



MEDICAL PHYSICS & HEALTH PHYSICS PROGRAM

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[Why I chose LSU for my M.S. in Medical Physics \(9/2010\)](#)



[Victory for LSU and Medical Physics](#)

WELCOME MESSAGE FROM THE PROGRAM DIRECTOR

Our programs provide training necessary for a career in medical physics. Medical physicists play a vital role in the delivery of health care in a variety of settings. Typically, medical physicists specialize in radiation therapy, diagnostic imaging, or nuclear medicine. Each of these fields is advancing and expanding to meet society's growing health care needs. This is being fueled by the introduction of new breakthroughs in science and technology and also by the growth and aging of our population. In addition, there is increasing emphasis on improving safety and efficiency in virtually all aspects of health care. Well-trained medical physicists are highly qualified to contribute to meeting these societal needs. The work is exciting, challenging, and rewarding. However, becoming a qualified medical physicist takes careful planning and a decade or more of training, typically including an undergraduate degree in physics or engineering, an MS or PhD in medical physics, and residency training. This web site presents material of relevance to obtaining MS and PhD degrees.



Selecting a medical physics graduate program can be challenging because there are so many accredited programs to choose from. Each of these programs shares a common goal of providing trainees with the knowledge and experience required to become a practicing medical physicist. However, each program is unique because of variations in the research interests of the faculty, the mission of the host institution, and many other factors. In selecting a program, prospective students should consider how well the program matches with their immediate educational needs, subject matter interests, and long-term career plans.

Perhaps the strongest reason to consider our program is its high quality. This quality is possible because our program is a joint venture of Mary Bird Perkins Cancer Center (MBPCC) and the Louisiana State University (LSU). The partnership leverages the clinical resources at MBPCC with the academic and research resources at LSU. This partnership provides an ideal environment for medical physics education and research. Our graduate program is nationally-recognized, CAMPEP-accredited, and has a 100% placement rate of graduates. Excellence is further evidenced by other performance indicators listed elsewhere on this web site, including admission rates, completion times, and board certification rates.

Another strength of our graduate degree program is the flexibility it affords our students. For example, most of our students enroll with the intention of earning a terminal MS degree, but in the course of performing their thesis research, they develop a passion for research and decide to pursue a PhD. On the other hand, a PhD student may discover a passion for patient care activities and choose instead to graduate with an MS degree to rapidly enter the workforce. Our program not only accommodates this, we encourage our students to make maximally informed decisions about their eventual career paths, i.e., after having gained some hands-on clinical and research experience in our graduate program.

Another noteworthy feature of our program is our faculty. Their research interests include advanced technology for photon, electron, and proton radiotherapies, targeted therapy using chemo-irradiation, diagnostic imaging, nuclear medicine, and radiation protection. We have 20 faculty and staff physicists involved in teaching 24 graduate students. With this low student-to-instructor ratio, our faculty teach students in small groups or individually. We also offer access to state-of-the-art

research facilities and resources, such as high performance computer clusters, radiotherapy accelerators, medical imaging laboratories, and a synchrotron light source, to name a few.

Last but not least, when selecting a graduate program prospective graduate students should consider their training needs after graduation. For those who aspire to become “qualified medical physicists” in the United States, an additional 2-years of training in an accredited residency program is necessary. Nationally, there is a shortage of residency slots. Our partner institution, MBPCC, leads a consortium of four participating institutions which currently trains 12 residents (6 new admissions) each year. Graduates from our M.S. and Ph.D. programs have first priority for admission to the MBPCC residency program.

On behalf of the medical physics team, I invite you to learn more about our programs by visiting our websites at [LSU](#) and at [MBPCC](#).

Wayne Newhauser, Ph.D.

BRIEF HISTORY OF THE PROGRAM

Our Medical Physics and Health Physics Program started in 1980 as collaboration between the LSU Nuclear Science Center and Mary Bird Perkins Cancer Center (MBPCC), a community-owned, nonprofit cancer treatment, education, and research facility. Since 1980, we have offered an MS curriculum in Medical Physics and Health Physics. In 1999, the Medical Physics and Health Physics Program merged into the LSU Department of Physics & Astronomy.



The partnership with MBPCC was further strengthened in 2004 when LSU and MBPCC signed a formal agreement to recreate our partnership as an integrated academic-community cancer center model for medical physics education and research. This renewal resulted in substantial expansion in terms of program faculty and resources, including the joint hire of a new Program Director whose time is split between LSU and MBPCC. Currently, the Program Director is Wayne Newhauser, PhD. Philanthropic efforts also resulted in the creation of the Dr. Charles M. Smith Chair of Medical Physics, held by the current Program Director.

Our MS program has been accredited by CAMPEP since 2006. A dedicated PhD curriculum in Medical Physics was added in 2011, receiving CAMPEP accreditation that same year. A medical physics residency program created by MBPCC received its CAMPEP accreditation in 2012. Finally, a certificate program was added in 2014.



DR. CHARLES M. SMITH CHAIR OF MEDICAL PHYSICS



The Dr. Charles M. Smith Chair of Medical Physics was created in 2006 through the generosity of a gift from LSU alumnus, Dr. Charles M. Smith. Dr. Smith graduated from LSU in 1951 and from the LSU Medical School in New Orleans in 1955. He practiced family medicine for 35 years in Sulphur, Louisiana. Dr. Smith's passion for quality patient care and his strong desire to make an impact on cancer treatment in Louisiana led him to support the Medical Physics Program.

Dr. Smith's contribution was matched by funds raised through the 2004 Mary Bird Perkins capital campaign. In 2007, the Smith Chair received additional funding from the Louisiana Board of Regents Support Fund. This endowment provides funds annually that are used to support graduate student research, to seed new research directions, and for other Program needs.

In 2007, Professor Kenneth R. Hogstrom was the inaugural recipient of the Smith Chair. The Smith Chair is currently held by Dr. Wayne Newhauser, Professor and Director of the Medical Physics Program.

MS DEGREE PROGRAM – OVERVIEW AND GOALS

To meet increasing demand by hospitals, clinics, and industry for trained medical physicists and health physicists, LSU's Department of Physics & Astronomy offers a Master of Science degree in Medical Physics and Health Physics. The M.S. degree program is oriented toward professional training, including successful completion of future board certification exams. Students graduating from the medical physics concentration are well prepared for residency programs; those completing the health physics concentration are suitable for entry-level health physics positions. Some students choose to continue their education by pursuing a PhD degree.

Students spend one year in the classroom learning the fundamentals of medical and health physics, radiation biology, and human anatomy. In the second year, students in the medical physics concentration learn to apply the knowledge gained in the classroom; for two semesters these students take advanced courses in medical physics



and receive clinical training and experience by working side-by-side with medical physicists, medical dosimetrists, and radiation oncologists at Mary Bird Perkins Cancer Center. Second-year students in the health physics concentration take courses relevant to applied nuclear science to prepare them for careers with hospitals, industrial companies, and national laboratories that use radiation sources.

Students in both the medical physics and health physics concentrations are required to complete a thesis based on hypothesis-driven research. Thesis research typically begins at the end of the first year, culminating in a public presentation and thesis defense. The results of the thesis are expected to be submitted for publication in a peer-reviewed scientific journal.

OBJECTIVES: MEDICAL PHYSICS

The Medical Physics component of the M.S. Program is designed for individuals who wish to be educated in clinical medical physics. The Program's objective is to provide clinical and research training in Medical Physics, which give the student opportunity to prepare for advanced training in a clinical physics residency program. M.S. Program graduates are well-prepared for:

- A career as a professional medical physicist in a clinical environment,
- A career as a professional medical physicist in a clinical-support industry,
- A career as a professional medical physicist in a clinical-support research laboratory, or
- Further research training in a Ph.D. medical physics program.

M.S. in medical physics students typically take Part I of the [ABR professional certification exam in medical physics](#) at the end of their second year of graduate study.

OBJECTIVES: HEALTH PHYSICS

The Health Physics component of the M.S. Program is designed for individuals who wish to be educated in medical health physics. The Program's objective is to provide clinical, industrial, and research training in Health Physics, which give the student opportunity to prepare for:

- A career as a professional medical health physicist in a hospital environment,
- A career as a professional health physicist in nuclear power or related industry,
- A career as a researcher in a health physics research laboratory, and
- Further research training in a Ph.D. health physics or medical physics program.



M.S. CURRICULUM for MEDICAL PHYSICS

Year 1, Fall Semester

- (3) MEDP-4331 Radiation Protection and Exposure Evaluation
- (2) MEDP-4351 Radiation Detection and Instrumentation
- (1) MEDP-4352 Radiation Detection Laboratory
- (3) MEDP-7537 Radiation Interactions and Transport
- (1) MEDP-7995 Medical Physics and Health Physics Seminar

Year 1, Spring Semester

- (3) MEDP-4111 Introduction to Medical Imaging
- (3) MEDP-7121 Radiobiology
- (2) MEDP-7530 Radiation Shielding
- (3) MEDP-7331 Radiation Therapy Physics
- (1) MEDP-7995 Medical Physics and Health Physics Seminar



Year 1, Summer Semester

- (3) KIN-2500 Anatomy
- (3) MEDP-7992 Advance Topics: Radiation Physics Research Methods

Year 2, Fall Semester

- (3) MEDP-7111 Advanced Medical Imaging Physics
- (4) MEDP-7260 Clinical Radiation Therapy Physics Rotation
- (3) MEDP-7270 Advanced Radiation Therapy Physics
- (1) MEDP-7991 Advanced Projects in Medical Physics and Health Physics
- (1) MEDP-7995 Medical Physics and Health Physics Seminar

TARGET DATE FOR FORMATION OF SUPERVISORY COMMITTEE

Year 2, Spring Semester

- (3) MEDP-7210 Clinical Principles of Radiation Therapy

(6) MEDP-8000 Thesis Research

Year 2, Summer Semester

(6) MEDP-8000 Thesis Research

Year 3, Fall Semester

(9) MEDP-8000 Thesis Research

Year 3, Spring Semester

(9) MEDP-8000 Thesis Research



M.S. CURRICULUM for HEALTH PHYSICS

Year 1, Fall Semester

- (3) MEDP-4331 Radiation Protection and Exposure Evaluation
- (2) MEDP-4351 Radiation Detection and Instrumentation
- (1) MEDP-4352 Radiation Detection Laboratory
- (3) MEDP-7537 Radiation Interactions and Transport
- (1) MEDP-7995 Medical Physics and Health Physics Seminar

Year 1, Spring Semester

- (3) MEDP-4111 Introduction to Medical Imaging
- (3) MEDP-7121 Radiobiology
- (2) MEDP-7530 Radiation Shielding
- (1) MEDP-7995 Medical Physics and Health Physics Seminar
- (3) NS-4570 Nuclear Facility Safety



Year 1, Summer Semester

- (3) KIN-2500 Anatomy
- (3) Elective course (see below)

TARGET DATE FOR FORMATION OF SUPERVISORY COMMITTEE

Year 2, Fall Semester

- (3-6) Elective courses (see below)
- (1) MEDP-7995 Medical Physics and Health Physics Seminar
- (3-6) MEDP-8000 Thesis Research

Year 2, Spring Semester

- (3) NS-4352 Environmental Radiological Evaluation and Remediation
- (3) Elective course (see below)

(3-6) MEDP-8000 Thesis Research

Year 2, Summer Semester

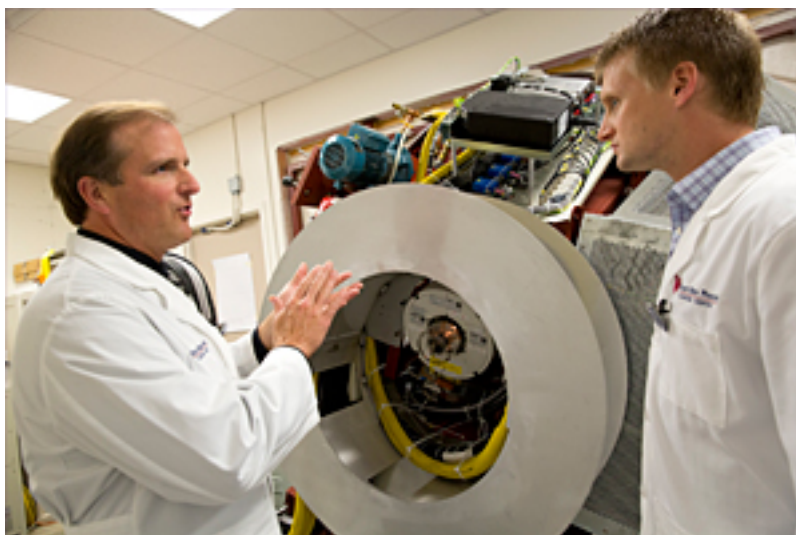
(6) MEDP-8000 Thesis Research

Recommended Elective Courses:

- (3) MEDP-7111 Advanced Medical Imaging Physics
- (3) MEDP-7331 Radiation Therapy Physics
- (3) MEDP-7538 Monte Carlo Simulation of Radiation Transport
- (1-3) MEDP-7991 Advanced Projects in Medical Physics and Health Physics
- (1-3) MEDP-7992 Advanced Topics in Medical Physics and Health Physics
- (1-6) MEDP-7999 Report Investigation
- (3) EXST-4012 Introduction to Sampling Techniques
- (4) EXST-4050 Principles and Theory of Statistics



PHD DEGREE PROGRAM – OVERVIEW AND GOALS



To meet the ongoing demand of university hospitals, clinics, and industry for medical physicists trained in research and clinical medical physics, LSU's Department of Physics and Astronomy offers a concentration in Medical Physics for its Ph.D. in Physics degree. The Ph.D. degree program provides students with

- a fundamental knowledge of medical physics;
- advanced courses in medical physics, physics, and other fields; and
- advanced research training in a particular subfield of medical physics.

The Ph.D. curriculum requires a core medical physics component of 11 courses (27 credit hours), a course in human anatomy (3 credit hours), 9 credit hours of advanced medical physics courses, 6 hours of outside electives, and research credit hours as recommended by the student's supervisory committee. Students must complete a written Qualifying Exam, an oral General Exam (typically the dissertation proposal), and a Final Examination / oral Dissertation Defense. Students are required to complete a dissertation based on hypothesis-driven research. Dissertation research should begin by the end of the second year and typically requires approximately 3 years of effort. The results of the dissertation are expected to result in multiple publications in peer-reviewed scientific journals. The full program of study is expected to take 5 years for the typical Ph.D. student.

Students pursuing a clinical career should expect to acquire comprehensive clinical training through a [CAMPEP-accredited medical physics residency program](#). Commencing in 2014, [eligibility for the American Board of Radiology Part 2 or Part 3 examinations in medical physics](#) requires that candidates must have completed a CAMPEP-accredited residency program.

OBJECTIVES: MEDICAL PHYSICS

The Ph.D. Program is designed for individuals who wish to be educated in medical physics with emphasis in research. The Program's objective is to provide a general knowledge of medical

physics along with research training in a particular subfield of medical physics. The Ph.D. degree will prepare the student for:

- An entry level research position, i.e., postdoctoral fellow position in an academic medical physics department,
- A medical physics residency position under the supervision of a board-certified medical physicist in a clinical environment, or
- A career as a medical physicist researcher in a clinical-support industry.

REQUIREMENTS FOR Ph.D. IN PHYSICS (MEDICAL PHYSICS CONCENTRATION)

CURRICULUM REQUIREMENTS

Table 1 lists the core course requirements for the Ph.D. degree in Physics (Medical Physics), which includes 11 courses (27 credit hours) in Medical Physics courses plus a course in human anatomy (3 credits). The credits from the anatomy course are not counted toward the completion of the Ph.D. degree because the course is taught at the undergraduate level. The core coursework follows the recommendations of CAMPEP [1].

Table 1. Core course requirements for the Ph.D. degree in Physics (Medical Physics).

Index	Course ID	Course Name	Credit Hours
1	MEDP-4111	Introduction to Medical Imaging	3
2	MEDP-4331	Radiation Protection and Exposure Evaluation	3
3	MEDP-4332	Radiation Detection Laboratory*	1
4	MEDP-4351	Radiation Detection and Instrumentation*	2
5	MEDP-7111	Advanced Medical Imaging Physics	3
6	MEDP-7121	Radiobiology	3
7	MEDP-7331	Radiation Therapy Physics	3
8	MEDP-7530	Radiation Shielding	2
9	MEDP-7537	Radiation Interactions and Transport	3
10	MEDP-7995	Medical Physics and Health Physics Seminar**	1
11	MEDP-7260	Clinical Physics Experience	3
12	KIN-2500	Human Anatomy [#]	3

* Fulfills PHYS 7398 Graduate Laboratory requirement

** Fulfills PHYS 7857 Graduate Seminar requirement. Students typically enroll in MEDP-7995 for multiple semesters; only 1 credit counts toward degree requirements.

Required for eligibility to sit for American Board of Radiology certification exam in radiological physics. Credits are not counted toward Ph. D. degree because of 2000 level course number.

In addition to the core courses, students must complete advanced (elective) courses in medical physics and in one or more disciplines outside of medical physics. The advanced (elective) courses in medical physics comprise a set of 7 courses (15-24 credit hours), of which each student is required to complete at least 3 courses (9 credit hours). Table 2 lists these courses.



Table 2. Advanced (elective) courses in Medical Physics offered for the Ph.D. degree in Physics (Medical Physics).

Index	Course ID	Course Name	Credit Hours
1	MEDP-7210	Clinical Principles of Radiation Therapy	3
2	MEDP-7270	Advanced Radiation Therapy Physics	3
3	MEDP-7538	Monte Carlo Simulation of Radiation Transport	3
4	MEDP-7991	Advanced Projects in Medical Physics and Health Physics	1-3
5	MEDP-7992	Advanced Topics in Medical Physics and Health Physics	1-3
6	MEDP-7992	Radiation Physics Research Methods	3
7	MEDP-7999	Research Investigation	1-6

For the outside advanced (elective) courses, each student is required to complete at least two graduate-level courses and 6 credit hours in physics, chemistry, biology, and engineering, or related field. The selection of advanced (elective) courses must be approved by the student's Supervisory Committee.

In addition, students are required to register for research credit hours. The total number of research credit hours is not explicitly prescribed. However, full-time graduate students are expected to register for at least nine credit hours in the fall and spring semesters and six hours in the summer term. Typically, most credit hours earned in the first four semesters are from core and elective courses; credit hours from research predominate in subsequent semesters. The maximum number of research credits is implicitly limited by the requirement that the program for the doctoral degree must be completed within seven years from the time a student is classified as a doctoral student.

The total credit hours for the degree of Ph.D. in Physics (Medical Physics) is defined as the sum of credits from all core courses, elective courses, and research courses, as described above. The required total number of credit hours for the degree of Ph.D. in Physics (Medical Physics) is the same as that for the degree of Ph.D. in Physics.

QUALIFYING EXAMINATION

Each prospective doctoral student is required to qualify for the status of pre-doctoral candidate. The qualification includes generally satisfactory grades, fulfillment of the core curriculum, and other requirements as set forth in Ref. [1]. In addition, each student must pass a written Qualifying Examination. The results of the Qualifying Examination provide

- 1.) an assessment of the student's prospects for success in the doctoral program,
- 2.) an assessment of the student's mastery of *graduate* level material covered in the Medical Physics core curriculum, or
- 3.) a basis for the student to petition the Medical Physics Program for a waiver for one or more core course requirements if the student was admitted to the medical physics program having completed the core course requirements at another CAMPEP accredited institution, and
- 4.) an assessment of each student within his or her peer group.

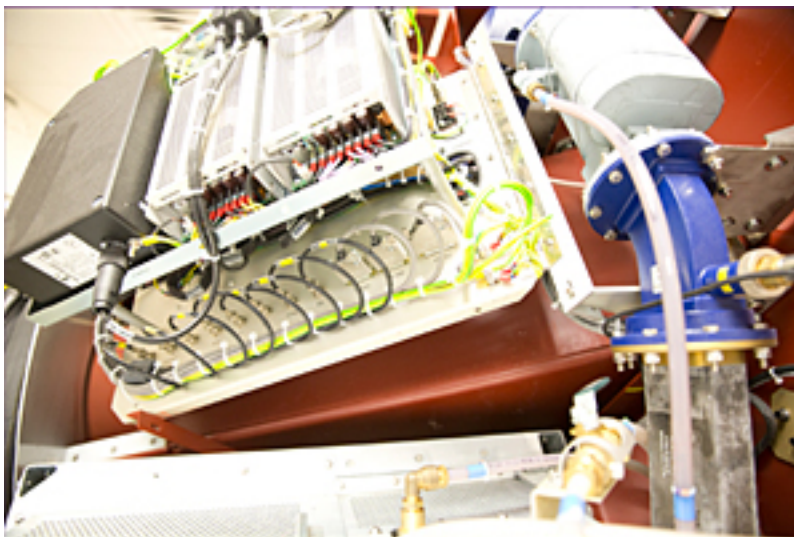
The Qualifying Examination is administered once per year in late summer. The specific date will be set by the Exam Committee each year. It is a written examination, given in two parts, a morning and an afternoon session of three hours each. The exam covers general physics, radiation physics (radiation interactions and transport, radiation biology, radiation protection, and radiation measurement and instrumentation), and applied radiation medical physics (the physics of medical imaging, the physics of radiation therapy, radiation shielding, and anatomy) at a graduate level. The type, content, and number of questions may be adjusted by the exam committee from one year to the next.

The questions for the Qualifying Examination are chosen by the Medical Physics Qualifying Examination Committee. The exam questions may change from one year to the next. Questions from previous Qualifying Examinations are made available to students in the program. A passing score is 60% at the Ph.D. level.

The Qualifying Examination is mandatory for prospective Ph.D. students and it is optional for terminal MS students in the Medical Physics program. For terminal MS students who elect to take the Qualifying Examination, the results will be valid for a period of five years (e.g., to accommodate students who later enter the Ph.D. program in Physics (Medical Physics), either immediately after graduation or after having separated from the LSU graduate school, e.g., to work, because of medical leave, etc.). A student may normally sit for the examination twice. If a passing score is not achieved in the first two attempts, the student may seek permission from his supervisory committee to sit for the exam a third and final time.

The exam should be attempted during the first year, normally at the end of the first year. It must be passed within the first two years that the student is in the program. In the event of failing the exam, the student must attempt the exam when it is next offered. A student who retakes the exam must take the entire exam.

Students are strongly urged to give a full effort in every attempt at the Qualifying Examination.



Other aspects of the Ph.D. curriculum (e.g., General Exam, publication of research, Public Seminar and Dissertation Defense) remain identical to the corresponding requirements for the degree of Ph. D. in Physics set forth by the Department of Physics and Astronomy (see “A Brief Guide to Graduate Studies in Physics and Astronomy” [2]) and by the LSU Graduate Bulletin [3].

REFERENCES

- [1] CAMPEP: “[Guidelines for Accreditation of Graduate Educational Programs in Medical Physics.](#)”
- [2] LSU Department of Physics & Astronomy: “[A Brief Guide to Graduate Studies in Physics and Astronomy](#)”
- [3] LSU Graduate School: [Graduate Catalog](#)

**SAMPLE CURRICULUM for
Ph.D. in PHYSICS (MEDICAL PHYSICS CONCENTRATION)**

The following plan is typical of a student pursuing a Ph.D. degree in Physics (Medical Physics). Students may petition for courses taken previously at other institutions to be waived. Core courses are denoted by (*).

Year 1, Fall Semester

- (3) MEDP-4331* Radiation Protection and Exposure Evaluation
- (2) MEDP-4351* Radiation Detection and Instrumentation
- (1) MEDP-4352* Radiation Detection Laboratory
- (3) MEDP-7537* Radiation Interactions and Transport
- (1) MEDP-7995* Medical Physics and Health Physics Seminar

Spring Semester

- (3) MEDP-4111* Introduction to Medical Imaging
- (3) MEDP-7121* Radiobiology
- (2) MEDP-7530* Radiation Shielding
- (3) MEDP-7331* Radiation Therapy Physics
- (1) MEDP-7995* Medical Physics and Health Physics Seminar

Summer Semester

- (3) KIN-2500 Human Anatomy
- (3) MEDP-7992 Advanced Topics: Radiation Physics Research Methods

COMPLETE WRITTEN QUALIFYING EXAM



Year 2, Fall Semester

- (3) MEDP-7111* Advanced Medical Imaging Physics
- (3) MEDP-7270 Advanced Radiation Therapy Physics
- (1) MEDP-7995 Medical Physics and Health Physics Seminar

(2) PHYS-9000 Dissertation Research

Spring Semester

(6) PHYS-9000 Dissertation Research

(3) MEDP-7538 Monte Carlo Simulation of Radiation Transport

COMPLETE ORAL GENERAL EXAM

Summer Semester

(6) PHYS-9000 Dissertation Research

Year 3, *Fall Semester*

(6) PHYS-9000 Dissertation Research

(3) PHYS-7411 Computational Physics

Spring Semester

(6) PHYS-9000 Dissertation Research

(3) PHYS-7412 Computational Physics

Summer Semester

(6) PHYS-9000 Dissertation Research

Year 4, *Fall Semester*

(9) PHYS-9000 Dissertation Research

Spring Semester

(9) PHYS-9000 Dissertation Research

Summer Semester

(6) PHYS-9000 Dissertation Research

Year 5,

Fall Semester

(3) MEDP-7260* Clinical Physics Experience

(6) PHYS-9000 Dissertation Research

Spring Semester

(9) PHYS-9000 Dissertation Research

COMPLETE FINAL EXAMINATION / ORAL DISSERTATION DEFENSE

RECENT PROGRAM STATISTICS (2007-2013)

Since its inception, 106 students have completed the MS Program; our first graduate for the PhD in Physics (Medical Physics concentration) finished in 2011. Our regular Fall 2013 enrollment was 15 MS students (14 medical physics, 1 health physics) and 7 PhD students in medical physics. Table 1 (MS Program) and Table 2 (PhD Program) summarizes Medical Physics and Health Physics Program statistics from 2007 to 2013 (since receiving initial CAMPEP accreditation). These statistics include program admissions, board certification status, and initial employment following graduation. The number of offers listed refers to offers of admission; most admission offers include assistantship support. For students who matriculated since 2007, we have a 100% graduation rate. Also, all of our students have either entered a medical physics residency program, continued their graduate education in MD or PhD programs, or directly entered the workforce.



Our strong curriculum, which includes substantial clinical experience and a research thesis, has helped our MS students to compete successfully for medical physics residency programs across the U.S. Graduates from the past several years have gone to residency programs at Washington University, M.D. Anderson Cancer Center, University of North Carolina, CARTI (Little Rock, AR), and others, in addition to those who advanced into the Mary Bird Perkins Cancer Center residency program.

Our graduates have successfully found employment across the U.S. LSU medical physics alumni currently work at Johns Hopkins University, Washington University, Mayo Clinic, Medical University of South Carolina, Loma Linda University, University of North Carolina, and many other institutions.

Table 1. Statistics for MS degree in Medical Physics and Health Physics, 2007-2014

Year	Admissions			Graduation and Professional Development		Initial Placement			
	# of Applicants	# of Offers	# of Matriculants	# of Graduates	# passing Board Exam (any part)	Residency	Clinic	MD or PhD Program	Other
2007	36	7	4	6	13	-	6	-	-
2008	63	7	5	4	6	-	3	1	-
2009	56	9	7	5	5	1	3	1	-
2010	60	8	6	4	1	-	2	1	1
2011	50	7	5	5	6	4	1	-	-
2012	48	6	5	8	8	4	-	4	-
2013	46	8	4	7	6	4	-	1	2

2014	19	6	3	6	4	5	-	-	1
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Table 2. Statistics for PhD degree in Medical Physics, 2007-2013

Year	Admissions			Graduation and Professional Development		Initial Placement			
	# of Applicants	# of Offers	# of Matriculants	# of Graduates	# passing Board Exam (any part)	Residency	Clinic	MD or PhD Program	Other
2007	2	1	1	-	-	-	-	-	-
2008	6	0	-	-	-	-	-	-	-
2009	23	0	-	-	-	-	-	-	-
2010	4	0	-	-	1	-	-	-	-
2011	6	1	1	1	-	1	-	-	-
2012	13	2	2	-	-	-	-	-	-
2013	33	4	2	-	-	-	-	-	-
2014	37	4	3	-	2	-	-	-	-

Notes:

1. Successful applicants majored in physics (85%), engineering (4%), or other disciplines (3%). The mean undergraduate grade point average of successful applicants was 3.6; mean GRE scores were 751 (quantitative) and 542 (verbal), corresponding to 159 and 156, respectively, on the new scoring system.
2. Average time to complete degree requirements was
 - a. MS degree: 3.15 years. We expect this to drop somewhat in future years because of recent changes to the curricula, closer to our target of 2.7 years.
 - b. PhD degree: -- years. Statistical data are not yet available for the PhD program, which received inaugural accreditation by CAMPEP, Inc., in 2011. The first doctoral graduate of the program completed the degree requirements in 3.75 years.

FACULTY MEDICAL PHYSICS AND HEALTH PHYSICS PROGRAM

FACULTY	ACADEMIC TITLE	CERTIFICATIONS	PROGRAM TITLE
<u>LSU DEPARTMENT OF PHYSICS AND ASTRONOMY</u>			
Dey, Joyoni	Assistant Professor		
Hogstrom, Kenneth	Professor Emeritus	1	
Jia, Guang	Associate Professor	2	
Matthews II, Kenneth	Associate Professor	3	Deputy Director, Medical Physics Program
Newhauser, Wayne	Professor	1	Director, Medical Physics Program
Varnes, Marie	Instructor (part-time)		
Wang, Wei-Hsung	Associate Professor	7,8	Director, Radiation Safety Office

MARY BIRD PERKINS CANCER CENTER

Carver, Robert	Adjunct Assistant Professor		Medical Physicist (Radiation Oncology)
Dugas, Joseph	Adjunct Assistant Professor	1	Medical Physicist (Radiation Oncology)
Fontenot, Jonas	Adjunct Assistant Professor	1	Medical Physicist (Radiation Oncology)
Hogstrom, Kenneth	Professor Emeritus	1	Senior Medical Physics Advisor
Newhauser, Wayne	Professor	1	Chief of Physics (Radiation Oncology)
Zhang, Rui	Adjunct Assistant Professor	1	Medical Physicist (Radiation Oncology)

SOUTHEAST LOUISIANA RADIATION ONCOLOGY GROUP

Fields, Robert	Affiliate Graduate Faculty	5	Radiation Oncologist
Henkelmann, Gregory	Affiliate Graduate Faculty	5	Radiation Oncologist
Johnson, Sheldon	Adjunct Assistant Professor	5	Radiation Oncologist
King, Maurice	Affiliate Graduate Faculty	5	Radiation Oncologist
Levine, Renee	Affiliate Graduate Faculty	5	Radiation Oncologist
Lo, Kenneth	Affiliate Graduate Faculty	5	Radiation Oncologist
Sanders, Mary Ella	Affiliate Graduate Faculty	5	Radiation Oncologist
Wood, Charles	Affiliate Graduate Faculty	5	Radiation Oncologist and Medical Director

OUR LADY OF THE LAKE REGIONAL MEDICAL CENTER

Bujenovic, Stephen	Affiliate Graduate Faculty	6	Director, PET Imaging Center
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BOARD CERTIFICATIONS

- 1-Certified by American Board of Radiology in Therapeutic Medical Physics
- 2-Certified by American Board of Radiology in Diagnostic Medical Physics
- 3-Certified by American Board of Radiology in Nuclear Medical Physics
- 4-Certified by American Board of Medical Physics in Radiation Oncology Physics
- 5-Certified by American Board of Radiology in Radiation Oncology
- 6-Certified by American Board of Nuclear Medicine
- 7-Certified by American Board of Health Physics
- 8-Certified by Board of Laser Safety
- *-Certification in progress

PROGRAM RESEARCH

MEDICAL PHYSICS & HEALTH PHYSICS PROGRAM

The medical physics and health physics groups research the applications of radiation technology to the health-care, national defense, and nuclear energy industries. All graduate students in the Medical Physics and Health Physics Program are required to complete a research thesis (MS) or dissertation (PhD) in their field of study.

Research Faculty

- [Robert Carver](#), Ph.D. - Adjunct Assistant Professor
- [Joyoni Dey](#), Ph.D. - Assistant Professor
- [Joe Dugas](#), Ph.D. - Adjunct Assistant Professor
- [Jonas Fontenot](#), Ph.D. - Adjunct Assistant Professor
- [Kenneth Hogstrom](#), Ph.D. - Professor Emeritus
- [Guang Jia](#), Ph.D. - Associate Professor
- [Kenneth \(Kip\) Matthews II](#), Ph.D. - Associate Professor
- [Wayne Newhauser](#), Ph.D. - Professor and Director
- Marie Varnes, Ph.D. - Instructor
- [Wei-Hsung Wang](#), Ph.D. - Associate Professor
- [Rui Zhang](#), Ph.D. - Adjunct Assistant Professor

[Areas of Research Concentration](#)

[Research Publications](#) (2006-present)

[Student Dissertations and Theses](#) (2007-present)

[Physical Facilities and Resources](#)



AREAS OF RESEARCH CONCENTRATION

Medical Physics Research

- [Intensity-modulated Radiotherapy](#)
- [Electron Beam Radiotherapy](#)
- [Proton Radiotherapy](#)
- [Image-guided Radiotherapy](#)
- [X-ray Capture Therapy](#)
- [Intracavitary Brachytherapy](#)
- [Radioisotope Imaging Systems](#)
- [Magnetic Resonance Imaging](#)

Health Physics Research

- [Radiation Detection, Dosimetry and Environmental Impacts](#)

Medical Physics Research

Intensity-modulated Radiotherapy: Medical physicists at Mary Bird Perkins Cancer Center are studying the fundamentals and clinical potential of using intensity modulated x-ray therapy (IMXT) in lieu of or in conjunction with modulated electron therapy (MET). Parallel to this work, applications of an electron multi-leaf collimator (eMLC) to MET are being studied and compared to utilization of compensating wax bolus to achieve energy modulation.



Electron Radiotherapy: Improved treatment planning and delivery of electron beam radiotherapy is a major focus of research by Dr. Hogstrom and his research team. Electron beam dose distributions used to treat cancer-bearing treatment volumes within 6 cm of the skin surface can be made more conformal by modulating dose penetration across the electron beam, and one method of achieving this utilizes wax bolus, which is referred to as bolus electron conformal therapy (ECT). A research agreement with .decimal, Inc., funds research to improve bolus ECT, e.g. mixing it with a small fraction of IMXT to produce mixed-beam distributions superior to either modality alone. For alternative delivery methods, which utilize energy-segmented fields, the challenges of treatment planning, abutment dosimetry, and MLC delivery have been investigated. Analytical calculations using radiation transport calculations and EGSNRC Monte Carlo calculations have been used to study these problems, as well as to design dual scattering foils and collimating systems, the latter funded by a research agreement with Elekta, Inc. Such research requires accurate dose measurement methods, a specialty of the research group.

Proton Radiotherapy: Proton radiotherapy is an emerging technology that utilizes the finite range and sharp characteristic Bragg peak of proton beams to treat tumors to high doses while minimizing dose to surrounding normal tissue. Dr. Newhauser's research group investigates the efficacy of proton therapy compared to other methods, including risk prediction of secondary effects. Dr. Newhauser's group is also investigating microdosimeters for measuring radiation dose at cellular scales. In another effort, led by Drs. Fontenot and Hogstrom, members of the medical physics team at Mary Bird Perkins Cancer Center are developing dose calculation algorithms for the dielectric wall proton radiotherapy accelerator that model the transport of protons through the treatment head and patient. Potential applications of dose calculation algorithms include clinical treatment planning and real-time quality assurance. Funding and collaboration to support this research is expected soon from the Department of Defense and TomoTherapy, Inc., respectively.

Image-guided Radiotherapy: Drs. Fontenot and Hogstrom at Mary Bird Perkins Cancer Center are conducting research in image-guided radiation therapy physics, gated radiotherapy, and adaptive radiotherapy. One research program concentrates on usage of orthogonal x-ray imaging using the BrainLab Novalis for radiosurgery and radiotherapy of brain and extra-cranial cancers, e.g. spine, liver, and prostate. Another program focuses on usage of megavoltage CT scanning using the TomoTherapy HiART for radiotherapy of prostate, head and neck, and many other anatomical sites. These programs are currently supported by research agreements with BrainLAB, Inc. and TomoTherapy, Inc., respectively.

X-ray Capture Therapy: X-ray capture therapy is a potentially new radiotherapy paradigm (chemo-irradiation) that uses monochromatic x-rays to deliver targeted radiation dose to high-Z labeled (e.g. iodine) pharmaceuticals that are preferentially taken up by cancer cells, e.g. IUdR taken up by DNA. Our research program, led by Drs. Hogstrom, Varnes and Matthews, uses the CAMD synchrotron's monochromatic x-ray beam line to study dosimetry techniques, treatment planning dose algorithms, microdosimetry, cell biology, and small animal irradiations. Our long term goal is to conduct clinical trials using a prototype laser-particle accelerator to produce monochromatic x-rays such as one developed by MXI Systems, Inc. (www.mxisystems.com).

Intracavitary Brachytherapy: Intracavitary brachytherapy is a type of radiation therapy that is delivered by placing radioactive material directly in or near a target, which is often a tumor. Dr. Price conducts research in image-guided, adaptive brachytherapy as it applies to the treatment of gynecological cancers. He has participated in the development of a device that allows clinicians to shape the dose distributions delivered to a patient, analogous to intensity-modulated radiotherapy, common in external-beam radiotherapy treatments. This work is leading to a partnership with Nucletron Corporation to develop new technology in the field of adaptive brachytherapy and heterogeneous-based treatment planning systems.

Radioisotope Imaging Systems: Drs. Dey and Matthews are pursuing research in medical nuclear imaging. Current detector development projects include high-sensitivity cardiac SPECT imaging as well as hand-held and compact CZT imaging systems for intraoperative imaging. Graduate students with Dr. Matthews have also worked on topics such as observer performance studies for PET/CT, quality assurance methods for PET/CT, performance characterization of megavoltage CT imaging for radiotherapy applications, and dose reduction for CT lung screening. A second research area for Dr. Dey is tumor modeling based on oncology imaging data.

Magnetic Resonance Imaging: Dr. Jia's group focuses on the clinical application of a novel molecular imaging technique: chemical exchange saturation transfer (CEST)-MRI. For prostate cancer imaging, Dr. Jia successfully applied amide-proton-transfer magnetic resonance imaging (APT-MRI) techniques to accurately detect prostate cancer. It has also been applied to investigate bladder tumors. This technique will provide a novel imaging biomarker for early prediction of treatment responses. For joint cartilage imaging, Dr. Jia non-invasively quantified mobile protein levels in human knee synovial fluid in the differentiation of osteoarthritis (OA) knee joints from non-OA joints. Dr. Jia proposed CEST-MRI to detect the overexpressed proteins and peptides in OA knee synovial fluid.

Health Physics Research

Radiation Detection, Dosimetry, and Environmental Impacts: Health physics research includes radiation detector development with safety/security applications and intercomparisons of dosimetric methods by Drs. Wang and Matthews. Dr. Wang and students also work on environmental impacts of radiation use, currently including an environmental assessment of a hypothetical low-level radioactive waste repository located in Louisiana.

STUDENT DISSERTATIONS AND THESES (2007-PRESENT)

Year	Student	Advisor	Title	Abstract/PDF
2014	Derek Freund	Zhang	<i>Risk of post-irradiation necrosis in pediatric brain cancer patients: Proton versus photon therapy planning comparison and predictive risk evaluation.</i>	--
2014	David Byrd	Wang	<i>Tube Current Modulated Computed Tomography Effective Dose and Size Specific Organ Dose Estimates with ImPACT: Total Scan versus Slice by Slice Parameters for Urogram Protocols</i>	Link
2014	Margaret Hernandez	Zhang	<i>A Treatment Planning Comparison of Volumetric Modulated Arc Therapy and Proton Therapy for a Sample of Breast Cancer Patients Treated with Post-Mastectomy Radiotherapy</i>	Link
2014	Bart Morris	Fontenot	<i>An Efficient Approach to EPID Transit Dosimetry</i>	Link
2014	Ben Rusk	Carver	<i>A Dosimetric Comparison of Copper and Cerrobend Electron Inserts</i>	Link
2014	Melissa Lamberto	Matthews	<i>A Feasibility Study of Ultra-Short Echo Time MRI for Positive Contrast Visualization of Prostate Brachytherapy Permanent Seed Implants for Post-Implant Dosimetry</i>	Link
2013	Adam Watts	Gibbons	<i>A Secondary Monitor Unit Calculation Algorithm using Superposition of Symmetric, Open Fields for IMRT Plans</i>	Link
2013	David McLaughlin	Hogstrom	<i>Energy Spectra Comparisons for Matched Clinical Electron Beams on Elekta Linear Accelerators using a Permanent Magnet Spectrometer</i>	Link
2013	Lydia Wilson	Newhauser	<i>Simple and Fast Reconstruction of 6 MV Radiotherapy Doses to the Whole Body</i>	--
2013	Kendrick Williams	Matthews	<i>Assessment of Detection and Characterization of Simulated Lung Nodules with Low-Dose CT</i>	Link
2013	John-Paul Grenier	Fontenot	<i>Evaluation of an Automated Delivery Verification System for Volumetric Modulated Arc Therapy Treatments</i>	Link
2013	Diane Alvarez	Hogstrom	<i>Impact of IUDR in Rat 9L Glioma Cell Survival for 25-35 keV Photo-Activated Auger Electron Therapy</i>	Link
2013	Justin Silkwood	Shikhaliev	<i>Spectral Breast CT: Effect of Adaptive Filtration on CT Numbers, CT Noise, and CT Dose</i>	Link
2012	Nels Knutson	Fontenot	<i>Evaluation of a Proton Pencil Beam Algorithm for Dose Calculations in Heterogeneous Media</i>	Link
2012	Jeff Kemp	Price	<i>The Feasibility of Using Megavoltage CT for the Treatment Planning of HDR Cervical Brachytherapy with Shielded Tandem and Ovoid Applicators</i>	Link
2012	Charles Wilson	Wang	<i>Louisiana's Suitability for a Low-level Radioactive Waste Storage</i>	Link
2012	Justin LeBlanc	Hogstrom	<i>Design of Electron Dual Foil Scattering Systems for Elekta Infinity Radiotherapy Accelerators</i>	Link
2012	Guy Harris	Fontenot	<i>Development and Validation of an Electron Monte Carlo Model for the Elekta Infinity Accelerator</i>	Link
2012	Geoff Nichols	Fontenot	<i>A Treatment Planning Comparison of Dual-Arc VMAT vs. Helical Tomotherapy for Post-Mastectomy Radiotherapy</i>	Link
2012	Ryan Posey	Newhauser	<i>Utilization of Machined Skin Collimation for Electron Therapy</i>	Link
2012	John Chapman	Fontenot	<i>Proton Dose Calculations in Homogeneous Media</i>	Link
2011	Matt Roberts	Parker	<i>Comparison of TLD Dose and Reconstructed Dose for Post-Mastectomy Radiation Therapy With TomoTherapy</i>	Link

2011	Matt Sutton	Matthews	<i>Delivery Accuracy of Image Guided Radiation Therapy Using Elekta Infinity's On-Board Imaging</i>	Link
2011	James Kavanaugh	Hogstrom	<i>Evaluation of the Pencil Beam Algorithm and Pencil Beam Redefinition Algorithm for Bolus Electron Conformal Therapy Dose Computation</i>	Link
2011	Gordon Mancuso	Fontenot	<i>Evaluation of Volumetric Modulated Arc Therapy (VMAT) Patient Specific Quality Assurance</i>	Link
2011	Shannon Fritz	Shikhaliev	<i>Characterization of Photon Counting CZT Detectors for Medical X-ray Imaging and Spectroscopy</i>	Link
2011	Bobby Mathews	Price	<i>Development of a Monte Carlo Based Correction Strategy for a TG-43 Based Brachytherapy Treatment Planning System to Account for Applicator Inhomogeneities</i>	Link
2010	Catharine Batte	Parker	<i>Accuracy of SRS Dose Delivery Using the TomoTherapy Hi-Art System</i>	Link
2010	Catherine Talbert	Fontenot	<i>Comprehensive Study of Parameters for Volumetric Modulated Arc Therapy (VMAT) Treatment Planning</i>	Link
2010	Peter Petrek	Shikhaliev	<i>Positron Autoradiography for Intravascular Vulnerable Plaque Imaging</i>	Link
2010	Chad Robertson	Price	<i>Prototype Electron Phantom for Radiographic and Radiochromic Film Dosimetry</i>	Link
2009	Todd Racine	Gibbons	<i>Investigations of the Energy Variation on a TomoTherapy HI-ART II Using an Aluminum Stepwedge</i>	Link
2009	John Eley	Hogstrom	<i>Segmented Field Electron Conformal Therapy with an Electron Multi-leaf Collimator</i>	Link
2009	Olivier Blasi	Fontenot	<i>Comparison of Helical Tomotherapy and Mixed Beam Treatment Plans for Superficial Head and Neck Cancer</i>	Link
2009	Ricky Hesston	Gibbons	<i>Dosimetric Evaluation of a Delivery Verification and Dose Reconstruction Method for Helical Tomotherapy</i>	Link
2009	Shima Ito	Parker	<i>Impact of Intrafraction Motion on Post-Mastectomy TomoTherapy of the Chest Wall</i>	Link
2008	Christopher Welch	Matthews	<i>Computed Tomography Imaging to Quantify Iodine Distribution in IUdR-Labeled DNA</i>	Link
2008	Jason Matney	Parker	<i>Determination of CTV-to-ITV Margins for Free-Breathing Respiratory-Gated Treatments Using 4DCT and the Novalis ExacTrac Gating System with Implanted Fiducials</i>	Link
2008	David Perrin	Hogstrom	<i>Segmented Field Electron Conformal Therapy Planning Algorithm</i>	Link
2008	Andrew Morrow	Matthews	<i>PET/CT Detectability and Classification of Simulated Pulmonary Nodules Using an SUV Correction Scheme</i>	Link
2008	Scott Oves	Hogstrom	<i>Dosimetry Intercomparison using a 35-keV Synchrotron Beam</i>	Link
2007	William Hill	Matthews	<i>Experimental Investigation of an Electronically Collimated Radiation Detector for Location of Gamma-Ray Sources</i>	Link
2007	Justin Vinci	Hogstrom	<i>Accuracy of Cranial Coplanar Beam Therapy with BrainLAB ExacTrac Image Guidance</i>	Link
2007	Allen Beardmore	Rosen	<i>Evaluation of MVCT Images with Skin Collimation for Electron Treatment Planning</i>	Link
2007	Koren Smith	Gibbons	<i>Investigation of Superficial Dose from a Static TomoTherapy Beam</i>	Link
2007	Adam Lackie	Matthews	<i>Directional Algorithm for an electronically-collimated radiation detector</i>	Link

PHYSICAL FACILITIES AND RESOURCES

GENERAL

- Student offices with individual desks and personal computer
- Student lab coats and radiation badges
- Medical Physics Program administrative support office

LIBRARIES

- Dept. of Physics & Astronomy library
- Medical physics libraries in Program Office and at MBPCC
- Louisiana State University libraries



CLINICAL FACILITIES at MARY BIRD PERKINS CANCER CENTER

- Treatment Delivery Systems
 - 4 Varian Clinac radiotherapy accelerators with Millennium MLC (4, 6, 10, 15, 18 MV x-ray and 6, 9, 12, 16, and 20 MeV electron beams)
 - 2 Elekta Synergy radiotherapy accelerators with iView and XVI (6, 10, 15 MV x-ray and 7, 9, 10, 11, 13, 16, and 20 MeV electron beams)
 - BrainLab Novalis stereotactic radiotherapy system
 - TomoTherapy HI-ART II system
- Patient Data Systems
 - GE Lightspeed RT CT Simulator (4D Advantage Windows)
 - GE Discovery ST PET-CT
- IMPAC record and verify system
- Treatment Planning Systems
 - Philips ADAC Pinnacle³ systems (17)
 - 9 - Baton Rouge
 - 2 - Hammond
 - 2 - Covington

- 2 – Houma
 - 2 - Gonzalez
- Philips ADAC Pinnacle³ systems (Research Server)
- TomoTherapy planning station (Clinical)
- TomoTherapy planning station (Research)
- BrainLab stereotactic system (iPlan)
- K&S Diamond MU Software
- MU Check Software
- Brachytherapy Systems
 - Nucletron microSelectron HDR system
 - Oncentra planning system
 - Multiple applicators
 - Varian VariSource HDR system
 - MammoSite (breast)
 - Varian VariSeed LDR planning system (prostate seeds)
 - Sr-90 ophthalmic applicator
 - I-125 eye plaques for ocular melanoma
- Dosimetry Lab
 - 3D beam scanning system (Welhoffer/Scanditronix)
 - 2D beam scanning systems (Scanditronix, TomoDose, CRS)
 - Cylindrical water phantoms
 - TLD in-vivo dosimetry system
 - Radiographic Film scanning system (Vidar scanner, RIT, and TomoScan software)
 - Radiochromic Film scanning system (Epson scanner, Image Acquisition, and Film QA software)
 - Tissue equivalent phantoms (rectangular, cylindrical, and 4D)
 - Sun Nuclear (1D (Profiler) and 2D (MapCheck) diode arrays)
 - Imaging QA phantoms for CT and PET
- Patient Support Labs/QA Systems
 - Treatment planning room
 - Block and mold room



RESEARCH FACILITIES

Mary Bird Perkins Cancer Center: Most of the equipment used for patient care during the day (listed above for clinical training), is available for research at nights and on weekends.

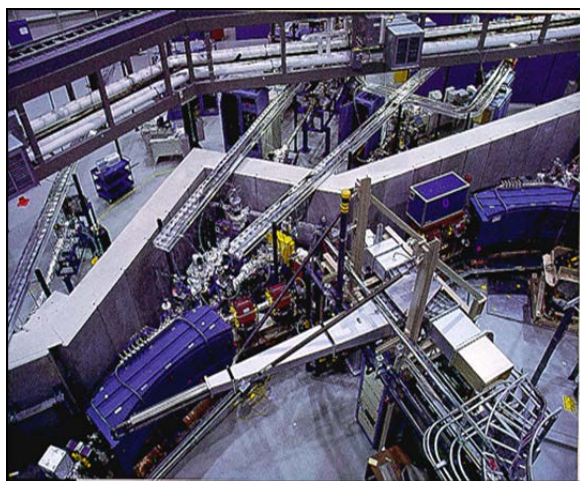


Radiation Detector Development Lab: The Radiation Detector Development (RDD) laboratory is used by Drs. Matthews and Shikhaliev, as well as their students, for radioisotope imaging research. The RDD Lab has equipment and materials for design, fabrication, testing, and analysis of prototype detector systems, including radioactive sources, dose calibrator, collimators and shielding, scintillation and CZT radiation detectors, data acquisition electronics, imaging phantoms, and light-tight (“black”) box.

X-ray Imaging Labs: Two C-arm x-ray fluoroscopy units are being used for photon-counting detector development and other projects, as well as providing a platform for teaching students about x-ray production and measurement. The labs have other general-purpose x-ray imaging equipment, including various types of x-ray receptors, and capabilities for prototyping and evaluating new detectors.

Micro-CT Imaging System: Skyscan 1074 instrument with 37 μm resolution, 3 cm field of view and variable beam energy. Image reconstruction software has multiple capabilities and can run on a distributed computing environment.

CAMD Synchrotron Radiation Facility: The 1.3 GeV electron storage ring (<http://camd.lsu.edu/>) provides a beam line from a superconducting wiggler magnet for medical radiological research, such as the x-ray capture therapy project with Drs. Hogstrom, Varnes, and Matthews. In 2010, funded improvements to the wiggler and medical radiology beamline will provide higher x-ray energies and beam intensities, as well as an enhanced end-station to support medical radiology research utilizing monochromatic x-rays. <http://camd.lsu.edu/>



Design and Construction Shops: The Department of Physics and Astronomy provides fully-staffed machine and electronics shops. These shops provide in-house fabrication facilities. In addition, a "student" machine shop is also available for faculty and student use.

Animal Irradiation Facilities: The School of Veterinary Medicine supports radiological facilities for animals. Diagnostic facilities include x-ray fluoroscopy and CT scanning. A small animal therapy facility includes a Varian Clinac 600C with a 52-leaf MLC and the Pinnacle treatment planning system.

Computing Facilities:

- Various multi-teraflop systems, including Tezpur (15 Tflop, 360 node) and Pelican (3 Tflop, 32 node), operated by the Center for Computation and Technology
- Linux cluster for student use, operated by Department of Physics and Astronomy.
- The Medical Physics and Health Physics Program has several high-performance multi-processor Unix workstations for research and instructional purposes with the following software:
 - Philips ADAC Pinnacle³ research treatment planning system
 - TomoTherapy research treatment planning system
 - EGSnrc MCNP (various versions), and GEANT Monte Carlo codes
 - A collection of deterministic neutron, photon and charge particle transport codes, including cross section processing routines
 - Fortran, C, C++ compilers with high-performance multi-threading extension
 - In-house software for advanced aerosol transport computations, external beam photon transport calculations, and brachytherapy seed identification and dosimetry.

Nuclear Science Building:

The Nuclear Science Building serves primarily as a laboratory research and teaching facility. In addition, it gives housing to the LSU campus Radiation Safety Office. The building houses:

- Six research laboratories equipped with fume hoods, sinks, counters, storage space. All are all acid-proof and are rated for radiochemistry, radiobiology, nano-sized aerosol, and generic radiation research. The aerosol laboratory houses a 1.8x1.5x0.6 m³ environmental chamber equipped with a real-time laser multi-channel aerosol spectrometer and nano-particle nebulizer. This lab supports experimental and computational study of how aerosols transport in confined spaces.
- Multiple irradiation facilities (high-intensity radio-isotopic source irradiators having a maximum dose rate of 5000 R/min include): self-contained Co-60 irradiator, pool-type Co-60 irradiator, and Eberline Cs-137 calibrator/irradiator. Neutron facilities include: a subcritical assembly for neutron physics experiments and Cf-252 sources (total isotope mass of about 60 micro-grams) stored in two separate neutron irradiators (scalar thermal neutron flux of about 5E6 n/cm²/s).
- Multiple radiation detection systems: HPGe detectors, NaI(Tl) detectors, a Si(Li) detector, liquid scintillation detector, etc. Counting laboratories maintain a cross-calibration schedule with the State of Louisiana Radiation Laboratory under the Louisiana Department of Environmental Quality, using NIST traceable standards.

QUALIFICATIONS FOR ADMISSION

At a minimum, students entering the MS and PhD programs should have a B.S. degree in physics, or should have a B.S. degree in engineering or physical science with a strong foundation in physics represented by coursework equivalent to a minor in physics.* Applicants should also have completed the equivalent of three semesters of calculus and one semester of differential equations.

Also, we strongly recommend that students entering the Program should have completed these additional undergraduate topics:

- Biology: one semester of general biology; one semester of human anatomy/physiology
- Chemistry: two semesters of general chemistry and/or organic chemistry
- Computer Science: Proficiency in a programming language such as C++ or Matlab; knowledge of basic numerical analysis methods

Completion of a course in human anatomy is an eligibility requirement for the American Board of Radiology certification exam. Students who did not take a human anatomy course as an undergraduate must complete this requirement during their graduate studies. This is usually achieved by taking "KIN 2500 - Anatomy" during the summer semester at the end of the first year. Any other deficiencies in coursework deemed necessary for ABR eligibility will be determined by consultation with Program faculty, and should be completed during graduate studies.

*At LSU, required courses for a minor in Physics are PHYS 1201, 1202, 1208, 1209 (or PHYS 2101, 2102, 2108, 2109); PHYS 2221; and at least three courses in physics above 2200 (excluding PHYS 2401, 2995, 4399, and 4991) of which at least three hours must be at the 4000 level, and/or astronomy above 4000 (excluding ASTR 4997), for a total of 20-22 hours.



STUDENT STIPENDS

M.S. Program

It is the goal of the Program faculty to provide student funding through graduate assistantships throughout the course of graduate study. Tuition is waived for graduate students on assistantship. M.S. student stipends are typically \$14,900/year. Graduate student assistantships for Program students are typically:

Medical Physics Concentration

- Teaching Assistantships- Year 1
- Medical Assistantships- Year 2 (Fall and Spring Semesters)
 - These assistantships are provided during the 2 semesters that students are receiving clinical training at Mary Bird Perkins Cancer Center.
- Research Assistantships- Year 2 (Summer Semester) and Year 3 (until Program requirements completed)
 - Student typically funded by his or her faculty supervisor for the M.S. thesis research.

Health Physics Concentration

- Teaching Assistantships- Year 1
- Research Assistantships- Year 2 (until Program requirements completed)
 - Student typically funded by his or her faculty supervisor for the M.S. thesis research.

Ph.D. Program

It is the goal of the Program faculty to provide student funding through graduate assistantships throughout the course of graduate study. Ph.D. students are typically supported by a teaching assistantship during the first two years of graduate student; these stipends are typically \$22,000 per calendar year, including graduate tuition waiver and supplements. Subsequent years are typically funded as a research assistantship through the faculty advisor's research grants and contracts; RA stipends include graduate tuition waiver. Fellowships or other forms of support may be available for some students.

FREQUENTLY ASKED QUESTIONS

Additional general FAQs may be found on the department website,

<http://www.phys.lsu.edu/newwebsite/graduate/faq.html>.

Question: Do I need to major in physics in college to go into medical physics?

Answer: Graduate students in medical physics come from a variety of backgrounds – physics and engineering are common. However, all students must have a solid background in physics, typically including a year of calculus-based general physics, and upper-level courses in mechanics, E&M, modern physics and experimental lab. Often, some engineering courses are sufficiently equivalent.



Question: Can I earn a Ph.D. in medical physics at LSU?

Answer: Yes. We offer a Medical Physics concentration to the Ph.D. in Physics degree. The degree requires core coursework in medical physics plus advanced coursework in physics, medical physics and other topics. Progress benchmarks include a Qualifying Exam, a General Exam, and defense of an original research dissertation. See the medical physics Ph.D. pages on our web site.

Question: After completing the LSU M.S. in Medical Physics and Health Physics Program, will I be capable of entering a medical physics Ph.D. program or residency program?

Answer: Yes. The academic instruction follows the guidelines of [AAPM Report 197](#). In recent years, many of our M.S. graduates have gone on to Ph.D. programs or residency programs in medical physics.

Question: On average, how long does it take to complete the graduate programs in medical physics and health physics at LSU?

Answer: Three years for M.S. in Medical Physics, two years for M.S. in Health Physics, and five years for Ph.D. in Physics (Medical Physics concentration).

Question: Where have your graduates found employment?

Answer: Graduates from the LSU Medical Physics and Health Physics Program have found employment in public and private hospitals, private cancer clinics, university hospitals, and government regulatory divisions. Some students have even struck out on their own, performing medical physics contract and consulting work.

Question: What is the CAMPEP accreditation status of the LSU Medical Physics Program?

Answer: The M.S., Ph.D., and certificate tracks in the LSU Medical Physics and Health Physics Program all have full accreditation by CAMPEP through 2016. See <http://www.campep.org/campeplstgrad.asp> for a list of CAMPEP-accredited programs.

Question: I already have an M.S. or Ph.D. degree in medical physics. Do you offer a medical physics residency program?

Answer: The [Mary Bird Perkins Cancer Center](#), our educational partner for the medical physics program, operates a CAMPEP-accredited radiation oncology physics residency program. Our long-term goal is to build sufficient capacity into this residency program to match the annual output of the

graduate program. The residency program page elsewhere on our website will take you to the full residency program website.

Question: I already have a Ph.D. in a field other than medical physics. Can I take medical physics courses at LSU to improve my chances to enter a residency program? Do you have a certificate program?

Answer: Beginning in 2014, we offer a certificate program. Prior to that, post-doctoral fellows in our research group typically had opportunity to complete coursework analogous to the requirements of [AAPM Report 197S](#), and have previously been successful at entering medical physics residency programs. Contact the Program Director or Deputy Director for further information.

Question: Do students in your Program generally specialize in learning one specific area of medical physics (medical imaging, radiation therapy, radiation safety), or is the Program geared more toward a general knowledge of all medical physics areas?

Answer: Courses cover all areas of medical physics; however, the advanced courses and clinical rotations are more focused on radiation therapy. For the final year, students focus on their area of research, typically in radiation therapy physics or medical imaging physics.

Question: How many students do you accept each year into the M.S. in Medical Physics and Health Physics Program, or the Ph.D. in Physics (Medical Physics concentration)?

Answer: We anticipate accepting 6 students per year in the M.S. and Ph.D. medical physics concentrations and 0-1 students per year in the health physics concentration. All M.S. students start in the Fall semesters.

Question: When are applications due? When will I hear about my application status?

Answer: The application deadline is January 15 each year for the upcoming Fall semester, although we continue reviewing applications received after this date until available slots are filled. Applications are reviewed and ranked in February, so that ~12 applicants can be invited to interview in late February/early March. Admissions offers are made in prioritized order following the interviews; by mid-March, we will typically begin notifying applicants to whom no offer is expected.

Question: Do you offer graduate assistantships or other financial support?

Answer: Most admissions offers include financial support in the form of a graduate assistantship or fellowship. Students are typically supported by teaching assistantships in the first phase of their education.

Question: What are the GRE and GPA requirements for entry into the Program?

Answer: The LSU Graduate School requires a minimum GPA of 3.0. The minimum GRE combined score that we consider is ~1100 (~300 for the new scoring system). Typically, applicants who are invited for interviews have a GRE quantitative reasoning score of at least 700 (155 on new system) and overall score of at least 1250 (~310 on new system). Over the past several years, entering medical physics students had an average GRE score above 1300 and average GPA of 3.5. No subject test is required for the M.S. Program; the Physics subject test is desirable for Ph.D. students.

Question: What are the institution and department codes for GRE reporting?

Answer: Institution: 6373 (Louisiana State University - Baton Rouge)
Department: 0808 (Physics)

Question: Do you accept international students?

Answer: All students are welcome to apply; for student located outside the U.S., we will use telephone or Skype interviews during the admissions process, rather than in-person interviews. In recent years, most of our international students were already completing an undergraduate degree from a four-year college within the U.S. at the time of application to the M.S. Program.

Question: What duties and time commitment are required for a graduate assistant?

Answer: Students are expected to work 20 hours per week for their assistantships, in addition to the significant time commitment needed for your own coursework and projects. Teaching assistants may teach undergraduate physics labs, do grading and proctoring for the physics service courses, or work in the department's tutoring center. Research assistants work in the research lab of their major professor.

Question: Do you accept students who are deficient in one or two classes (for example, physics, math or chemistry) and allow them to take those classes while pursuing the master's degree?

Answer: Deficiencies are handled on a case-by-case basis; applicants must have a minimum number of deficiencies and be strong in all other respects to be considered. Deficiencies typically must be remedied prior to the end of your first year as a graduate student.

Question: Can I visit LSU and the Medical Physics Program?

Answer: Certainly. Contact the LSU Medical Physics Program office at 225-578-2163 or medphys@phys.lsu.edu to discuss a visit at any time during the year. Unfortunately, we cannot provide financial assistance for most visits. In the Spring of each year, however, we do invite our highest-rated applicants to visit LSU (at our expense) for an interview with the Program faculty.

Question: Who should I contact if I have more questions?

Answer: Our program's Applicant Liaison is available to answer questions. Our contact information is available at http://www.phys.lsu.edu/newwebsite/graduate/medphys_inforequest.html.

PROGRAM CONTACT INFORMATION

If you have questions about the Medical Physics and Health Physics Program, please contact us. Send general questions to medphys@phys.lsu.edu or call (225) 578-2163.

APPLICANT LIAISON (for questions about applying to the MS and PhD programs)

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RADIATION ONCOLOGY PHYSICS RESIDENCY TRAINING PROGRAM

OVERVIEW

A Medical Physics Residency Program has operated at the Mary Bird Perkins Cancer Center (MBPCC) since 2009. MBPCC is a community-owned not-for-profit cancer treatment facility located in Baton Rouge about 6 miles from the LSU campus. With its breadth of technology, MBPCC comprises an ideal environment for clinical training of medical physicists, providing the practical experience necessary to successfully complete examinations for board certification. The Residency Program received CAMPEP accreditation in 2012. Additional information on the Residency Program is at the [MBPCC residency website](#), with key information summarized below.



CURRICULUM

The residency program follows the intent of [AAPM Report 90, "Essentials and Guidelines for Hospital-Based Medical Physics Residency Training Programs."](#) The two-year Program consists of parallel tracks of clinical rotations and independent projects.

During clinical rotations, residents are assigned to regular duties within the clinic under the supervision of staff medical physicists. These rotations provide the resident with experience in the activities of clinical medical physicists in radiation oncology.

Independent projects provide the resident with additional experience in clinical topics, especially those that may not be encountered on a daily basis. Example projects include linac acceptance testing and commissioning, planning system commissioning, and HDR program commissioning.

Residents may also participate in rotations at MBPCC's partner sites. These provide additional education and training on procedures, technology, etc., beyond what is available at MBPCC. These rotations are limited in time and scope to cover specific topics found in AAPM Report 90. Partner institutions follow the same training requirements as the MBPCC program with appropriate accommodations for the partner institutions' local specialties and environment.

ELIGIBILITY

The Program accepts M.S. and Ph.D. graduates of CAMPEP-accredited Medical Physics Programs; we also accept postdoctoral fellows who have worked at least 2 years in radiation oncology physics and have completed appropriate medical physics courses (see [AAPM Report 197S](#)). LSU medical physics M.S. and Ph.D. graduates, as well as LSU and MBPCC postdoctoral fellows, have first priority for admission.

STIPEND

Residents receive a stipend from MBPCC at the same rate as physician PGY-1 and PGY-2 residents in regional medical residencies of the LSU System for the first and second years of residency, respectively.

CONTACT INFORMATION

Please visit the [MBPCC residency website](#). To request additional information, please contact

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