical chemistry laboratory, 6-MV electron accelerator, ^{60}Co and ^{137}Cs irradiators. The faculty have collaborative arrangements with Los Alamos National Laboratory, Lawrence Berkeley National Laboratory, the Savannah River Ecology Laboratory, the Brookhaven National laboratory and the National Institute of Radiological Science in Chiba, Japan

4. DICKINSON COLLEGE

Department of Physics and Astronomy
Telephone: (717) 245-1413 / Fax: (717) 245-1642

Program Director:

Dr. John Luetzelschwab
Department of Physics and Astronomy
Dickinson College
Carlisle, Pennsylvania 17013-2896
email: luetzelj@dickinson.edu
website: www.physics.dickinson.edu

HP Degrees Granted:

B.S. in Physics

Remote Delivery of Course: None

BS

HP Enrollment (Fall 2001):	1
HP Graduates (9/00 to 8/01):	2
HP Graduates (9/99 to 8/00):	2

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

John Luetzelschwab, CHP, Professor of Physics (717-245-1241); Ph.D. Washington University 1968; Radon measurement. [email: luetzelj@dickinson.edu]

Student Financial Assistance:

Regular undergraduate loans, grants, and work study.

Research Facilities:

HPGe gamma spectroscopy system, Ge(Li) gamma spectroscopy system, neutron howitzer, radon source, radon detection equipment.

5. FRANCIS MARION UNIVERSITY

Department of Chemistry and Physics

Telephone: (803) 661-1381 / Fax: (803) 661-4616

Program Director:

Dr. David M. Peterson
 Department of Physics & Astronomy
 Francis Marion University
 P.O. Box 100547
 Florence, South Carolina 29501
Tel: (803) 661-1445
email: dpeterson@fmarion.edu

HP Degrees Granted:

B.S. in Health Physics (no specialty)

Remote Delivery of Course: None**BS (Junior/Senior)**

HP Enrollment (Fall 2001):	8
HP Graduates (9/00 to 8/01):	0
HP Graduates (9/99 to 8/00):	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

David M. Peterson., Professor of Physics (803-661-1445); Ph.D. North Carolina State University 1975; Nuclear physics, instrumentation. [email: dpeterson@fmarion.edu]

R. Seth Smith, Associate Professor of Physics (803-661-1453); Ph.D. Louisiana State University 1986; Lasers, electronics. [email: smith@scarolina.fmarion.edu]

Derek Jokisch, Assistant Professor of Physics (843-661-4653); Ph.D. University of Florida 1999; Health physics. [email: djokisch@fmarion.edu]

Student Financial Assistance:

Undergraduate scholarship

Research Facilities:

Counting laboratory - 4 stations with computerized MCAs with electronics and detectors, neutron howitzer (^{252}Cf source), TLD system.

Professional Certification:

Graduates of our program have been very successful in passing the American Board of Health Physics Certification Exam.

6. GEORGETOWN UNIVERSITY

Health Physics Program
Department of Radiation Medicine
Telephone: (202) 687-2212 / Fax: (202) 784-3323

Program Director:

Dr. Marko Moscovitch
Health Physics Program
Building D
Georgetown University Medical Center
4000 Reservoir Road, NW
Washington, DC 20007-2197
Tel: 202-687-8993
Fax: 202-687-2221
email: moscovim@georgetown.edu
website: <http://www.dml.georgetown.edu/depts/radiation/hphysics/HealthPhys.html>

HP Degrees Granted:

M.S. in Health Physics

Remote Delivery of Course: None

MS

HP Enrollment (Fall 2001):	3
HP Graduates (9/00 to 8/01):	3
HP Graduates (9/99 to 8/00):	8

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Allen Brodsky, CHP, Adjunct Professor (703-288-6869); Sc.D. University of Pittsburgh 1966; Operational health physics, regulatory policy.

Timothy J. Jorgensen, Associate Professor of Radiation Medicine (202-687-1810); Ph.D. Johns Hopkins University 1984; Radiation biology. [email: tjorge01@georgetown.edu]

Usha Kasid, Associate Professor of Radiation Medicine (202-687-2226); Ph.D. University of Punjab 1978; Radiation biology, molecular carcinogenetics. [email: kasidu@georgetown.edu]

Marko Moscovitch, Director and Associate Professor of Radiation Medicine, (202-687-8993); Ph.D. Ben Gurion University of the Negev (Israel) 1985; Thermoluminescent dosimetry (TLD), environmental monitoring, space radiation detection. [email: moscovim@georgetown.edu]

GEORGETOWN UNIVERSITY (Continued)

James E. Rodgers, Associate Professor of Radiation Science (202-687-2212); Ph.D. University of California, Riverside 1972; Radiation dosimetry, Monte Carlo simulation, radiation shielding. [email: jr@gamma.rip.georgetown.edu]

Other Faculty:

Mira Jung, Ph.D.

Stephen A. McGuire, Ph.D.

Seong K. Mun, Ph.D.

Azam Niroomand-Rad, Ph.D.

Vicente Notario, Ph.D.

David A. Schauer, Ph.D.

Other Information:

The Health Physics program offers a Master of Science degree with an option to specialize in Health Physics or Environmental Health Physics. For students who select the environmental option, the focus of the internships and the thesis will be directed more towards environmental radiation protection. The program has been designed to provide students with the necessary theoretical and practical knowledge to become competent health physicists. Students in the program will have the opportunity to gain valuable experience in various areas associated with health physics, such as basic radiation physics, radiation detection and dosimetry, environmental radiation protection, and radiation biology. Applicants to the Master's program are selected on a competitive basis by a faculty committee which evaluates the application, letters of recommendation, and academic record. For full-time students, it is expected that the Master's program can be completed in two years. Part-time students taking two courses per semester would be expected to complete the program in approximately three years. The program offers evening courses to enable working part-time students to participate.

Visiting Faculty Financial Assistance:

Both visiting faculty and postdoctoral fellowships are occasionally available.

Student Financial Assistance Program:

Georgetown University has an extensive student financial assistance program. In addition, the program is funded by external grants from NASA and the DOE Health Physics Faculty Research Award Program. Occasionally student fellowships are available.

Research Facilities:

The program is located on the campus of Georgetown University in a new research building with spacious laboratories and state-of-the-art equipment, including thermoluminescence dosimetry (TLD), and radiation detection and spectroscopy systems. In addition, we have a computer laboratory equipped with a silicon graphics workstation (Indigo² Solid Impact R-10000) and a variety of Pentium and Macintosh workstations.

7. GEORGIA INSTITUTE OF TECHNOLOGY
Health Physics Program
George W. Woodruff School of Mechanical Engineering
Telephone: (404) 894-3200 / Fax: (404-894-8336

Program Director:

Dr. Ward O. Winer,
Regents' Professor and Chair
George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology
Atlanta, GA 30332-0405
Tel: 404-894-3200
Fax: 404-894-1658
Email: ward.winer@me.gatech.edu

HP Degrees Granted:

M.S. in Health Physics
Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Course: Entire M.S. curriculum
Selected courses from the Ph.D. program

	MS	PhD
HP Enrollment (Fall 2001):	20	9
HP Graduates (9/00 to 8/01):	6	0
HP Graduates (9/99 to 8/00):	5	2

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Nolan E. Hertel, Professor of Nuclear Engineering and Health Physics (404-894-3601; Fax: 404-894-9325); Ph.D. University of Illinois 1979; Radiation shielding, high-energy neutron/transport, Monte Carlo Simulation; radiation dosimetry, radiological assessment, waste management.
[Email: nolan.hertel@me.gatech.edu]

Rodney Ice, CHP, Radiological Safety Officer and Adjunct Professor (404-894-3621, Fax: 404-853-9325); Ph.D. Purdue University 1967; Radiopharmaceuticals, radioprotectants, boron neutron capture theory. [Email: rodney.ice@nnrc.gatech.edu]

Bernd Kahn, Professor Emeritus, Nuclear Engineering and Health Physics, and Director, Environmental Resource Center (404-894-3776, Fax: 404-894-3828); Ph.D. Massachusetts Institute of Technology 1960; Analytical radiochemistry, radiological surveillance at nuclear power facilities, measurement of radionuclides at environmental levels. [Email: bernd.kahn@me.gatech.edu]

C-K Chris Wang, Associate Professor of Nuclear Engineering and Health Physics (404-894-3727, Fax: 404-894-3733); Ph.D. Ohio State University 1989; Neutron capture therapy, radiation brachytherapy, radiation detection and radiation dosimetry. [Email: chris.wang@me.gatech.edu]

GEORGIA INSTITUTE OF TECHNOLOGY (Continued)

John D. Valentine, Associate Professor of Nuclear Engineering and Health Physics (404-894-3745, Fax: 404-894-9325); Ph.D. University of Michigan 1993; Radiation detection and measurements, including medical imaging, personnel monitoring, radiological characterization, statistical analysis of data and Monte Carlo simulation. [Email:john.valentine@me.gatech.edu]

Other Faculty:

S. I. Abdel-Khalik, Southern Nuclear Professor, Nuclear Engineering and Health Physics

Melvin W. Carter, Neely Professor Emeritus, Nuclear Engineering and Health Physics

Geoffrey G. Eichholz, Regents' Professor Emeritus, Nuclear Engineering and Health Physics

Don S. Harmer, Emeritus Professor of Physics

Ratib A. Karam, Emeritus Professor, Nuclear Engineering and Health Physics

Farzad Rahnema, Associate Professor, Nuclear Engineering and Health Physics

Weston M. Stacey, Callaway and Regents' Professor, Nuclear Engineering and Health Physics

William J. Wepfer, Professor and Director for Graduate Programs, School of Mechanical Engineering

Ward O. Winer, Regents' Professor and Chair, School of Mechanical Engineering

Paul Champ, ATSDR - CDC, Adjunct Professor, Environmental Health Physics

Kenneth W. Crase, Westinghouse Savannah River Co., Adjunct Professor, Radiation Protection.

Visiting Faculty Financial Assistance:

No formal program at present.

Student Financial Assistance:

Research and teaching assistantships, fellowships and tuition waivers are available to graduate students. Graduate assistantships carry a twelve-month stipend starting at \$18,500 (2001-2002 academic year) and include a waiver of out-of-state tuition. President's Fellowships and Woodruff Fellowships of up to \$5000 to supplement graduate assistantships, are available to qualified students wishing to pursue the Ph.D. degree. Federal, industrial and private fellowships are also available. International students must guarantee their first-year support but are eligible to compete for awards on a quarterly basis.

Research Facilities:

Light-Water and graphite subcritical assemblies, 120,000 curies of ^{60}Co , hot cells. Extensive laboratory facilities for radiochemistry, materials preparations and nuclear spectroscopy. Cf-252-based neutron dosimetry reference sources. Neely Nuclear Research Center, Fusion Research Center, Environmental Resources Center.

8. IDAHO STATE UNIVERSITY

Department of Physics

Telephone: (208) 236-2350 / Fax: (208) 236-4649

Program Director:

Dr. Richard Brey
Department of Physics, Campus Box 8106
Idaho State University, Pocatello, ID 83209
email: brey@physics.isu.edu

HP Degrees Granted:

B.S. in Physics (Health Physics Emphasis)
M.S. in Physics (Health Physics Emphasis)
Ph.D. in Engineering and Applied Science (Health Physics Emphasis)

Remote Delivery of Course: Selected courses in the B.S., M.S., and Ph.D. programs are offered to remote locations within the state of Idaho in real-time via microwave video communication.

	BS	MS	PhD
HP Enrollment (Fall 2001):	11	23	4
HP Graduates (9/00 to 8/01):	2	1	2
HP Graduates (9/97 to 8/98):	2	5	1

Health Physics Faculty: (25% FTE toward the HP program)

Richard R. Brey, C.H.P. (Physics) Director & Associate Professor of Health Physics (208) 282 2667; Ph.D., Purdue University 1994; Applied health physics, Environmental health physics, Internal dosimetry, Accelerator health physics. [email: brey@physics.isu.edu]

Thomas F. Gesell, (Physics) Professor of Health Physics (208) 282 3669; Ph.D., University of Tennessee 1971; Dosimetry, Environmental health physics. [email: gesell@physics.isu.edu]

Douglas P. Wells, C.H.P. (Physics) Assistant Professor of Health Physics (208) 282-3986; Ph.D., University of Illinois at Urbane-Champaign 1990; Environmental health physics, Accelerator health physics.[email: wells@physics.isu.edu]

Jay F. Kunze, C.H.P. (Engineering) Professor of Engineering (208) 282 2902; Ph.D., Carnegie Mellon University 1959; Medical Physics, Reactor health physics, Low-level radiation health effects. [email: kunzejay@isu.edu]

John S. Bennion, C.H.P. (Engineering) Assistant Professor of Engineering (208) 282 3351; Ph.D., University of Utah, 1997; Reactor health physics, Low-level radiation health effects. [email: jrbennion@isu.edu]

IDAHO STATE UNIVERSITY (Continued)**Adjunct Faculty:**

Rick Cummings
Bernie Graham
Yale Harker
Steve Oberg
Mark Otis
Norman Rohrig

Affiliate Faculty:

Klaus Buzzi
Mark Davidson
Karen Langley
Todd Lewis
James O'Rear
Paul Ritter

Other Information:

The Idaho State University (ISU) Health Physics Program, within the Department of Physics, operates two separate environmental radioactivity monitoring and assessment laboratories. These laboratories are equipped with state-of-the-art low-level radiation detection equipment and extensive human resources. Physics department faculty administer the Idaho Accelerator Center (IAC) which currently operates several accelerators including two Van de Graaff accelerators and seven electron LINAC accelerators. A special interest of the department is a recently acquired 30-MeV fast pulse (10 picosecond pulse width) LINAC. The IAC will be increasing the number of available accelerators in the near future. Idaho State University's College of Engineering operates an AGN-201 research and training reactor. All of these facilities provide work opportunities and research resources for Health Physics Students. Additionally, the nearby Idaho National Environmental & Engineering Laboratory (INEEL) offers many collaborative opportunities for students to gain practical experience and to conduct thesis research in a Department of Energy (D.O.E.) environment. The Health Physics Program at Idaho State University is a participant in both the D.O.E. Applied Health Physics (AHP) Fellowship program administered by the Oak Ridge Institute for Science and Engineering (ORISE) and the D.O.E. Nuclear Engineering and Health Physics (NE/HP) Fellowship Program administered by the South Carolina Universities Research and Education Foundation (SCUREF). Nestled in the heart of the Rocky Mountains, ISU is located near several national parks and premier ski areas. Please see our web page at: <http://www.physics.isu.edu>

9. LAKESHORE TECHNICAL COLLEGE

Department of Health Physics

Telephone: (414) 684-4408 / Fax: (414) 693-3564

Program Director:

Dr. Douglas G. Gossen
Department of Health Physics
Lakeshore Technical College
1290 North Avenue
Cleveland, Wisconsin 53015

HP Degrees Granted in Health Physics:

A.A. in Health Physics

Remote Delivery of Courses: The entire curriculum is available in an alternative delivery format. Laboratory activities can be completed on campus or at another facility with equivalent equipment.

AA

HP Enrollment (Fall 2001):	9
HP Graduates (9/00 to 8/01):	3
HP Graduates (9/99 to 8/00):	5

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Douglas G. Gossen, Coordinator of Health Physics Department (414-684-4408, ext. 221); Ph.D. LaSalle University 1996; Applied health physics, radiochemistry.

Daniel J. Shannon, Health Physics Instructor, M.S. Georgia Tech. 1995; Radiological emergencies, applied health physics.

Ernest T. James, Health Physics Instructor, Ph.D. University of Alberta 1971; Radiochemistry.

Other Information

Annually, the program offers 40 hours of refresher courses and the NRRPT examination.

10. MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Department of Nuclear Engineering

Telephone: (617) 253-3801 / Fax: (617) 258-7437

Program Director:

Dr. Jacquelyn C. Yanch

Department of Nuclear Engineering

NW14-2207

Massachusetts Institute of Technology

Cambridge, Massachusetts 02139-4307

email: jcyanch@mit.edu

HP Degrees Granted:

M.S. in Nuclear Engineering (health physics option)

Ph.D. or Sc.D. in Nuclear Engineering (health physics option)

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2001):	2	3
HP Graduates (9/00 to 8/01):	0	1
HP Graduates (9/99 to 8/00):	1	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Jacquelyn C. Yanch, Professor of Nuclear Engineering (617-258-6999); Ph.D. University of London 1988; Biological and medical applications of accelerator-produced neutron, proton, and alpha beams; radiation transport modeling; neutron detection and dosimetry, and radiation health physics. [email: jcyanch@mit.edu]

Kenneth Czerwinski, Assistant Professor of Nuclear Engineering (617-253-3843); Ph.D. University of California, Berkeley, 1992; Actinide spectroscopy, actinide thermodynamics, environmental chemistry of actinide elements, radiation health physics, geochemical modeling. [email: kczer@mit.edu]

Otto K. Harling, Professor Emeritus of Nuclear Engineering (617-253-4201); Ph.D. Penn State 1962; Research reactor applications, experimental materials research, neutron research. [email: oharling@mit.edu]

Jeffrey A. Coderre, Associate Professor of Nuclear Engineering (617-452-383); Ph.D. Yale University 1981; Boron neutron capture therapy, radiation biology. [coderre@mit.edu]

John Bernard, Director, Nuclear Reactor Laboratory (617-253-4202); Ph.D. Massachusetts Institute of Technology 1984; Health physics, digital control of reactors, application of expert systems. [jbernard@mit.edu]

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Continued)

Sidney Yip, Professor of Nuclear Engineering (617-253-3809); Ph.D. University of Michigan 1962; Atomistic simulations, condensed matter sciences, statistical mechanics, neutron scattering.
[email: syip@mit.edu]

Other Faculty:

Mujid S. Kazimi, Professor of Nuclear Engineering.
Fred W. McWilliams, Head of Radiation Protection, MIT Reactor.
Francis X. Massé, CHP, Radiation Protection Officer for MIT.

Student Financial Assistance:

Fellowships, teaching assistantships, research assistantships

Research Facilities:

5-MW MIT Research Reactor plus associated laboratories, 4.1-MeV high current particle accelerator for biomedical research, scanning electron facility, an RFQ proton generator for neutron tomography and non-destructive testing, a waste encapsulation laboratory, neutron activation analysis laboratory, NMR laboratory, medical imaging laboratory, and a charged particle microbeam for subcellular irradiations.

11. THE OHIO STATE UNIVERSITY

Department of Nuclear Engineering
 Telephone: (614) 292-8519 / Fax: (614) 292-3163

Program Director:

Dr. Thomas E. Blue
 Health Physics Program Director
 2091 Robinson Laboratory
 206 West 18th Avenue
 Columbus, Ohio 43210-1107
 (614) 292-0629

email (Thomas E. Blue): blue.1@osu.edu

email (Nuclear Engineering): Nuclear01@postbox.acs.ohio-state.edu

website (Nuclear Engineering home page): <http://rclsgi.eng.ohio-state.edu/nuclear/>

website (The Ohio State University Graduate School home page): <http://www.gradsch.ohio-state.edu/>

HP Degrees Granted:

M.S. in Nuclear Engineering (Health Physics Option)

Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Course: None

	MS	PhD
HP Enrollment (Fall 2001):	5 FT 2 PT	0 FT 2 PT
HP Graduates (9/00 to 8/01):	3	0
HP Graduates (9/99 to 8/00):	1	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Thomas E. Blue, Professor of Nuclear Engineering (614-292-0629); Ph.D. University of Michigan 1978; Radiation protection, boron neutron capture therapy, accelerator-based neutron source design, radiation dosimetry. [email: blue.1@osu.edu]

Richard Denning, Professor and Acting Chairman of Nuclear Engineering (614-292-5736); Ph.D. University of Florida 1967; Reactor safety analysis, severe accident behavior, probabilistic risk analysis, criticality safety, shielding analysis [email: denning.8@osu.edu]

Audeen W. Fentimen, Associate Professor Civil and Environmental engineering and Geodetic Science and Acting Chairman of Nuclear engineering (614-292-7930); Ph.D. the Ohio State University 1982; Nuclear waste management, criticality safety. [fentiman.1@osu.edu]

Nilendu Gupta, Assistant Professor of Radiology and Adjunct Assistant Professor of Nuclear Engineering (614-293-4204); Ph.D. The Ohio State University 1995; Boron neutron capture therapy, head scatter in Radiotherapy Linacs, scatter in Patient Dose Compensator Systems, Radiosurgery, 3D Treatment Planning and Conformal Radiation Therapy. [email: gupta.6@osu.edu]

THE OHIO STATE UNIVERSITY (Continued)

Don W. Miller, Professor of Nuclear Engineering (614-292-7979); Ph.D. The Ohio State University 1971; Nuclear medical instrumentation, artificial intelligence applied to plant operations, digital x-ray radiography. [email:miller.68@osu.edu]

Jeffrey E. Woollard, Research Associate in Nuclear Engineering (614-292-1074); Ph.D. The Ohio State University 1997; Computational radiation transport for application in biology and medicine, nuclear criticality safety. [email: jeff@bullmoose.eng.ohio-state.edu]

Other Faculty:

Tunc Aldemir, Professor of Nuclear Engineering. (614-292-4627)

Walter E. Carey, CHP, Emeritus Associate Professor of Nuclear Engineering and Zoology and Past Director, Office of Radiation Safety

Richard S. Denning, Professor of Nuclear engineering (614-294-7412)

Brian K. Hajek, Professor of Nuclear Engineering (614-292-5405)

Other Information:

Approved institution for the DOE Applied Health Physics Fellowships. Typically receive annually one Institute for Nuclear Power Operations Health Physics Fellowship.

Student Financial Assistance:

Financial assistance is available to Nuclear Engineering graduate students. Previous academic performance, GRE scores, and work experience are considered when selecting students for research assistantships, teaching assistantships, and fellowships. Fellowships are available through OSU, the Department of Energy, the Institute for Nuclear Power Operations, the Nuclear Regulatory Commission, and the National Science Foundation. Research assistantships are available on projects with faculty members as well as through cooperative agreements between the Nuclear Engineering Program and the Ohio Department of health and the Ohio emergency Management Agency. Stipends for all positions start at \$1,350 per month; in addition, tuition and fees, which range from over \$8,000 to about \$20,000 per year, are waived. The deadline for fellowship applications is January 1.

Application for all forms of financial assistance administered by the department as well as the Graduate School may be made by completing the appropriate portion of the application form for admission to the Graduate School. Application materials may be obtained by writing to:

Chair, Nuclear Engineering Program,
The Ohio State University,
206 West 18th Avenue, Columbus, OH 43210-1154 USA

Research Facilities:

500kW OSU Research Reactor(OSURR), graphite moderated natural-uranium fueled subcritical reactor, neutron howitzer, a 10,000 Ci Co-60 source in a water pool, Neutron Activation Analysis Laboratory, Nuclear Instrumentation Laboratory. Other on-campus facilities include: The Ohio Emergency Management Agency's Radiation Dosimeter Calibration Facility, Ohio Department of Health Bureau of Radiation Protection Emergency Response Laboratory, The James Comprehensive Cancer Center, OSU Hospital.

12. OREGON STATE UNIVERSITY

Department of Nuclear Engineering
 Telephone: (541) 737-2343 / Fax: (541) 737-0480
 Website: <http://www.ne.orst.edu>

Program Director:

Dr. Kathryn A. Higley
 Department of Nuclear Engineering
 Oregon State University
 116 Radiation Center
 Corvallis, Oregon 97331-5902
 (541) 737-0675
email: higley@ne.orst.edu

HP Degrees Granted:

B.S. in Radiation Health Physics
 M.S. in Radiation Health Physics
 Ph.D. in Radiation Health Physics

Remote Delivery of Course: Under consideration

	BS	MS	PhD
HP Enrollment (Fall 2001):	18	12	2
HP Graduates (9/00 to 8/01):	5	3	3
HP Graduates (9/99 to 8/00):	7	3	1

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Stephen E. Binney, PE, Director, Radiation Center and Professor of Nuclear Engineering (541-737-2344); Ph.D. University of California, Berkeley 1970; Applications of nuclear instrumentation and techniques, production of medical radioisotopes, boron neutron capture therapy, transmutation of radionuclides, nuclear radiation shielding. [email: binneys@rc.orst.edu]

Brian Dodd, Professor of Nuclear Engineering (541-737-2343); Ph.D. University of London 1973; Health physics, radioactive materials transportation, emergency response, research reactor management. (On leave at the International Atomic Energy Agency, Vienna) [email: doddb@rc.orst.edu]

Jack F. Higginbotham, PE, CHP, Professor of Nuclear Engineering (541-737-7068); Ph.D. Kansas State University 1987; Instrumentation, research reactor applications, activation analysis, gamma-ray and beta-particle spectroscopy, radiation protection. [email: jackf.higginbotham@orst.edu]

OREGON STATE UNIVERSITY (Continued)

Kathryn A. Higley, CHP, Radiation Health Physics Program Director and Assistant Professor of Nuclear Engineering, (541-737-0675); Ph.D. Colorado State University 1994; Human and ecological risk assessment, environmental pathway analysis, environmental radiation monitoring, radionuclide and hazardous chemical transport. [email: higley@ne.orst.edu]

David M. Hamby, CHP, Chair of Graduation Committee and Associate Professor of Nuclear Engineering (313-936-0764); Ph.D. University of North Carolina 1989; Environmental assessment, environmental transport and dosimetry, radiological instrumentation development and biokinetic modeling. [hambydm@ne.orst.edu]

Andrew C. Klein, PE, Department Head and Professor of Nuclear Engineering, (541-737-2343); Ph.D. University of Wisconsin, Madison 1983; Space nuclear power applications, arms control technology, nuclear system analysis and design, shielding. [email: kleina@ne.orst.edu]

Steven R. Reese, CHP, Reactor Administrator and Professional Faculty in Nuclear Engineering, (541-737-7046); Ph.D. Colorado State University 1997; Radiation protection, activation analysis, radiation shielding and dosimetry. [email: reeses@rc.orst.edu]

Other Faculty:

Arthur G. Johnson, Professor Emeritus of Nuclear Engineering

Todd S. Palmer, Associate Professor of Nuclear Engineering.

José N. Reyes Jr., Professor of Nuclear Engineering and Director of the Advanced Thermal Hydraulics Research Laboratory.

John C. Ringle, Professor Emeritus of Nuclear Engineering

Qiao Wu, Assistant Professor of Nuclear Engineering.

Other Information:

Program is housed in the OSU Radiation Center, which has a 1.1 MW TRIGA reactor, ⁶⁰Co irradiator, instrument calibration facilities as well as full analytical and laboratory capabilities. The Department of Nuclear Engineering at Oregon State University also offers B.S., M.S., and Ph.D. degrees in nuclear engineering.

13. PURDUE UNIVERSITY

School of Health Sciences

Telephone: (765) 494-1419 / Fax: (765) 496-1377

Program Director:

Dr. John D. Zimbrick
 School of Health Sciences
 Purdue University
 1338 Civil Engineering Building
 West Lafayette, Indiana 47907-1338

HP Degrees Granted:

B.S. in Health Physics
 M.S. in Health Physics
 Ph.D. in Health Physics

Remote Delivery of Course: Selected courses in the MS program as part of the MS health physics degree from National Technological University.

	BS	MS	PhD
HP Enrollment (Fall 2001):	5	2	1
HP Graduates (9/00 to 8/01):	4	1	1
HP Graduates (9/99 to 8/00):	7	2	1

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Herman Cember, CHP, Visiting Professor of Health Physics (765-496-1874); Ph.D. University of Pittsburgh, 1952; Pulmonary radiotoxicology, absorption of radionuclides on silver zeolite samplers. [email: cemberh@purdue.edu]

Robert Landolt, Professor of Health Sciences (765-494-2699); Ph.D. Purdue University 1968; Radioactive waste management, health physics aspects of decommissioning. [email: landoltr@purdue.edu]

George Sandison, Professor and Head, School of Health Sciences (765-494-1435); Ph.D. Oxford University; Medical Physics-cryotherapy, imaging [sandison@purdue.edu]

John D. Zimbrick, Professor of Health Sciences (765-494-1408); Ph.D. University of Kansas 1967; Molecular radiobiology, radiation dosimetry. [email: zimbrick@purdue.edu]

Other Faculty:

Wei Shung Wang, Assistant Professor of Health Sciences and Health Physicist

Stanley Shaw, Professor of Nuclear Pharmacy.

James Schweitzer, Assistant Professor of Health Sciences and Radiation Safety Officer.

Frank Rosenthal, Associate Professor of Occupational and Environmental Health Sciences.

Neil Zimmerman, Associate Professor of Occupational Safety and Health.

14. RENSSELAER POLYTECHNIC INSTITUTE
 Nuclear Engineering and Engineering Physics Program
 Department of Mechanical, Aerospace, and Nuclear Engineering (MANE)
 110 8th Street, Troy, NY 12180-3590
 Telephone: (518) 276-6550 / Fax: (518) 276-4832
<http://www.rpi.edu/dept/mane/dept/deptweb/index/html>

Program Director:

Dr. X. George Xu
 Nuclear Engineering, and Engineering Physics Program
 Department of Mechanical, Aerospace, and Nuclear Engineering (MANE)
 NES Building, Tibbits Avenue
 Troy, NY 12180-3590
Tel: (518) 276-4014 **Fax:** (518) 276-4832
e-mail: xug2@rpi.edu

HP Degree Granted:

B.S. in Nuclear Engineering/Engineering Physics (health physics option)
 M.S. in Nuclear Engineering/Engineering Physics (health physics option)
 Ph.D. in Nuclear Engineering/Engineering Physics (health physics option)

Remote Delivery of Course: None

	BS	MS	PhD
HP Enrollment (Fall 2001):	*	1	6
HP Graduates (9/00 to 8/01):	*	1	1
HP Graduates (9/99 to 8/00):	*	0	1

* There were 10 undergraduate students enrolled in Nuclear engineering and Engineering Physics on campus. Additionally, about 20 Navy students were also registered in Nuclear engineering and engineering Physics at the remote Malta campus.

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Bimal K. Malaviya, Executive Officer and Professor; Ph.D. Harvard University 1964; Radioactive waste management, fission and fusion reactor physics and technology, biomedical applications, human factor engineering [e-mail: malavb@rpi.edu].

Michael Z. Podowski, Professor; Ph.D. Warsaw Technical University 1972; Nuclear safety, system stability, applied mathematics, multiphase flow and heat transfer. [e-mail: podowm@rpi.edu].

Don Steiner, NEEP program director and Institute Professor; Ph.D. Massachusetts Institute of Technology 1967; Radiation physics, fusion systems analysis, plasma engineering, blanket design and overall fusion reactor design, nuclear instrumentation, environmental safety assessment [e-mail: steind@rpi.edu].

RENSSELAER POLYTECHNIC INSTITUTE (Continued)

Yaron Danon, Assistant Professor; Ph.D. Rensselaer Polytechnic Institute 1993; Radiation transport, shielding design, nuclear instrumentation. [kilduff@rpi.edu]

X. George Xu, Assistant Professor and Institute Radiation Safety Officer; Ph.D. Texas A&M University 1994; Internal and external radiation dosimetry, Monte Carlo simulations, anatomical whole-body model development, medical health physics, Monte Carlo application in radiotherapy, radiology, and nuclear medicine, in-situ gamma spectroscopy, environmental health physics.
[email: xug2@rpi.edu]

Chan-Hyeong Kim, Research Assistant Professor and Institute Radiation Safety Officer. Ph.D. Texas A&M University 1998. Operational Health Physics, Monte Carlo simulations, effective dose equivalent calculations. [kimc@rpi.edu]

Other Faculty:

Nicholas Clesceri, Professor of Environmental Engineering.
Simeon J. Komisar, Associate Professor of Environmental Engineering
Donald Drew, Professor; Joint Appointment with Mathematics Dept.
Mark J. Embrechts, Associate Professor of Nuclear engineering
Richard T. Lahey, Jr., Edward E. Hood Jr. Professor of Nuclear engineering
John C. Corelli, Professor Emeritus of Nuclear Engineering
Robert C. Block, Active Professor Emeritus and director of LINAC Lab
Donald R. Harris, Active Associate Professor Emeritus and Director of Reactor Critical Facility
Norman Francis, Adjunct Professor of Nuclear Engineering
John Matuszek, Adjunct Professor of Nuclear Engineering
Robert M. Ryan, Active Associate Professor Emeritus of Nuclear Engineering
Dawson Chen, Adjunct Associate professor of Nuclear Engineering
Narayan Sahoo, Adjunct Associate Professor of Nuclear Engineering

Other Information:

Health physics is an integral part of the research and degree programs in the Department of Environmental and Energy Engineering at Rensselaer Polytechnic Institute, the nation's oldest engineering school. Students in health physics degree concentration receive degrees in nuclear engineering, engineering physics, or environmental engineering, after completing core courses and research project in health physics. Rensselaer Polytechnic Institute has one of the nation's most outstanding nuclear engineering programs, and has provided a large number of highly qualified 'Can-Do' graduates to nuclear industry, national laboratories and academia over the past 40 years. Active collaborations in health physics teaching and research have been established with New Your State Department of Health, local medical centers, nuclear power plants in New York State, Knoll Atomic Power Laboratory and GE/CRD, as well as several national labs.

RENSSELAER POLYTECHNIC INSTITUTE (Continued)

Off-campus site: In co-operation with the U.S. Navy, the department has been offering undergraduate degree programs in Engineering Science and Nuclear Engineering to Navy personnel stationed at the Kesselring site in West Milton, New York. Programs and classes are mainly delivered at our Malta Commons campus (30 miles from Troy campus). The course schedules have been designed to accommodate the shift work schedule of about 60 students who are currently enrolled.

Visiting Faculty:

Many visiting and adjunct faculty are currently involved in health physics teaching and research in the department.

Student Financial Assistance:

Graduate teaching and research assistantships (partial or full stipend and tuition) are awarded each year to incoming students.

Research Facilities:

Major nuclear engineering facilities include a 100-MeV electron accelerator and a 5-W research reactor. Rensselaer Polytechnic Institute's Troy campus is one of the most computerized campuses in the nation, and has been constantly ranked among the top five "Most Wired" universities nationwide by Yahoo.

15. SAN DIEGO STATE UNIVERSITY

Department of Physics

Telephone: (619) 594-6240 / Fax: (619) 594-5485

Program Director:

Dr. Patrick J. Papin

Department of Physics

San Diego State University

San Diego, California 92182-1233

email: patrick.papin@sdsu.edu

HP Degrees Granted:

M.S. in Radiological Health Physics

Remote Delivery of Course: None**MS****HP Enrollment (Fall 2001):** 7**HP Graduates (9/98 to 8/99):** 3**HP Graduates (9/97 to 8/98):** 2**Health Physics Faculty:** ($\geq 25\%$ FTE toward the HP program)

Patrick J. Papin, Professor of Physics (619-594-6240); Ph.D. University of California 1985, Computational methods in dosimetry, shielding, and medical imaging, Neutron-gamma mixed field dosimetry. [email: patrick.papin@sdsu.edu]

Gordon Shackelford, Lecturer in Radiological Health Physics (619-594-6240); M.S. San Diego State University 1974, Nuclear instrumentation and methods. [email: gshackelford@sciences.sdsu.edu]

Eric Goldin, CHP, Lecturer in Radiological Health Physics and Radiation Biology, ABHP Certified Health Physicist (Comprehensive and Power Reactor Health Physics), Health Physics Engineer, Southern California Edison (619-594-6240); Ph.D. University of Texas 1976, Nuclear power reactor health physics.

Ralph Cerbone, Lecturer in Radiological Health Physics (619-594-6240); Ph.D. Rensselaer Polytechnic Institute 1967, Computational methods in shielding, nuclear engineering.

Other Faculty:

Steven J. Goetsch, Lecturer in Radiological Health Physics.

Michael Russell, Lecturer in Radiological Health Physics.

Sharon Thompson, Lecturer in Radiological Health Physics.

SAN DIEGO STATE UNIVERSITY (Continued)

Other Information

Health Physics curriculum includes applied health physics courses in areas of nuclear power reactor health physics (in co-operation with San Onofre Nuclear Generating Station) and medical health physics (in co-operation with the Naval Hospital, San Diego).

Student Financial Assistance

The department currently supports students as both teaching and research assistantships. Students also have numerous opportunities for scholarships and fellows.

Research Facilities:

On campus facilities include: Nuclear counting laboratories with radioisotope preparation capabilities, neutron generator facility, x-ray laboratory, whole-body counter, instrument calibration facility (including gamma and neutron sources), computational radiological physics laboratory (with high-speed supercomputer access). Off campus facilities: Through elective courses and special study students have access to equipment and facilities at San Onofre Nuclear Generating Station, various hospitals (with nuclear medicine, diagnostic and radiation therapy facilities), and biotech laboratories.

Professional Certification:

Graduates of our program have been very successful in passing the American Board of Health Physics Certification Exam.

16. TEXAS A&M UNIVERSITY
 Department of Nuclear Engineering
 Telephone: (979) 845-4161 / FAX: (979) 845-6443

Program Director:

Ian Scott Hamilton, Ph.D., CHP
 129 Zachry Engineering Center
 Department of Nuclear Engineering
 Texas A&M University
 College Station, TX 77843-3133
email: poston@trinity.tamu.edu

Degrees Granted:

B.S. in Radiological Health Engineering (ABET accredited)
 M.S. in Health Physics
 Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Courses: On demand

	BS	MS	PhD
Enrollment (Fall 2001)	28	9	12
Graduates (9/00 to 8/01)	3	2	1
Graduates (9/99 to 8/00)	3	4	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

John W. Poston, Sr., Professor of Nuclear Engineering (979-845-4161); Ph.D. Georgia Institute of Technology 1971; External and internal dosimetry, applied health physics.
 [e-mail: poston@ne.tamu.edu]

Leslie A. Braby, Research Professor (979-862-1798); Ph.D. Oregon State University 1972; Microdosimetry, radiation biology, space radiation, radiation detection.
 [e-mail: labraby@tamu.edu]

John R. Ford, Assistant Professor (409-847-9492); Ph.D. University of Tennessee-Knoxville 1992; Radiation carcinogenesis, radiation biology. [e-mail: ford@trinity.tamu.edu]

Ian S. Hamilton, CHP, Assistant Professor (979-845-8101); Ph.D. Texas A&M University 1995; Radiation detection and measurement, radiological assessment, radiation biology, and applied health physics. [e-mail: hamilton@cedar.tamu.edu]

Warren D. Reece, Associate Professor of Nuclear Engineering and Director, Nuclear Science Center (979-847-8946); Ph.D. Georgia Institute of Technology 1988; Radiation transport, assessment of effective dose equivalent, medical applications for radionuclides.
 [e-mail: reece@cedar.tamu.edu]

TEXAS A&M UNIVERSITY (continued)

Other Faculty:

William H. Marlow, Professor of Nuclear

James C. Rock, PE, CIH, Senior Lecturer of Industrial Hygiene

John P. Wagner, Associate Professor of Safety Engineering

Other Information:

The Department of Nuclear Engineering also offers M.S. degrees in both Industrial Hygiene and Safety Engineering. Texas A&M is an approved site for the DOE Nuclear Engineering & Health Physics Fellowship, the DOE Applied Health Physics Fellowship and the NANT Health Physics Fellowship.

Visiting Faculty Financial Assistance:

Faculty wishing to spend sabbatical leave at Texas A&M are welcome. Financial arrangements are negotiated on an individual basis but may encompass half-time to full support for the academic year. The Department has a long history of such arrangements with several national laboratories as well as some foreign institutions.

Student Financial Assistance Programs:

Scholarships, fellowships and assistantships are available through the Department, the College and the University. All applications for our graduate program are automatically considered for financial aid. The Department is an approved site for the DOE Applied Health Physics Fellowship, the DOE Nuclear Engineering and Health Physics Fellowship, and the NANT Health Physics Fellowship.

Research Facilities

1 MW TRIGA research reactor, 5 W AGN-201M training reactor, 5 accelerators, Microbeam Facility, Nuclear Counting Laboratory, Radon Laboratory, Thermoluminescence Dosimetry Laboratory, Nuclear Spectroscopy Laboratory, Liquid Scintillation Counting Laboratory, Environmental Measurements Laboratory, Radiochemistry Laboratory, two Radiation biology laboratories, and a Pulsed-Power Plasma Physics and Neutron Science Center. A \$10,000,000 state-of-the art food irradiation facility is under construction and will be on-line in early Spring 2002.

Professional Certification:

The B.S., M.S. and Ph.D. programs in health physics prepare the student for Parts I&II of the certification examination administered by the American Board of Health Physics. Further eligibility for Part II of the examination is based on professional experience and achievement.

In addition, the B.S. degree in Radiological Health Engineering is accredited by ABET. Students completing this degree are eligible for examinations leading to a Professional Engineer license.

17. TEXAS STATE TECHNICAL COLLEGE WACO
 Environmental Health & Safety Technology/Health Physics Specialization
 Telephone: (254) 867-4877 / Fax: (254) 867-3381

Program Director:

David Day
 Environmental Health & Safety Technology
 3801 Campus Drive
 Waco, Texas 76705

HP Degrees Granted:

Associate of Applied Science in EHS with a Health Physics Specialization

Remote Delivery of Course: None

AAS

HP Enrollment (Fall 2001):	0
HP Graduates (9/00 to 8/01):	0
HP Graduates (9/99 to 8/00):	1

Health Physics Faculty: (>25% FTE toward the HP program)

Linda K. Morris, Radiation Safety Officer and Instructor (254-867-2952); M.S. Biophysics (Health Physics) Texas A&M University 1971. [email: lmorris@tstc.edu]

Other Information:

Health physics is a specialization under the umbrella of the Environmental Health & Safety Technology program. Students receive basic training in all aspects of safety (safety compliance, environmental compliance, and health physics), but can then specialize in one of the three areas. Even though there are no students majoring in the Health Physics specialization at present, interest in the field remains high, and the Student Branch - HPS is very active. A number of students elect to take HP courses to supplement their safety or environmental training.

18. UNIVERSITY OF CINCINNATI

Department of Mechanical, Industrial & Nuclear Engineering
Telephone: (513) 556-2003 / Fax: (513) 556-3390

Program Director:

Henry B. Spitz
Department of Mechanical, Industrial & Nuclear Engineering
University of Cincinnati
598 Rhodes Hall
Cincinnati, Ohio 45221-0072
Tel: (513) 556-2003
e-mail: henry.spitz@uc.edu

DP Degrees Granted:

M. S. in Health Physics
M. S. & Ph. D. in Nuclear Engineering
M. S. & Ph. D. in Radiological Engineering
M. S. & Ph. D. in Medical Physics

Remote Delivery of Course: Available to matriculated students only.

	MS	PhD
HP Enrollment (Fall 2001)	10	2
HP Graduates (9/97 – 8/98)	3	1
HP Graduates (9/98 – 8/99)	4	1

Health Physics Faculty: (25% FTE toward HP Program)

Henry Spitz, Professor and Graduate Studies Director (513-556-2003); Ph. D., New York University, 1978: Internal radiation dosimetry, bioassay and *in vivo* measurements, calibration phantoms, tissue substitutes, radiation detection & measurement, environmental radioactivity.
[email: henry.spitz@uc.edu]

John Christenson, Professor and Nuclear & Radiological Engineering Program Director (513-556-2003); Ph.D., University of Wisconsin 1970: Nuclear reactor kinetics and system dynamics, probabilistic determination of reactor operability rules, optimal control of nuclear reactors.
[email: john.christenson@uc.edu]

Bingjing Su, Assistant Professor; Ph. D., University of California, Los Angeles, 1995: Radiation transport in various media, medical imaging, Monte Carlo simulations. [email: bingjing.su@uc.edu]

Leroy Eckart, Professor & Associate Dean (513-556-2739); Ph. D., University of Cincinnati, 1971: Radiological Engineering, risk assessment, pathway analysis, nuclear waste management.
[email: roy.eckart@uc.edu]

UNIVERSITY OF CINCINNATI (Continued)

Howard Elson, Clinical Professor, Ph. D., University of Cincinnati, 1980: Medical physics, radiation oncology, [email: elsonhr@healthall.com]

Shoaib Usman, Research Professor, Ph.D. University of Cincinnati 1997: Nuclear Physics, turbulent diffusion. [shoaib.usman@uc.edu]

Other Faculty

James Neton, Ph. D., CHP, Adjunct Assistant Professor

Raymond Wood, Ph.D., Adjunct Assistant Professor

Eugene Rutz, M.S., Research Assistant Professor

Timothy Taulbee, M. S., Adjunct Assistant Professor,

Other Information:

The Health Physics Program is part of a comprehensive academic program in Nuclear and Radiological Engineering in the College of Engineering at the University of Cincinnati. Although Nuclear and Radiological Engineering is located in the Department of Mechanical, Industrial and Nuclear Engineering, collaborations in academic and research activities with the Department of Environmental Health in the College of Medicine, the Radiology Department in the College of Medicine, and Civil and Environmental Engineering in the College of Engineering are typically arranged to provide students with the greatest possible range of experience. The Health Physics Program actively participates in the health and Environmental Risk Institute which involves multi-disciplinary research in risk assessment, risk communication, environmental analysis, exposure assessment, and risk management. The Institute involves faculty from the Colleges of Engineering, Medicine, Art & Science, Law, Design, Arts, Architecture and Planning.

Visiting Faculty Financial Assistance

Arrangements for visiting faculty working on collaborative research and academic programs are arranged on an individual basis depending upon available funding.

Student Financial Assistance:

Many types of financial assistance are available to full-time students enrolled in the Nuclear and Radiological Engineering Program. Qualifying graduate students in the College of Engineering may receive a University Graduate Scholarship (UGS) which covers tuition for the academic year and the summer quarters. University Graduate Assistantships (UGA) are also available which, in addition to tuition and fees, provides the student with a stipend during the regular academic year. Research Assistantships (RA) are often available for students to participate in externally-funded research which may serve as thesis or project research topics. Graduate awards supported by University funds are subject to specific guidelines and requirements. All students accepted for entrance into the graduate program can be considered for financial assistance. The Nuclear and Radiological Engineering program also has some restricted fellowships which are limited to U.S. citizens. The faculty makes initial decisions on financial awards starting in February of each year. Academic excellence is the major criterion for these awards, but additional information submitted with the application is also considered.

UNIVERSITY OF CINCINNATI (Continued)

The Nuclear and Radiological Engineering Program also has a few fellowships that are restricted to students having U. S. citizenship. Graduate awards supported by University funds are subject to specific guidelines and requirements. Any student who has been accepted for entrance into the graduate program can be considered for financial assistance. The Nuclear and Radiological Engineering Faculty make initial decisions on such assistance, usually in March of each year. Academic excellence is the major criterion for these awards, but additional information submitted with the application, such as reports or publications, and reference letters are also considered.

Research Facilities:

The Nuclear and Radiological Engineering Program at the University of Cincinnati has an elaborate arrangement of research and academic facilities, including laboratories for radiochemistry. A kilocurie ⁶⁰Co pool irradiator, a wide variety of laboratory and portable radiation detection instrumentation, alpha and gamma spectrometers, and sample preparation facilities. In addition, the health Physics Program operates a state of the art whole body counter laboratory with two large shielded rooms containing multiple detector arrays for performing *in vivo* measurements of internally deposited radioactive materials. The laboratory specializes in the design and fabrication of anthropometric calibration phantoms containing tissue substitutes for human muscle and bone. The program also has excellent computer facilities for performing mathematical simulations using Monte Carlo analysis, modeling and computational analysis. The Nuclear and Radiological Engineering Program is also a participant in the University of Cincinnati health and Environmental Risk Institute, a multidisciplinary research institute involved with environmental analysis, exposure assessment, human health risk assessment, risk communication, and risk management.

19. UNIVERSITY OF FLORIDA

Department of Nuclear and Radiological Engineering

Telephone: (352) 392-1401 / Fax: (352) 392-3380

Program Director:

Dr. Wesley E. Bolch, PhD. PE, CHP

Department of Nuclear and Radiological Engineering

202 Nuclear Sciences Center

University of Florida

Gainesville, Florida 32611

Tel: 352-846-1361**email:** wbolch@ufl.edu**HP Degrees Granted:**

M.S. / M.E. in Nuclear Engineering Sciences (Health Physics)

Ph.D. in Nuclear Engineering Sciences (Health Physics)

Remote Delivery of Course: None

	MS/ME	PhD
HP Enrollment (Fall 2001):	3	5
HP Graduates (9/00 to 8/01):	5	3
HP Graduates (9/99 to 8/00):	3	3

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Samim Anghaie, Professor of Nuclear and Radiological Engineering, (352-393-1401, Ext 307); Ph.D. Pennsylvania State University 1982: Thermal hydraulics, advanced reactors, nuclear power and propulsion, inverse radiation transport. [anghaie@ufl.edu]

Wesley E. Bolch, PE, CHP, Professor of Nuclear and Radiological Engineering, (352-846-1361); PhD University of Florida 1988, External and internal radiation dosimetry, medical health physics, nuclear medicine dosimetry, NMR microscopy of trabecular bone for 3D skeletal dosimetry modeling, tomographic computational models for pediatric organ dosimetry, probabilistic internal dosimetry models for dose reconstruction efforts, microdosimetry, radiation effects to DNA.
[email: wbolch@ufl.edu]

W. Emmett Bolch, Jr., PE, Professor and Associate Chairman of Environmental Engineering (352-392-5074); Ph.D. University of California at Berkeley 1967, Environmental surveillance for radioactivity, radioactive waste treatment, radiochemistry, analysis of radioactivity, remedial actions, radon. [email: ebolch@ufl.edu]

G. Ronald Dalton, Professor of Nuclear and Radiological Engineering (352-392-1401, Ext. 323); Ph.D, University of Michigan 1960: Transport theory, numerical analysis, reactor analysis, computer graphics. [dalton@ufl.edu]

UNIVERSITY OF FLORIDA (Continued)

Edward T. Dugan, Associate Professor of Nuclear and Radiological Engineering (352-392-1401, Ext 309); Ph.D University of Florida 1976: thermal, neutronic, and control system analysis of nuclear reactors, including space power concepts. [edugan@ufl.edu]

David R. Gilland, Associate Professor of Nuclear and Radiological engineering (352-392-1401, Ext 310); Ph.D University of North Carolina at chapel Hill 1984; SPECT imaging systems, nuclear medicine, medical physics, biomedical engineering. [gilland@ufl.edu]

Alireza Haghghat, Chair and Professor of Nuclear and Radiological Engineering (352-392-1401, Ext 306); Ph.D. University of Washington 1986: Particle transport theory methods and their application to nuclear systems, parallel computing and visualization, automated variance reduction methods and their applications, multi-group cross-section generation methods, perturbation and sensitivity studies in particle transport. [haghghat@ufl.edu]

David E. Hintenlang, Associate Professor of Nuclear and Radiological Engineering (352-392-311); Ph.D. Brown University 1985: Clinical applications of radiation imaging and dosimetry, specifically for mammography and pediatric radiology.[dhinten@ufl.edu]

Alan M. Jacobs, Professor of Nuclear and Radiological Engineering (352-392-1401, Ext 312); Ph.D Pennsylvania State University 1963: Mathematical analysis and diagnostic applications of radiation transport in matter, especially in nuclear reactor systems, medical and industrial radiographic imaging. [jacobs@ufl.edu]

James S. Tulenko, professor of Nuclear and Radiological Engineering (352-392-1401, Ext 314); MS Massachusetts Institute of Technology 1963: Nuclear fuel cycle, radioactive wastes, reactor analysis, engineering applications of radioisotopes, robotics, intelligent data bases, systems analysis. [tulenko@ufl.edu]

William G. Vernetson, Associate Engineer, Director of Nuclear Facilities (352-392-1401), Ext 317; Ph.D University of Florida 1979: Reactor safety and risk assessment, technology and design, reactor operations and training in the nuclear industry, heat and mass transfer in reactor systems, radiation safety, neutron activation analysis and health physics. [vernet@ufl.edu]

Affiliate and Other Faculty:

Manuel Arreola, Assistant Professor, Department of Radiology, Chief of Radiological Physics, UF Shands Hospital (352-265-0293, Ext 45217) [arreolam@xray.ufl.edu]

Frank J. Bova, Professor, Department of Neurosurgery (352-392-4331) [bova@neurosurgery.ufl.edu]

Libby Brateman, Associate Professor, Department of Radiology (352-265-0291, Ext 44357) [brateman@xray.ufl.edu]

Richard Briggs, Associate Professor, Department of Radiology (352-392-2571, Ext 22571) [rbriggs@ufl.edu]

Jim Dempsey, Assistant Professor, Department of Radiation Oncology (352-395-0316) [dempsey@ufl.edu]

Siyong Kim, Assistant Professor, Department of Radiation Oncology (352-395-0136, Ext 87728) [kims@ufl.edu]

UNIVERSITY OF FLORIDA (Continued)

Jatinder R. Palta, Professor, Department of Radiation Oncology, Chief of Therapy Physics, UF Shands Cancer Center (352-395-8217, Ext 87823) [paltajr@ufl.edu]

William S. Properzio, Associate Professor, Department of Environmental Engineering, Director of Environmental Health & Safety Division (352-392-1590) [bill@ehs.ufl.edu]

Shailendra S. Shukla, Research Assistant Professor, Department of Radiology (352-376-1611, Ext 6514) [shuklas@xray.ufl.edu]

Chang-Yu- Wu, Assistant professor, Department of Environmental Engineering Sciences (352-392-0845) [cywu@ufl.edu]

Other Information

The Health Physics Program at the University of Florida is a cooperative effort of the Departments of Nuclear Engineering Sciences (NES) and Environmental Engineering Sciences (NES). Students enrolled in the Health Physics Program within NES may choose to concentrate their Master's studies in one of three areas: (1) power generation health physics, (2) radioactive waste management, or (3) medical health physics. The department also offers graduate degrees in nuclear engineering physics, and medical physics. The College of engineering also offers graduate degrees in Biomedical Engineering. The University of Florida is an approved site for U.S. Department of Energy fellowships. In addition, the department awards at least one National Academy of Nuclear Training Fellowship in health physics per year.

Visiting Faculty Financial Assistance:

The department occasionally hosts sabbatical leave for visiting faculty. Financial arrangements are negotiated on an individual basis.

Student Financial Assistance:

Scholarships, fellowships, and assistantships are available through the Department, the College, and the University. The Department is an approved site for the DOE Applied Health Physics Fellowships, the DOE Nuclear Engineering and Health Physics Fellowships, and the INPO Health Physics Fellowship.

Research Facilities:

Facilities associated with the NRE Department: University Florida Training Reactor, Neutron Activation Analysis Laboratory, Nuclear Detection Teaching Laboratory with four LabVIEW detection workstations, Digital Computation Facility, Hot Cell Facility, TLD Processing Laboratory, Robotics and Virtual Reality Laboratory, Dosimetry Phantom Development Laboratory, Non-Destructive Testing Facility, X-Ray Exposure Facility, Land-Mine Detection Facility, Innovative Space Nuclear Power Institute, Neutron Howitzer. Other on-campus facilities include: Shands Cancer Center, Shands Teaching Hospital, Radioneurosurgery Facility, UF Brain Institute, VA Hospital, Center for Structural Biology (NMR imaging and electron microscopy).

Professional Certification:

The M.S. and Ph.D. programs in health physics prepare the student for Part I of the certification examination administered by the American Board of Health Physics. Eligibility of Part II of examination is based on professional experience.

20. UNIVERSITY OF KENTUCKY

Program in Radiation Science, Division of Radiation Sciences,
College of Allied Health Professions
Telephone: (859) 323-1100 ext. 248 / Fax: (859) 257-1816

Program Director:

Dr. Ralph C. Christensen
Room 207 CAHP Building
University of Kentucky Medical Center
Lexington, Kentucky 40536-0003
Tel: (859)-323-1100 ext. 248
e-mail: rcchri1@uky.edu

HP Degrees Granted:

M.S. in Health Physics (medical health physics emphasis)
M.S. in Radiological Medical Physics (therapy medical physics emphasis)

Remote Delivery of Course: None

	MS
HP Enrollment (Fall 2001):	0
HP Graduates (9/00 to 8/01):	0
HP Graduates (9/99 to 8/00):	0
RMP Enrollment (Fall 2001):	10
RMP Graduates (9/00 to 8/01):	7

Health Physics Faculty: ($\geq 25\%$ FTE toward the Radiation Science program)

Ralph Christensen, Ph.D., Associate Professor and Director, Division of Radiation Sciences (606-323-1100, Ext. 248); Ph.D. University of California at Berkeley 1971; (radiation biophysics); Dosimetry, manpower issues, education and training quality.

Other Faculty:

Robert Zwicker, Ph.D., Professor of Radiation Medicine
Ali Soleimani-Meigooni, Associate Professor of Radiation Medicine
Guy Simmons, Professor of Radiation Medicine

Other Information:

We offer a program in Radiation Science with two possible degree options: one in Health Physics and one in Radiological Medical Physics. M.S. in Health Physics: specialization areas are medical health physics and general health physics. M.S. in Radiological Medical Physics: Specialization area is therapy medical physics.

21. UNIVERSITY OF MASSACHUSETTS LOWELL

Physics Department/Radiological Sciences Program

Telephone: (978) 934-3286 / Fax: (978) 441-0934

Program Director:

Dr. Clayton S. French

Radiological Sciences Program

University of Massachusetts Lowell

1 University Avenue

Lowell, Massachusetts 01854

HP Degrees Granted:

B.S. in Physics /Radiological Health Physics Option

M.S. in Radiological Sciences and Protection

Ph.D. in Physics/Radiological Sciences Option

Remote Delivery of Course: None

	BS	MS	PhD
HP Enrollment (Fall 2001):	6	12	17
HP Graduates (9/00 to 8/01):	1	7	1
HP Graduates (9/99 to 8/00):	0	5	2

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)**George E. Chabot, CHP**, Professor Emeritus of Radiological Sciences (978-934-3286); Ph.D. University of Lowell 1985: Shielding, dosimetry, radiochemistry.

[George_Chabot@uml.edu]

Jesse Y. Harris, Professor Emeritus of Radiological Sciences, (978-934-3286); Ph.D. Rutgers University 1968: Radiation biology, environmental radiation, environmental impact evaluation.**Clayton S. French, CHP**, Professor of Radiological Sciences (978-934-3286); Ph.D. University of Lowell 1985: Health physics, mathematical modeling and internal dosimetry, computer applications.

[Clayton_French@uml.edu]

Kenneth W. Skrable, CHP, Professor Emeritus of Radiological Sciences (978-934-3286); Ph.D. Rutgers the State University 1969: Health physics, internal dose, external dose. [SkrableKW@aol.com]**Mark A. Tries**, Assistant Professor of Radiological Science (978-934-3353); Ph.D. University of Massachusetts Lowell 2000: Health physics, external dosimetry, nuclear instrumentation, radiochemistry.

[Mark_Tries@uml.edu]

UNIVERSITY OF MASSACHUSETTS LOWELL (Continued)

Other Faculty:

Gus. P. Couchell, Professor of Physics, Nuclear Physics Program.

Walter A. Schier, Professor of Physics, Nuclear Physics Program.

Arthur Mittler, Professor of Physics, Nuclear Physics Program.

Gunther H. R. Kegel, Professor of Physics, Nuclear Physics Program.

Other Information:

All of the academic programs are strongly based in the physical and biological sciences. A five-year BS/MS degree option is available. Graduate students can receive support under DOE, INPO, NRC, and industry-based research fellowships. A limited number of teaching assistantships are available to qualified students. Scholarships are available to undergraduates. All students are given opportunities for gaining applied work experience through internships at the UML Nuclear Center, hospitals, nuclear power stations, and other participating organizations.

Visiting Faculty Financial Assistance:

UMass Lowell has no in-place program for supporting visiting faculty. UMass Lowell considers requests for visiting faculty on a case by case basis and may provide financial support or matching funding under certain circumstances.

Student Financial Assistance:

UMass Lowell offers a wide variety of financial assistance including scholarships, fellowships, student teaching assistantships, student research assistantships, and work study programs.

Research Facilities:

UMass Lowell has a 1-MW Research Reactor, 5-MW Van De Graaff Accelerator, radiochemistry and radiobiology laboratories, nuclear instrumentation laboratory, environmental radioactivity measurement laboratories, operational health physics laboratory, dosimetry laboratory, X-ray facility, and computer room dedicated to the Radiological Sciences Program. Off-campus research venues are available at nearby hospitals, radiopharmaceutical production facility, power reactor utility companies, universities, and engineering companies.

Professional Certification:

Students in Radiological Sciences are encouraged to obtain ABHP certification. In addition to offering an elective graduate course in ABHP Certification Preparation, M.S. degree candidates can opt to take Part I of the ABHP as an alternative to the comprehensive examination required for students who choose to complete a 3-credit research project rather than a 9-credit thesis.

22. UNIVERSITY OF MICHIGAN

Department of Nuclear Engineering & Radiological Sciences

Telephone: (734) 764-4260 / Fax: (734) 763-4540

Program Director:

Professor Kim Kearfott

University of Michigan

Department of Nuclear Engineering & Radiological Sciences

2355 Bonisteel Blvd., Rm. 1906 Cooley Bldg.

Ann Arbor, Michigan 48109-2104

Tel: (734) 763-9117**e-mail:** kearfott@umich.edu**website:** ners.engin.umich.edu**Admissions:** Peggy Jo Kramer [pjgramer@umich.edu]**HP Degrees Granted:**

B.S.E. in Nuclear Engineering (Radiological Sciences Option)

M.S.E. or M.S. in Nuclear Engineering & Radiological Sciences (Radiation Safety, Environmental Sciences, and Medical Physics Option)

Ph.D. in Nuclear Engineering & Radiological Sciences (Radiation Safety, Environmental Sciences, and Medical Physics Option)

Ph.D. in Nuclear Engineering & Radiological Sciences (Radiation Safety, Environmental Sciences, and Medical Physics Option or the Radiation Measurements and Imaging Option))

Remote Delivery of Course: None.

	BS	MS	PhD
HP Enrollment (Fall 2001):	8	1	18
HP Graduates (9/00 to 8/01):	3	1	2
HP Graduates (9/99 to 8/00):	2	2	1

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Kimberlee J. Kearfott, CHP, Professor of Nuclear Engineering & Radiological Sciences (734-763-9117); Sc.D Massachusetts Institute of Technology 1980; Radiation imaging, radiation detection, internal and external radiation dosimetry, radon gas detection and mitigation, applied health physics medical physics imaging, medical health physics. [kearfott@engin.umich.edu]

Alex Bielajew, Professor of Nuclear Engineering and Radiological Sciences (734-764-6364); Ph.D. Stanford 1982; Analytic and numerical methods for electron and photon transport processes and their application in radiation dosimetry and radiotherapy cancer treatment [bielajew@engin.umich.edu]

Rodney C. Ewing, Professor of Nuclear Engineering and Radiological Sciences (734-764-8529); Ph.D. Stanford 1974; Radioactive waste management, geology, materials. [rodewing@engin.umich.edu]

UNIVERSITY OF MICHIGAN (Continued)

Mitchell Goodsitt, Adjunct Professor of Nuclear engineering & Radiological Sciences (734-764-4260); Ph.D University of Wisconsin 1982; Reviewer of Medical Physics, Radiology, Academic Radiology, Radiographs, and IEEE Transactions on Information Technology in Biomedicine; AAPM Task Force Group: Image Intensifier.

Zhong He, Assistant Professor of Nuclear Engineering and Radiological Sciences (734-764-7130); Ph.D. Southampton 1993; Radiation detection, radiation imaging. [hezhong@engin.umich.edu]

James P. Holloway, Assistant Professor of Nuclear Engineering & Radiological Sciences (734-936-3126), Ph.D. University of Virginia 1989; Mathematical modeling and analysis, numerical methods, radiation transport and shielding, nuclear reactor physics. [hagar@engin.umich.edu]

David K. Wehe, Associate Professor of Nuclear Engineering and Radiological Sciences; Director, Michigan Memorial Phoenix Project (734-763-115); Ph.D. University of Michigan 1984; Radiation detection, radiation imaging. [dkw@engin.umich.edu]

Supporting Faculty:

A. Ziya Akcasu, Professor Emeritus of Nuclear Engineering

Michael Atzmon, Associate Professor of Nuclear Engineering & Radiological Sciences

James J. Duderstadt, Professor of Nuclear Engineering & University Professor Sciences and Engineering

Ronald M. Gilgenbach, Professor of Nuclear Engineering & Radiological Sciences

Terry Kammash, Stephan S. Attwood Professor of Engineering and Radiological Sciences

William Kerr, Professor Emeritus of Nuclear Engineering

John S. King, Professor Emeritus of Nuclear Engineering

Glenn F. Knoll, Professor Emeritus of Nuclear Engineering and Radiological Sciences

Edward W. Larsen, Professor of Nuclear Engineering and Radiological Sciences

Y. Y. Lau, Professor of Nuclear Engineering & Radiological Sciences

John C. Lee, Professor of Nuclear Engineering, Chair of the Department of Nuclear Engineering and Radiological Sciences

James E. Martin, CHP, Professor of Radiological Health.

William R. Martin, Professor of Nuclear Engineering and Radiological Sciences

Donald P. Umstadter, Associate Professor of Nuclear Engineering & Radiological Sciences

Dietrich H. Vincent, Professor Emeritus of Nuclear Engineering

Gary S. Was, Associate Dean for Research in the College of engineering, professor of Nuclear Engineering and Radiological Sciences

Adjunct Faculty

Mary L. Brake, Adjunct Associate Professor of Nuclear Engineering

Michael J. Flynn, Adjunct Professor of Nuclear Science

Roger Stoller, Adjunct Professor in Nuclear Engineering and Radiological Sciences

Randall Ten Haken, Adjunct Professor of Nuclear Engineering and Radiological Sciences

23. UNIVERSITY OF MISSOURI-COLUMBIA

Nuclear Engineering Program

Telephone: (573) 882-3550 / Fax: (573) 884-4801

Program Director:

Dr. William H. Miller
 Nuclear Engineering Program
 E2433 Engineering Building East
 University of Missouri-Columbia
 Columbia, Missouri 65211
email: millerw@Missouri.edu

HP Degrees Granted:

M.S. in Nuclear Engineering (Health Physics Option)
 Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Course: Partial MS and PhD curricula

	MS	PhD
HP Enrollment (Fall 2001):	5	3
HP Graduates (9/00 to 8/01):	2	0
HP Graduates (9/99 to 8/00):	1	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

William H. Miller, PE, Chairman and Professor of Nuclear Engineering (573-882-9692); Ph.D. University of Missouri 1976: Radiation detection and instrumentation, health physics applications. [millerw@missouri.edu]

Tushar Ghosh, Director of Graduate Studies and Assistant Professor of Nuclear Engineering (573-882-9736); Ph.D. Oklahoma State University 1989: Mass transfer in absorption processes- experimental and theoretical investigation, absorption phenomena (particularly radon) in biological systems, kinetics and reaction mechanisms of catalytic reactions, activation of coals, indoor air quality. [ghosht@missouri.edu]

Sudarshan K. Loyalka, PE, Curators' Professor, Professor of Nuclear Engineering and Director of Particulate Systems Research Center (573-882-3568); Ph.D. Stanford University 1967; Kinetic theory of gases, neutron transport, mechanics of aerosols including radon progeny, physics and thermal hydraulics of nuclear reactors, reactor safety analysis. [loyalkas@missouri.edu]

Robert V. Tompson, Assistant Professor of Nuclear Engineering (573-882-2881); Ph.D. University of Missouri 1988: Kinetic theory of gases, experimental and theoretical aerosol mechanics, neutron transport theory, nuclear reactor physics and safety. [email: tompsonr@ missouri.edu]

UNIVERSITY OF MISSOURI-COLUMBIA (Continued)

Other Faculty:

Evan Boote, Adjunct Assistant Professor of Nuclear Engineering, Assistant Professor of Radiology.

Julie Dawson, Adjunct Assistant Professor of Nuclear Engineering, ABR.

Gary Ehrhardt, Adjunct Assistant Professor of Nuclear Engineering, Research Reactor.

Michael Glascock, Adjunct Assistant Professor of Nuclear Engineering, Research Reactor.

Kiratadas Kutikkad, Adjunct Assistant Professor of Nuclear Engineering, Research Reactor.

Mark A. Prelas, PE, Professor of Nuclear Engineering.

Wynn A. Volkert, Professor of Radiology and Nuclear Engineering.

Other Information:

Participating university for the DOE Applied Health Physics Fellowship Program. Affiliated closely with the Research Reactor (10 MWth) and its 100+ employees as engaged in research, isotope production, radiation services, and radioactivity shipment.

24. UNIVERSITY OF MISSOURI-ROLLA

Department of Nuclear Engineering

Telephone: (314) 341-4720 / Fax: (314) 341-6309

Program Director:

Dr. Arvind Kumar
 102 Fulton Hall
 University of Missouri-Rolla
 Rolla, Missouri 65401
Tel: (314) 341-4747

HP Degrees Granted:

B.S. in Nuclear Engineering (Health Physics Option)
 M.S. in Nuclear Engineering (Health Physics Option)
 Ph.D. in Nuclear Engineering (Health Physics Option)

Remote Delivery of Course: Selected courses in the BS program

HP Enrollment (Fall 2001): BS 1, MS 0, PhD 0

HP Graduates (9/00 to 8/01): None

HP Graduates (9/99 to 8/00): BS 1

	BS	MS	PhD
HP Enrollment (Fall 2001):	1	0	0
HP Graduates (9/00 to 8/01):	0	0	0
HP Graduates (9/99 to 8/00):	1	0	0

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Nicholas Tsoulfanidis, Professor of Nuclear Engineering, Radiation Safety Officer, Associate Dean of The School of Mines and Metallurgy (314-341-4745); Ph.D. University of Illinois 1968: Radiation transport, radiation dose calculations, radiation protection (health physics and shielding).
 [email: tsoul@umr.edu]

Research Facilities:

A 200-kW nuclear research reactor, state-of-the-art radiation counting equipment.

Student Financial Assistance:

Assistantships and fellowships are available.

25. UNIVERSITY OF NEVADA LAS VEGAS

Department of Health Physics

Telephone: (702) 895-4320 / Fax: (702) 895-4819

Chair:

Dr. Mark Rudin

Box 453037

4505 Maryland Parkway

Las Vegas, Nevada 89154-3037

email: mrudin@ccmail.nevada.edu

HP Degrees Granted:

B.S. in Health Physics

M.S. in Health Physics

Remote Delivery of Course: None

	BS	MS
HP Enrollment (Fall 2001):	10	12
HP Graduates (9/00 to 8/01):	1	3
HP Graduates (9/99 to 8/00):	2	1

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Mark J. Rudin, Chair, Department of Health Physics (702-895-4320); Ph.D Purdue University 1989: Environmental restoration, waste management, risk analysis. [mrudin @ccmail.nevada.edu]

William H. Johnson, Ph.D Georgia Institute of Technology 1996; Environmental monitoring, environmental radiation, environmental restoration. [wjohnson@ccmail.nevada.edu]

Steen Madsen, Ph.D McMaster University (Canada) 1992: Applied nuclear physics, laser in therapeutic and diagnostic medicine. [steenm@ccmail.nevada.edu]

Other information:

A M.S. degree in Health Physics was established in 1996. The Department includes undergraduate programs in nuclear medicine and comprehensive medical imaging. The B.S. in the Health Physics program offers a 3+2 year dual degree program with Fort Valley State University in Fort Valley, Georgia. Students receive B.S. degrees in health physics and in biology, chemistry, or mathematics.

26. UNIVERSITY OF PITTSBURGH
 Environmental and Occupational Health
 Telephone: (412) 967-6500 / Fax: (412) 624-1020

Program Director:

Vacancy

Acting Director:

Nigel Wald, M.D.
 A-744 Crabtree hall
 Graduate School of Public Health
 University of Pittsburgh
 Pittsburgh, PA 15261

HP Degrees Granted:

M.S. in Environmental and Occupational Health
 Post-M.S. Certification in Radiation Health
 Ph.D. in Environmental and Occupational Health
 Post-Doctoral Fellowship in the Radiation Sciences (Two-year program)

Remote Delivery of Course: None

	MS	PhD	Post-Doctoral Fellows (Radiation Sciences)
HP Enrollment (Fall 2001):	2	0	3
HP Graduates (9/00 to 8/01):	2	0	6
HP Graduates (9/99 to 8/00):	0	0	6

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

Niel Wald, Professor of Environmental and Occupational Health Professor of Radiology (School of medicine) (412-624-2735); M.D. New York University 1948: Chromosome damage from radiation and other environmental mutagens, automated cytogenetic dosimetry, clinical management of radiation injury, radiation epidemiology. [wald@pitt.edu]

Jerry C. Rosen, CHP, Associate Professor of Environmental and Occupational Health, University Radiation Safety Officer (412-624-2728); M.S. University of Rochester 1965: Internal dosimetry, environmental radiation measurements, radiation doses. [rosen@radsafe.pitt.edu]

UNIVERSITY OF PITTSBURGH (Continued)

Other Faculty:

William L. Bigbee, Associate Professor of Environmental and Occupational Health and Co-Leader, Molecular Carcinogenesis Program, University of Pittsburgh Cancer Institute; Ph.D University of Oregon 1975: Biochemistry and molecular epidemiology. [wlbigbee@pitt.edu]

Bernard L. Cohen, Professor Emeritus of Physics and Adjunct Professor of Environmental and Occupational Health (412-624-92450; D.Sc. Carnegie Mellon University 1950: Radon measurement and assessments, radiation and hazardous waste risk analysis.

Walter F. Good, Adjunct Associate Professor of Environmental and Occupational Health, Associate Professor of Radiology (School of Medicine).

Chris Shaw, Professor of Environmental and Occupational Health, Associate Professor of Radiology (School of Medicine).

Visiting Faculty Financial Assistance:

No formal mechanism is in place. Opportunities to collaborate on specific projects arise occasionally.

Student Financial Assistance:

Approved DOE Applied Health Physics Fellowship site. Applicants may be considered for graduate assistantships.

Research Facilities:

The program is housed in a large laboratory research building that includes radiation laboratories, cytogenetics, biochemistry, molecular biology, and computer laboratories. Access to whole-body counting, high-dose radiation facilities, and research in radiation imaging is possible depending on the research interests of the student.

27. THE UNIVERSITY OF TENNESSEE

Department of Nuclear Engineering

Telephone: (865) 974-5048 / Fax: (865) 974-0668

Program Director:

Dr. H.L. Dodds

Department of Nuclear Engineering

The University of Tennessee

Knoxville, Tennessee 37996-2300

email: hdj@utk.edu

HP Degrees Granted:

B.S. in Nuclear Engineering (concentration in Radiological Engineering)

M.S. in Nuclear Engineering (concentration in Radiological Engineering)

Ph.D. in Nuclear Engineering (concentration in Radiological Engineering)

Remote Delivery of Course: None

	BS	MS	PhD
HP Enrollment (Fall 2001):	5	4	7
HP Graduates (9/00 to 8/01):	0	1	1
HP Graduates (9/99 to 8/00):	0	3	2

Health Physics Faculty: ($\geq 25\%$ FTE toward the HP program)

P.G. Groer, Associate Professor of Nuclear Engineering (865-974-5048); Ph.D. Vienna 1967: Radiation risk analysis, radiation dosimetry (external and internal), Bayesian estimation techniques, reliability and probabilistic risk assessment. [groer@utk.edu]

L.F. Miller, Professor of Nuclear Engineering (865-974-5048); Ph.D. Texas A&M University 1976: Radiological assessments, radiation dosimetry, nuclear instrumentation, neural networks, computational methods. [lfmiller@utk.edu]

R. E. Pevey, Associate Professor of Nuclear Engineering (423-974-5048); Ph.D. Tennessee, P.E.; Shielding and radiation transport, reactor physics, thermal hydraulics, and computer methods. [email: rpevey@utk.edu]

L.W. Townsend, Robert M. Condra Professor of Nuclear Engineering (865-974-5048); Ph.D. Idaho: Theoretical nuclear, atomic, and molecular physics; radiation physics; transport theory; gas kinetic theory; space shielding. [email: ltownsen@utk.edu]

Other Faculty:**Keith Eckerman**, Adjunct Professor of Nuclear Engineering**Paul Frame, CHP**, Adjunct Professor of Nuclear Engineering**Gloria Mei**, Adjunct Professor of Nuclear Engineering**Adrian Oliver**, Adjunct Associate Professor of Nuclear Engineering**David Simpson, CHP**, Adjunct Professor of Nuclear Engineering**Joseph Thie**, Adjunct Professor of Nuclear Engineering**James Turner, CHP**, Adjunct Professor of Nuclear Engineering

THE UNIVERSITY OF TENNESSEE (Continued)

Other Information:

Our Adjunct Faculty is composed primarily of professionals from Oak Ridge National Laboratory or Oak Ridge Associated Universities who teach health physics courses and/or direct graduate student research.

Visiting Faculty Financial Assistance:

Office and secretarial support would be provided.

Student Financial Assistance:

Scholarships, fellowships, student teaching and research assistantships.

Research Facilities:

Nuclear instrumentation laboratory, reactor simulator, ²⁵²Cf irradiation facility, computing laboratory, natural uranium graphite-moderated subcritical assembly, natural uranium water-moderated subcritical assembly, sample assay laboratory, wet radiochemistry laboratory. Additional facilities located at ORNL are also available to us.

NEBRASKA WESLEYAN UNIVERSITY

Department of Physics and Astronomy

Telephone: (402) 465-2235 / Fax: (402) 465-2179

E-mail: physics@NebrWesleyan.edu

Program Director:

Dr. Robert W. Fairchild, CHP

Department of Physics and Astronomy

Nebraska Wesleyan University

5000 Saint Paul Avenue

Lincoln, Nebraska 68504-2796

email: rwf@NebrWesleyan.edu

Degree Granted:

B.S. and B.A. in Physics

Health Physics Faculty:

Robert W. Fairchild, CHP, Professor and Chair of Physics, (402-465-2253); Ph.D. Cornell University 1975; M.S. Colorado State University 1993; Environmental radioactivity, radiation detection systems, computer models and interfaces, electronics. [email: rwf@NebrWesleyan.edu]

David Goss, Professor of Physics, (402-465-2250) Ph.D. University of Texas-Austin 1964; Radioactivity in the environment, radon. [goss@NebrWesleyan.edu]

Other Information:

Health Physics at Nebraska Wesleyan University offers an introductory health physics course and a physics curriculum that prepares majors for graduate studies in health physics.

Student Financial Assistance:

Scholarships, fellowships, and assistantships are available through the University.

Research Facilities:

Health Physics resources associated with the Physics Department: HPGe gamma-ray spectroscopy system, high resolution alpha spectroscopy system, XRF spectroscopy system, Low Background Liquid Scintillation Counter, and other spectroscopy and dosimetry systems.

IAEA

International Atomic Energy Agency
Division of Radiation & Waste Safety
(Safety Co-ordination Section)
Department of Nuclear Safety
Wagramer Strasse 5
P.O. Box 100
A-1400 Vienna
Austria

Contact: Mr K. Mrabit, Head, Radiation Monitoring and Protection Services Section

Tel: +43 1 2600 22722 **Fax:** +43 1 2600 7 **e-mail:** k.mrabit@iaea.org

Degree Programmes Offered in Radiation Protection:

Master: ~ 60 persons per year. This number is expected to increase shortly.

Other: Specialised courses on regulatory aspects; transport safety, occupational, medical and public exposures; and emergency planning and response. No diploma is granted but certificate of attendance is provided.

Prerequisites for Participants:

The participants should have a formal education to a level equivalent to a university degree in the physical, chemical and/or life sciences or engineering and should have been selected to work in the field of radiation protection and safety of radiation sources in their countries.

Practice Specific Specialised Courses:

The participants should have a formal education equivalent to a university degree in science.

There are additional requirements based on the category of persons trained.

For health professionals (medical doctors, medical physicists) the training is provided at the post-graduate level and the prerequisite is also postgraduate university level education.

For Qualified Experts (QE) undergoing specialised training in industrial applications, waste management, monitoring services, research, emergency response etc., the requirements is they have attended the postgraduate educational course in radiation protection and safe use of radiation sources (PGEC).

For radiation protection officers (RPO) undergoing specialised training for practices like radiation protection in nuclear facilities, waste management and emergency response, completion of PGEC is a prerequisite.

For regulators also it is required that they have attended PGEC prior to taking some of the specialised training. It is expected that regulators for each practice would be as competent and qualified as QE for that practice.

The general requirements are:

1. Appropriate background and technical competence;
2. Current or near future work related to the training requested;
3. Language skills appropriate to the training course's language;
4. Suitable ages for training purposes (too senior candidates should have less priority);
5. Relation to the country action plan, or TC project activities;
6. Impact in the improvement of the area in the country;
7. Frequency of participation in IAEA training activities in the topic or in difference areas.

Faculty

The faculty is generally the IAEA staff (maximum of two), external experts (maximum of two) and lecturers from the organising centre for each specialised course. For the post graduate course, since the duration is between 8-20 weeks, the faculty may reach up to 50, including IAEA staff and external experts.

Research Areas

The radiation safety programme of the of the Agency has two statutory functions: development of a unified set of safety standards based on consensus and provision for the application of these standards through, inter alia, education and training. IAEA training activities are mainly hosted by institutions in its Member States and therefore research is pursued in such institutions.

The Agency also supports co-ordinated research in Member States in the field of radiation and waste safety.

Visiting Faculty Financial Assistance

As per the internal Guidance document: lecturer's fee, travel and other contractual matter are the responsibility of TC/expert and Training Sections of IAEA.

Students

30 per specialised training course and 20 per postgraduate education course.

Scholarships:

Nationally and Regionally sponsored.

Fellowships:

Nationally sponsored.

Research Facilities

The training courses/workshops are organised in Member States. However before finalising the training programme it is ensured by the Technical Officer that all the necessary laboratory facilities and other equipment requirement for the training event are adequate in the training centre organising the course.

Professional Certification

At the end of the training course, participants are given a certificate of successful completion.

ANNEX

**NEA SURVEY OF
UNIVERSITY-LEVEL EDUCATION PROGRAMMES
IN RADIATION PROTECTION**

**NEA SURVEY OF
UNIVERSITY-LEVEL EDUCATION PROGRAMMES
IN RADIATION PROTECTION**

In order to foster better exchange of ideas and research in radiation protection, the CRPPH is sponsoring a survey of university-level education programmes. The objective of this survey is to produce a Handbook of information useful to those students wishing to pursue an education in radiation protection, or to those faculty members wishing to exchange ideas or collaborate with, or take sabbatical leave at other universities in different countries.

The results of this survey will be summarized, by country, and will be published as an OECD Nuclear Energy Agency document, which will be updated periodically.

1. **University/College Information**

University Name:

Department Teaching Radiation Protection:

Note: If radiation protection is a minor or specialty offered by another discipline (for example, mechanical engineering, chemical engineering, physics, etc.) please specify the parent department.

Address:

.....

.....

Contact person for further information:

Name: Title:

Tel: Fax: e-mail:

2. **Degree Programmes Offered in Radiation Protection**

	Offered		Average Number of Diplomas Granted Per Year
	Yes	No	
Undergraduate Degree	<input type="checkbox"/>	<input type="checkbox"/>
Master	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>
		

3. **Curricula**

Please attach a list of curriculum required for each degree listed above. Include all prerequisites for entry into the programme (required course work, standardized entry examination with minimum acceptable scores, etc.), and graduation requirements (Preliminary Examination, Qualifying Examination, Thesis, etc.).

4. **Faculty**

Please specify the number or average number of faculty members in radiation protection, in the below-listed categories, over the past 3 years.

- Full-time Teaching/Research Faculty:
- Part-time Teaching/Research Faculty:
- Full-time Research Faculty:
- Part-time Research Faculty:
- Visiting Faculty:
- Other Faculty:

7. **Students**

Please specify the number or average number of students in radiation protection, in the below-listed categories, over the past 3 years.

	Number of full-time students	Number of part-time students
Undergraduate Level
Master's Level
Doctorate Level
Post-Doctorate Level
Other (specify):

8. **Student Financial Assistance Programmes**

Please indicate whether the following types of financial assistance are available to students:

	YES	NO
Scholarships:		
- Nationally Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Regionally Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Corporately Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Professional Society Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
Fellowships:		
- Nationally Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Regionally Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Corporately Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
- Professional Society Sponsored	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
Student Teaching Assistantships:	<input type="checkbox"/>	<input type="checkbox"/>
Student Research Assistantships:	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):	<input type="checkbox"/>	<input type="checkbox"/>

Note: For any positive responses, please attach information containing an address and phone number where detailed information can be acquired.

Contact person:

Tel:

Fax:

Degrees Granted:

Faculty:

Research Areas:

**Financial
Assistance:**

Contact person:

Tel:
e-mail:

Fax:

Degrees Granted:

Faculty:

Research Areas:

Students:

undergraduate
masters
doctorate
other

full-time

part-time

**Student financial
assistance
programmes:**

**Research
facilities:**

**Professional
Certification:**