



## **DOCTOR OF PHILOSOPHY IN PHYSICS**

### **Objectives**

The program aims to produce graduates with advanced training in physics who are capable of: (1) undertaking original and independent research in experimental or theoretical physics; and (2) assuming top-level physicist positions in academic, industrial and/or research institutions.

### **Admission Requirements**

Admission to the Ph. D. Physics program shall require:

1. An M. S. Physics degree or its equivalent from a recognized institution of higher learning
2. A copy of the Official Transcript of Records
3. Three (3) letters of recommendations from former professors and immediate supervisors attesting to the applicant's intellectual capacity for advanced studies
4. Compliance of the School of Graduate Studies and the institute admission requirements.
5. If necessary, an entrance examination covering the core courses at the M.S. Physics level will be administered.

### **Course Requirements**

A minimum of sixty-two (62) units consisting of eighteen (18) units of course work after the M.S Physics course, thirty (30) units of doctoral research work, two (2) units of seminar presentation and twelve (12) units of Ph. D. dissertation are required.

The course work will be chosen from the Physics 300 series course offerings. This shall be determined by the Graduate Program Committee based on the student's academic background and research interests.

The graduate seminars are one-unit subjects involving the presentation of a research paper arising from library, independent research and dissertation works.

The doctoral research work will be taken after the student has completed all the course requirements and has passed the candidacy examination. This research work is done towards the completion of the student's Ph. D. dissertation. The subsequent enrollment in doctoral research work is contingent upon the certification of the student's adviser that his/her work is satisfactorily in progress every semester.

The Ph. D. dissertation is enrolled on the semester when the student is ready for the final doctoral examination.

### **Other Requirements**

Other requirements include:

1. pass a written examination in his/her area of specialization.
2. pass an oral defense of his/her dissertation.
3. submit a preprint based on the approved dissertation and endorsed as an acceptable article for publication in a refereed scientific journal.

**DOCTOR OF PHILOSOPHY IN PHYSICS (PH.D. PHYS)**  
(LIST OF COURSES BY SEMESTER)

**First Year, First Semester**

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 300 series		3				
Phys 300 series		3				
Phys 300 series		3				
	Graduate Seminar	1				
	Total	10				

**First Year, Second Semester**

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 300 series		3				
Phys 300 series		3				
Phys 300 series		3				
	Graduate Seminar I	1				
	Total	10				

**First Year, Summer**

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 399	Doctoral Research Work	6				
	Total	6				

**Second Year, First Semester**

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 399	Doctoral Research Work	6				
	Total	6				

**Second Year, Second Semester**

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 399	Doctoral Research Work	6				
	Total	6				

### Second Year, Summer

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 399	Doctoral Research Work	6				
	Total	6				

### Third Year, First Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 399	Doctoral Research Work	6				
	Total	6				

### Third Year, Second Semester

Course No.	Course Title	Units	Hrs/Wk			Prerequisite(s)
			Lec	Lab	Total	
Phys 400	Doctoral Dissertation	12				
	Total	12				

**TOTAL NUMBER OF UNITS: 62**

#### Course Offerings:

Phys 301	Special Topics in Experimental Physics	1-3 units
Phys 305	Special Topics in Theoretical Physics	1-3 units
Phys 311	Advanced Mathematical Physics I	3 units
Phys 312	Advanced Mathematical Physics II	3 units
Phys 313	Advanced Mathematical Physics III	3 units
Phys 335	Plasma Physics I	3 units
Phys 336	Plasma Physics II	3 units
Phys 341	Quantum Field Theory I	3 units
Phys 342	Quantum Field Theory II	3 units
Phys 351	Advanced Statistical Mechanics	3 units
Phys 355	Advanced Atomic and Molecular Physics	3 units
Phys 361	Quantum Electronics I	3 units
Phys 362	Quantum Electronics II	3 units
Phys 371	Advanced Solid State Physics I	3 units
Phys 372	Advanced Solid State Physics II	3 units
Phys 375	Advanced Low-Temperature Physics	3 units
Phys 381	Advanced Nuclear Physics	3 units
Phys 385	Current Topics in Particle Theory	3 units
Phys 387	Current Topics in Experimental Particle Physics	3 units
Phys 390	Independent Study	3 units
Phys 398	Graduate Seminar	1 unit
Phys 399	Doctoral Research Work	50 units max.
Phys 400	Ph. D. Dissertation	12 units

## CATALOGUE OF COURSES

### PHYSICS 301 SPECIAL TOPICS IN EXPERIMENTAL PHYSICS

Advanced laboratory techniques and instrumentation in specialized area of experimental physics that is not covered in the other courses. This subject may be taken repeatedly.

Credit : 1 to 3 units

### PHYSICS 305 SPECIAL TOPICS IN THEORETICAL PHYSICS

Advanced topics in specialized area of theoretical physics that is not covered in the other courses. This subject may be taken repeatedly.

Credit : 1 to 3 units

### PHYSICS 311 ADVANCED MATHEMATICAL PHYSICS I

Structure and representation theory of various Lie groups.

Credit : 3 units

### PHYSICS 312 ADVANCED MATHEMATICAL PHYSICS II

Selected advanced topics in topology, differential geometry and related areas of mathematics that are important in contemporary theoretical physics.

Credit : 3 units

### PHYSICS 313 ADVANCED MATHEMATICAL PHYSICS III

Selected advanced topics in functional analysis, operator algebras and related areas of mathematics that are important in contemporary theoretical physics.

Credit : 3 units

### PHYSICS 335 ADVANCED PLASMA PHYSICS

Selected advanced topics of current interest in plasma physics.

Credit : 3 units

### PHYSICS 341 QUANTUM FIELD THEORY I

Lagrangian field theory; field quantization; Feynman path integral in field theory; renormalization, dimensional regularization and its application to  $\lambda\phi^4$  theory.

Credit : 3 units

### PHYSICS 342 QUANTUM FIELD THEORY II

Path integral formulation of gauge theories; perturbative evaluation of gauge theories; some applications to the theory of elementary particles; current problems.

Credit : 3 units

PHYSICS 351 ADVANCED STATISTICAL MECHANICS

Selected advanced topics of current interest in statistical mechanics.

Credit : 3 units

PHYSICS 355 ADVANCED ATOMIC AND MOLECULAR PHYSICS

Selected advanced topics of current interest in atomic and molecular physics.

Credit : 3 units

PHYSICS 361 QUANTUM ELECTRONICS I

Selected advanced topics in laser physics such as advanced laser systems; optical detectors and modulators; optical fibers and optical communication; optoelectronic devices' integrated optics.

Credit : 3 units

PHYSICS 362 QUANTUM ELECTRONICS II

Selected advanced topics of current interest in non-linear optics and quantum optics.

Credit : 3 units

PHYSICS 371 ADVANCED SOLID STATE PHYSICS I

Selected advanced topics in solid state physics with focus on semiconductors, metals, surfaces and interfaces, thin films and amorphous materials.

Credit : 3 units

PHYSICS 372 ADVANCED SOLID STATE PHYSICS II

Selected advanced topics in solid state physics with focus on dielectric materials, magnetic materials, phase transitions and low-dimensional systems.

Credit : 3 units

PHYSICS 375 ADVANCED LOW-TEMPERATURE PHYSICS

Selected advanced topics of current interest in superconductivity and superfluidity.

Credit : 3 units

PHYSICS 381 ADVANCED NUCLEAR PHYSICS

Selected advanced topics of current interest in nuclear physics.

Credit : 3 units

PHYSICS 385 CURRENT TOPICS IN PARTICLE THEORY I

Current topics in the gauge theories of strong, weak and electromagnetic interactions as well as the unification problem.

Credit : 3 units

PHYSICS 386 CURRENT TOPICS IN PARTICLE THEORY II

Additional current topics in theoretical particle physics.

Credit : 3 units

PHYSICS 390 INDEPENDENT STUDY

A short-term laboratory investigation of an assigned problem. This subject may be taken repeatedly.

Credit : 3 units

PHYSICS 398 GRADUATE SEMINAR

Involves the presentation of a research paper arising from library, independent research and dissertation research works. This subject maybe taken repeatedly.

Credit : 1 unit

PHYSICS 399 DOCTORAL RESEARCH WORK

Credit : 6 units up to a maximum of 50 units total credit

Prerequisite(s) : Passing of the candidacy examination and completion of all course requirements. This subject maybe enrolled repeatedly.

PHYSICS 400 PH. D. DISSERTATION

Credit : 12 units

Prerequisite(s) : Passing of the candidacy examination and completion of all course requirements.