

Orientation to the Undergraduate Thesis for BS Applied Physics Students

Second Semester, AY 2020-2021

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Introduction to the Undergraduate Thesis:

Outline:

- a. Physics and Applied Physics
- b. The BS Applied Physics Curriculum and APHY 200
- c. How to find a thesis adviser and join a research group
- d. Potential thesis advisers
- e. Thesis template

UNDERGRADUATE THESIS TEMPLATE FOR THE BS APPLIED
PHYSICS PROGRAM

by

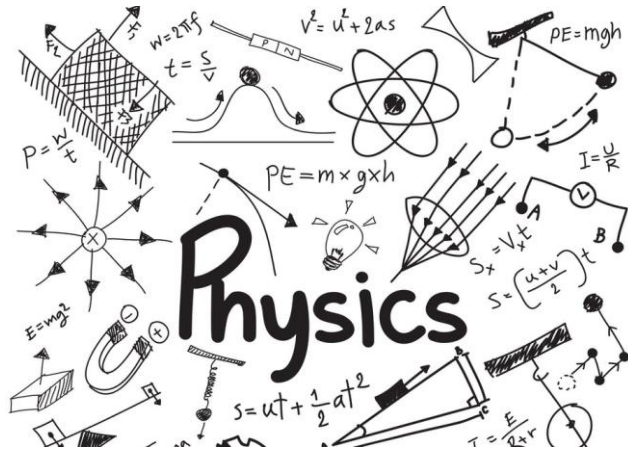
RICHARD P. FEYNMAN

An Undergraduate Thesis submitted to the Physics Division
Institute of Mathematical Sciences and Physics
College of Arts and Sciences
University of the Philippines Los Baños

In Partial Fulfillment of the Requirements
for the Degree of
Bachelor of Science in Applied Physics

July 2020

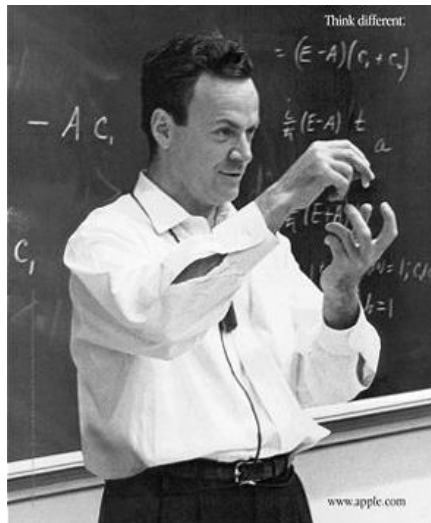
So you want to become a Physicist:



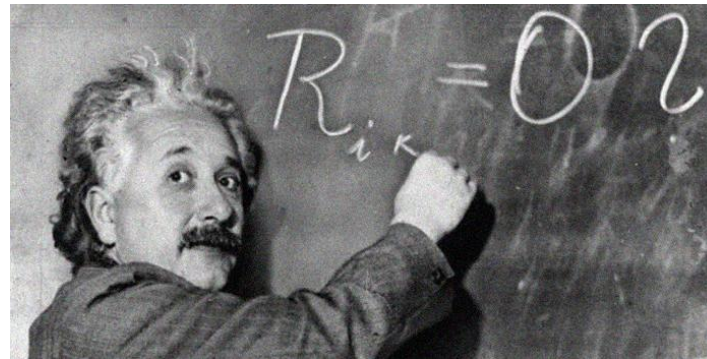
<http://theconversation.com>

Wikipedia:

Physics is the natural science that studies **matter**, its **motion and behavior through space and time**, and the related entities of **energy and force**. Physics is one of the most fundamental scientific disciplines and its **main goal is to understand how the universe behaves**.



Richard P. Feynman
(QED, Path-Integrals, Superconductivity)

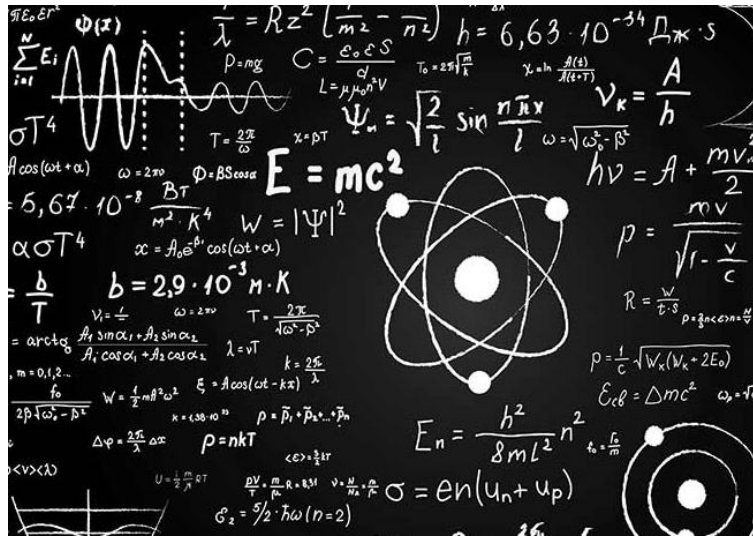


Albert Einstein
(Special and General Relativity,
Cosmology)



John Bardeen, William Shockley,
Walter Brattain
(transistor, semi-conductor devices)

Physics and Applied Physics:



<http://www.insidescience.org>

Physics is the systematic study of:

- matter,
- energy,
- and their interactions.

The ultimate goal of physics is the **understanding** of how the universe works.

Progress in physics is underpinned by:

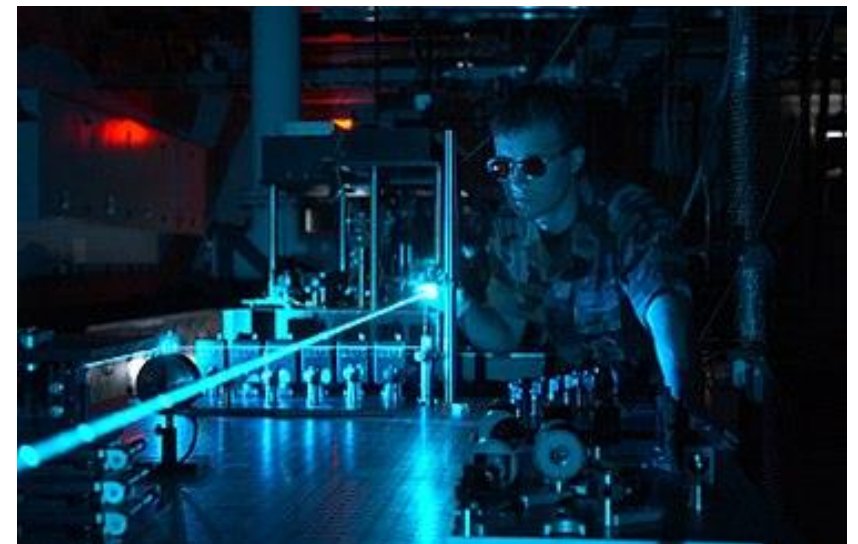
- tests and **experiments**, and
- the construction of **theoretical models**

to explain physical phenomena.

The knowledge gained from our deeper understanding of how things work can be utilized to create new technological devices, gadgets, and instruments.

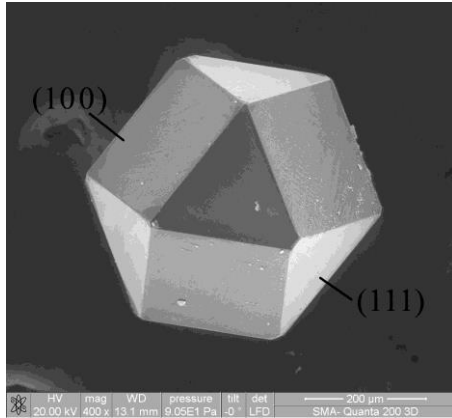
Applied Physics is a category of physics:

- that focuses on the creation of such new technologies, utilizing concepts and discoveries in physics, and
- the application of physics, including its methods and approaches, to other disciplines, including physics itself.



Wikipedia

Applied Physics and Engineering:



<https://commons.wikimedia.org/w/index.php?curid=293714>

Sample research fields in Applied Physics:

- Accelerator physics
- Atmospheric physics
- Biophysics
- Chemical physics
- Artificial Intelligence
- Materials physics
- Photonics
- Geophysics
- Medical physics
- Nuclear physics
- Plasma physics
- Quantum technology
- Spectroscopy



<https://commons.wikimedia.org/w/index.php?curid=40512710>

Engineering, in contrast, aims to develop specific practical applications from our understanding of how things work.

Both engineering and applied physics are rooted in physics. However, the difference lies in their approaches:

- An engineer starts out with a particular practical application in mind and then utilizes physics to realize that application.
- An applied physicist, on the other hand, takes into account recently discovered physics and then explores their practical implications.

Applied Physics and Engineering are necessary for technology to progress.

Categories of Physics:

- **Experimental physics:**
The construction of actual **laboratory set-ups**, the acquisition of data, and the statistical analysis of the resulting data to probe the properties and behavior of physical systems.
- **Theoretical physics:**
The construction of **theoretical models** to explain the properties and behavior of physical systems and predict how those systems will behave in specific situations.
- **Computational physics:**
The utilization of **computers** to solve theoretical problems and construct simulations of theoretical models to compare with experimental results and predict the properties and behavior of physical systems.
- **Observational physics:**
The acquisition of data via **observation** of physical processes involving systems that are too large for the construction of experiments.
- **Applied physics:**
The construction of new devices, materials, processes, and technologies for **practical use** and the application of physics and its methods to other scientific disciplines.
- **Physics education:**
The investigation of methods to improve the **instruction** of physics to high school, college, and graduate students.

The BS Applied Physics Curriculum at UPLB:

FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR
First Semester: KAS 1 ARTS 1 CHEM 18 CHEM 18.1 MATH 27 PHYS 101	First Semester: ETHICS 1 GE APHY 10.1 APHY 101 PHYS 103 PHYS 112	First Semester: APHY 102 PHYS 122 PHYS 115 PHYS 132 PHYS 192.1 PI 10	First Semester: APHY 200 Physics Elective Physics Elective Physics Elective PHYS 142 Free Elective
Second Semester: GE COMA 150 PHYS 102 PHYS 111 MATH 28	Second Semester: GE PHYS 104 PHYS 113 PHYS 121 PHYS 131	Second Semester: PHYS 141 PHYS 151 PHYS 195 Physics Elective PHYS 165 COMM 10	Second Semester: APHY 200 APHY 191 APHY 199 Physics Elective Free Elective STS 1
		Midyear: APHY 198	

APHY 200 (Undergraduate Thesis):

The BS Applied Physics Curriculum requires students to take APHY 200 twice.

- First APHY 200:
 - Problem identification, background study, literature search
 - If research is theoretical, preliminary theoretical modeling and calculations
 - If research is experimental, design and set up of experiment, preliminary data gathering
 - If research is computational, design and construction of algorithm and computer program
 - If research is applied, design and begin construction of a device
- Second APHY 200:
 - Finish research
 - Write and defend your thesis

Your thesis adviser will assign a problem for you and guide you throughout the whole process.

One year (two semesters) is not enough to produce a good thesis, this is why students are encouraged to join a research group during the 2nd semester of their sophomore year.

How to find a Thesis Adviser and join a Research Group:

- BS Applied Physics student who is at least at the second year academic standing

Procedure:

- Check the **List of Potential Thesis Advisers** to learn which faculty is doing research on topics that you are also interested in.
- Send email inquiries to several physics faculty members who you think can be your thesis adviser. Choose the faculty whose research interests coincide with your own. The faculty may discuss with you the outline/overview of his/her research, the problem that you may work on if you join his/her group, how you will be trained to do your research, and the research activities of the group.
- After communicating with several potential thesis advisers, you should have some idea about which faculty would be the right fit to be your thesis adviser. Choose 5 potential advisers and rank them according to your preference.
- Submit the following documents:
 1. **Cover Letter**, addressed to the Thesis Committee Chair, stating that you are applying to join a research group.
 2. Filled **Potential Thesis Adviser Form**.
 3. One-page **Curriculum Vitae**.
 4. A copy of your True Copy of Grades (TCG) or a printout of your **grades in SAIS**.
 5. A 400-word essay about your **research interests**.

Place all of these documents in one PDF file only. Submit it to eccuansing@up.edu.ph by 5 pm of 28 May 2021.

List of Potential Thesis Advisers:

FACULTY	SPECIALIZATION	RESEARCH CLUSTER	EMAIL ADDRESS ____@up.edu.ph
ALBAO, Marvin A.	Surface Physics	Condensed Matter and Statistical Physics	maalbao
ALINEA, Allan L.	Cosmology, Particle Physics	Astrophysics, Particle Physics, and Nuclear Physics	alalinea
ALTOVEROS, Nelio C.	Robotics and Automation, Agricultural and Environmental Instrumentation	Optics and Instrumentation	ncaltoveros
BALISTA, Junius André F.	Soft Condensed Matter Physics, Granular Matter	Analytics, Complex, and Environmental Systems	jfbalista
COLAMBO, Ivy R.	Surface Physics, Graphene and Related 2D Materials, Synchrotron-Based Spectroscopy	Condensed Matter and Statistical Physics	ircolambo
CUANSING, Eduardo C.	Quantum Thermodynamics, Quantum Transport	Condensed Matter and Statistical Physics	eccuansing
DE VERA, Francesca Isabel N.	Materials Science, Materials Characterization and Spectroscopy	Optics and Instrumentation	fndevera

List of Potential Thesis Advisers:

FACULTY	SPECIALIZATION	RESEARCH CLUSTER	EMAIL ADDRESS ____@up.edu.ph
DIZON, John Symon C.	Computational Materials Science, 2D Materials	Condensed Matter and Statistical Physics	jcdizon7
HERRERA, Marvin U.	Materials Physics, Surface and Interface Physics	Materials Physics and Engineering	muherrera
JUSI, Arvin Lester C.	Terahertz Spectroscopy, Instrumentation	Optics and Instrumentation	acjusi
LACUESTA, Terencio D.	Materials Physics, Surface and Interface Physics, Semiconductor Devices, Tribology	Materials Physics and Engineering	tdlacuesta
OCA, Gilbert M.	Computational Optics, Schlieren Optics, Instrumentation	Optics and Instrumentation	gmoca2
PADAMA, Allan Abraham B.	Computational Materials Science, Surface and Interface Physics	Condensed Matter and Statistical Physics	abpadama
PAREL, Marco Miguel P.	Superconductivity Physics, Surface and Interface Physics	Materials Physics and Engineering	mpparel

List of Potential Thesis Advisers:

FACULTY	SPECIALIZATION	RESEARCH CLUSTER	EMAIL ADDRESS ____@up.edu.ph
PIÑOL, Chryslie Margus N.	Complex Systems, Population Dynamics, Ecological Modeling	Analytics, Complex, and Environmental Systems	cnpinol
PUTUNGAN, Darwin B.	Computational Materials Science, First-Principles Calculations	Condensed Matter and Statistical Physics	dbputungan
ROXAS-VILLANUEVA, Ranzivelle Marianne L.	Physics Education and Complex Systems, Qualitative Literary Analysis, Agricultural and Environmental Instrumentation	Analytics, Complex, and Environmental Systems	rrvillanueva3
SANTOS-PUTUNGAN, Alexandra B.	Computational Materials Science, Low-Dimensional Materials Physics	Materials Physics and Engineering	absantos1
TAPIA, Alvin Karlo B.	Chemical Physics, Disordered Materials, Terahertz Spectroscopy	Optics and Instrumentation	agtapia
VILLANUEVA, Anthony Allan D.	Foundations of Quantum Mechanics, Quantum Mechanics in Phase Space	Quantum Information and Foundations of Quantum Mechanics	advillanueva1

Research Clusters:

- Analytics, Complex, and Environmental Systems
- Astrophysics, Particle Physics, and Nuclear Physics
- Condensed Matter and Statistical Physics
- Materials Physics and Engineering
- Optics and Instrumentation
- Physics Education
- Quantum Information and Foundations of Quantum Mechanics

In your application, you must choose one Research Cluster that is closest to your interests.

Writing Your Thesis:

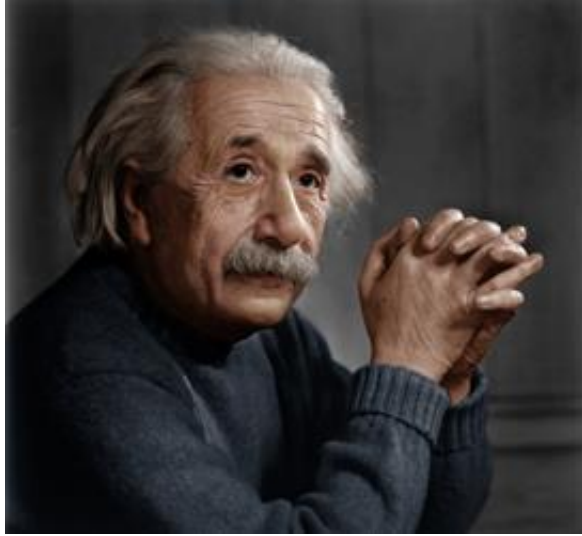
The thesis is the final output of your undergraduate research.

Good research results and an excellently written thesis can help you reach your goals.

The sequence of chapters in an undergraduate thesis:

- I. Introduction
- II. Review of Related Literature
- III. Methodology
- IV. Results and Discussion
- V. Summary and Conclusion
- VI. Appendix A: Draft of Journal Article
- VII. Appendix B: Other Supplemental Materials

UPLB has strict formatting rules for the thesis manuscript. The Thesis Committee has prepared a LaTeX [thesis template](#) that conforms to these rules. Using this template can help you focus on the content of your thesis rather than on its formatting. Contact me if you want a copy of the thesis template. To use the template, you will need a working LaTeX installation on your computer.



The next Einstein?

Thank you for your attention!