JAN 2 0 2020

UNIVERSITY OF THE PHILIPPINES
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OFFICE OF THE VICE PRESIDENT FOR ACADEMIC AFFAIRS

15 January 2020

DANILO L. CONCEPCION
President
University of the Philippines

Dear President Concepcion:

This is to recommend for approval the following curricular proposals of UP Diliman. These proposals were approved by the UP Diliman University Council (see Annex 1).

A. College of Architecture
   1. Bachelor in Landscape Architecture
B. College of Arts and Letters
   1. Bachelor of Arts (Speech Communication)
   2. Bachelor of Arts (Art Studies: Philippine Arts)
   3. Bachelor of Arts (Art Studies: Art History)
   4. Bachelor of Arts (Art Studies: Interdisciplinary)
   5. Bachelor of Arts (European Languages)
   6. Bachelor of Arts (Theater Arts)
C. College of Education
   1. Bachelor of Elementary Education
   2. Bachelor of Secondary Education
D. College of Engineering
   1. Bachelor of Science in Mining Engineering
   2. Bachelor of Science in Materials Engineering
   3. Bachelor of Science in Metallurgical Engineering
   4. Bachelor of Science in Geodetic Engineering
   5. Bachelor of Science in Computer Science
   6. Bachelor of Science in Electrical Engineering
   7. Bachelor of Science in Computer Engineering
   8. Bachelor of Science in Electronics and Communications Engineering
   9. Bachelor of Science in Industrial Engineering
   10. Bachelor of Science in Mechanical Engineering
E. College of Fine Arts
   1. Bachelor of Fine Arts (Art Education)
F. College of Home Economics
   1. Bachelor of Science in Family Life and Child Development
   2. Bachelor of Science in Hotel, Restaurant and Institution Management
   3. Bachelor of Science in Community Nutrition
G. College of Mass Communication
   1. Bachelor of Arts in Journalism

2. Bachelor of Arts in Communication Research
3. Bachelor of Arts in Film
4. Bachelor of Arts in Broadcast Communication

H. College of Music
1. Bachelor in Music

I. College of Science
1. Bachelor of Science in Physics
2. Bachelor of Science in Applied Physics (Instrumentation Physics)
3. Bachelor of Science in Applied Physics (Materials Physics)
4. Bachelor of Science in Molecular Biology and Biotechnology
5. Bachelor of Science in Mathematics
6. Bachelor of Science in Biology

J. College of Social Sciences and Philosophy
1. Bachelor of Arts (Anthropology)
2. Bachelor of Arts (Linguistics)
3. Bachelor of Science (Geography)
4. Bachelor of Arts (History)

K. College of Social Work and Community Development
1. Bachelor of Science in Social Work

L. School of Library and Information Science
1. Bachelor in Library and Information Science

M. School of Statistics
1. Bachelor of Science (Statistics)

Truly yours,

Maria Cynthia Rose Banzon Bautista
Vice President for Academic Affairs

APPROVED

TEODORO J. HERBOSA, M.D.
EXECUTIVE VICE PRESIDENT
BY AUTHORITY OF THE PRESIDENT

Annex 1. List of curricular proposals and dates of UC endorsement and submission of revised proposals to OVPAA

Curricular Proposal	UC Endorsement	1st submission of the revised proposal to OVPAA	UC Endorsement	2nd submission of the revised proposal to OVPAA	UC Endorsement	3rd submission of the revised proposal to OVPAA
College of Architecture						
Bachelor in Landscape Architecture	18-Apr-18	29-May-18	28-May-18	9-Aug-18		
College of Arts and Letters						
Bachelor of Arts (Speech Communication)	19-Jun-18	30-Aug-18				
Bachelor of Arts (Art Studies: Philippine Arts)	19-Jun-18	20-Aug-18				
Bachelor of Arts (Art Studies: Art History)	19-Jun-18	20-Aug-18				
Bachelor of Arts (Art Studies: Interdisciplinary)	19-Jun-18	20-Aug-18				
Bachelor of Arts (European Languages)	2-Sep-19	19-Sep-19				
Bachelor of Arts (Theater Arts)	19-Jun-18	30-Aug-18				
College of Education						
Bachelor of Elementary Education	15-Jul-19 & 2-Sept-19	21-Nov-19				
Bachelor of Secondary Education	15-Jul-19 & 2-Sept-19	21-Nov-19				
College of Engineering						
Bachelor of Science in Mining Engineering	*CC approved	17-Apr-19	24-Jun-19	28-Aug-19		
Bachelor of Science in Materials Engineering	18-Feb-19	7-May-19				
Bachelor of Science in Metallurgical Engineering	*CC approved	28-Nov-18	26-Nov-18	28-Aug-19	15-Jul-19	28-Aug-19
Bachelor of Science in Geodetic Engineering	*CC approved	17-Apr-19	24-Jun-19	19-Sep-19		
Bachelor of Science in Computer Science	19-Jun-18	6-Sep-18				
Bachelor of Science in Electrical Engineering	19-Jun-18	30-Aug-18				
Bachelor of Science in Computer Engineering	19-Jun-18	30-Aug-18				

Curricular Proposal	UC Endorsement	1st submission of the revised proposal to OVPAA	UC Endorsement	2nd submission of the revised proposal to OVPAA	UC Endorsement	3rd submission of the revised proposal to OVPAA
Bachelor of Science in Electronics and Communications Engineering	19-Jun-18	30-Aug-18				
Bachelor of Science in Industrial Engineering	19-Jun-18	30-Aug-18				
Bachelor of Science in Mechanical Engineering	28-May-18	15-Aug-18				
College of Fine Arts						
Bachelor of Fine Arts (Art Education)	15-Jul-19	5-Aug-19				
College of Home Economics						
Bachelor of Science in Family Life and Child Development	28-May-18	23-Aug-18	18-Feb-19	9-Sep-19		
Bachelor of Science in Hotel, Restaurant and Institution Management	19-Jun-18	20-Aug-18				
Bachelor of Science in Community Nutrition	*CC approved	23-May-18	28-May-18	30-Aug-18		
College of Mass Communication						
Bachelor of Arts in Journalism	19-Jun-18	24-Jun-19				
Bachelor of Arts in Communication Research	28-May-18	20-Aug-18				
Bachelor of Arts in Film	19-Jun-18	30-Aug-18				
Bachelor of Arts in Broadcast Communication (The previous curriculum proposal (2018) was approved by the President on 8 March 2019. The attached proposal is the revised 2018 curriculum)	15-Jul-19	5-Aug-19				
College of Music						
Bachelor in Music	*CC approved	29-Nov-18	26-Nov-18	17-Oct-19		
College of Science						
Bachelor of Science in Physics	19-Jun-18	20-Aug-18				

Curricular Proposal	UC Endorsement	1st submission of the revised proposal to OVPAA	UC Endorsement	2nd submission of the revised proposal to OVPAA	UC Endorsement	3rd submission of the revised proposal to OVPAA
Bachelor of Science in Applied Physics (Instrumentation Physics)	19-Jun-18	20-Aug-18				
Bachelor of Science in Applied Physics (Materials Physics)	19-Jun-18	20-Aug-18				
Bachelor of Science in Molecular Biology and Biotechnology	28-May-18	20-Aug-18				
Bachelor of Science in Mathematics	19-Jun-18	20-Aug-18				
Bachelor of Science in Biology	19-Jun-18	20-Aug-18				
College of Social Sciences and Philosophy						
Bachelor of Arts (Anthropology)	19-Jun-18	20-Aug-18		1 July 2019 (replacement of proposed & final checklist)		
Bachelor of Arts (Linguistics)	28-May-18	24-Aug-18				
Bachelor of Science (Geography)	19-Jun-18	5-Sep-18				
Bachelor of Arts (History)	28-May-18	24-Jun-19				
College of Social Work and Community Development						
Bachelor of Science in Social Work	19-Jun-18	20-Aug-18				
School of Library and Information Science						
Bachelor in Library and Information Science	28-May-18	15-Aug-18				
School of Statistics						
Bachelor of Science (Statistics)	19-Jun-18	23-Aug-18				

20 August2018

Referred to : VP Bautista

For Appropriate Action, please

UPDiliman Proposals

Ref. No. & Date	Title	Date Received/DTS Nos.
Ref. No. MLT 18-427, dtd 16August2018	Proposal for the Revision of the Bachelor of Science in Mathematics Program (Appendix ZZ)	17August2018 2018-0815-0011-8375
Ref. No. MLT 18-428, dtd 16August2018	Proposal for the Revision of the Bachelor of Arts in Communication Research Program (Appendix JJ)	17August2018 2018-0815-0011-8376
Ref. No. MLT 18-429, dtd 16August2018	Proposal for the Revision of the Bachelor of Science in Social Work (Appendix AJ)	17August2018 2018-0815-0011-8374
Ref. No. MLT 18-430, dtd 16August2018	Proposal for the Revision of the Bachelor of Arts (Anthropology) (Appendix NN)	17August2018 2018-0815-0011-8373
Ref. No. MLT 18-431, dtd 16August2018	Proposal for the Revision of the Bachelor of Science in Molecular Biology Program (Appendix GG)	17August2018 2018-0815-0011-8372
Ref. No. MLT 18-432, dtd 16August2018	Proposal for the Revision of the Bachelor of Science in Biology (Appendix YY)	17August2018 2018-0815-0011-8370
Ref. No. MLT 18-433, dtd 16August2018	Curricular proposals (*Appendix OO*, Revision of Bachelor of Arts [Art Studies: Philippine Art] program College of Arts and Letters); (*Appendix PP*, Revision of Bachelor of Arts [Art Studies: Art History] program, CAL); (*Appendix QQ*, Revision of Bachelor of Arts [Art Studies: Interdisciplinary] program, CAL)	17August2018 2018-0815-0011-8369
Ref. No. MLT 18-434, dtd 16August2018	Curricular Proposal (*Appendix AB*, Revision of Bachelor of Science in Physics) Program, College of Science; (Appendix AC, Revision of Bachelor of Science in Applied Physics [Instrumental Physics] program, CS); Appendix AD, Revision of Bachelor of Science in Applied Physics [Materials Physics] program, CS)	17August2018 2018-0815-0011-8371
Ref. No. MLT 18-435, dtd 17August2018	Proposal for the Revision of the Bachelor of Science in Hotel, Restaurant and Institution Management (Appendix RR)	20August2018 2018-0815-0011-8379

818 924

Instrumentation

Atty. Roberto M.J. Lara

Secretary of the University and of the Board of Regents

OFFICIAL RELEASE

JAN 20 2020

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16 August 2018

REFERENCE NO. MLT-18-434

Atty. Danilo L. Concepcion
President
University of the Philippines System
Diliman, Quezon City

Dear President Concepcion:

I would like to submit for your consideration and approval the curricular proposals endorsed by the University Council at its (special) meeting held on 19 June 2018.

Appendix AB	*Revision of Bachelor of Science in Physics Program* College of Science
Appendix AC	*Revision of Bachelor of Science in Applied Physics (Instrumentation Physics) Program* College of Science
Appendix AD	*Revision of Bachelor of Science in Applied Physics (Materials Physics) Program* College of Science

Thank you.

Very truly yours,

MICHAEL L. TAN, PhD
Chancellor

Encl.: 1 copy of the proposal

UNIVERSITY OF THE PHILIPPINES DILIMAN
Office of the University Registrar

T.M. Kalaw St. corner Quirino St., U.P. Diliman, Q.C. 1101 ▪ P.O. Box 161, U.P. Diliman, Q.C. 1101
Direct Line 927-6084 ▪ U.P. Diliman Trunk Line No. 981-8500

10 August 2018

MICHAEL L. TAN, DVM, PhD
Chancellor
University of the Philippines
Diliman, Quezon City

THROUGH: Vice Chancellor Evangeline C. Amor, PhD
Office of the Vice Chancellor for Academic Affairs

Dear Chancellor Tan:

I would like to submit for your consideration and endorsement to the President the curricular proposals endorsed by the University Council at its (special) meeting held on 19 June 2018.

Appendix AB *Revision of the Bachelor of Science in Physics Program*
College of Science

Appendix AC *Revision of the Bachelor of Science in Applied Physics (Instrumentation Physics) Program*
College of Science

Appendix AD *Revision of the Bachelor of Science in Applied Physics (Materials Physics) Program*
College of Science

Sincerely,

MA. THERESA T. PAYONGAYONG, PhD
University Registrar and UPD UC CC Member-Secretary

Encl. 1 copy of the proposal

NATIONAL INSTITUTE OF PHYSICS
College of Science
University of the Philippines
Diliman, Quezon City

PROPOSED CURRICULAR REVISION OF THE BACHELOR OF SCIENCE IN APPLIED PHYSICS (INSTRUMENTATION PHYSICS) PROGRAM

I. Background/Rationale

Students who have taken the K-12 basic education program are entering the university in AY 2018-2019. Internationally, a 4-year BS Applied Physics program is typical after a basic K-12 education.

The BS Applied Physics program adopted a 5-year curriculum effective AY 1984-1985 to enhance the offering of the Institute, with Applied Physics 199 (Independent Research) and Applied Physics 200 (Undergraduate Thesis) to be taken in the 5th year. Since then, it has become an institutional practice to accept students into the research laboratories in their 3rd or early 4th year in preparation for their thesis. This practice has been validated by the increased enrollment in the graduate Physics program. Graduates of the program have found employment in fields ranging from the semiconductor industry to the more nascent sector of data analytics. Mentoring inside a research lab goes beyond providing a nurturing environment for writing a thesis. Exposure to issues of national development and industry needs are encountered inside labs that require an infusion of grants from the national government and other institutions.

Without losing the gains of mentoring inside the research laboratories while still maintaining the level of rigor of the courses, this proposal aims to change the length of the BS Applied Physics program, which was last updated in June 2012, from 5 years to 4 years. There is a need to streamline the courses to make the program more responsive to the demands of a fast-changing environment both in a national as well as a global context. Enhancing the depth and breadth of courses becomes possible with the increased background preparation and maturity of students entering the program, and pedagogical and technological advances. Reflective of these ideas are: (1) institution of new courses without changing the course titles for the fundamental physics series, mathematical physics series, and the classical mechanics series; (2) reconfiguration of the experimental physics laboratories; (3) institution of electives geared towards understanding physics concepts in depth; (4) revision of existing courses to cover the physics of enabling technologies such as photonics and optoelectronics; and (5) merging of existing courses that evolved to have significant overlap.

Concurrently existing courses may have the same title but different course numbers: there is a plan to eventually change the new course numbers back to the old ones (e.g. Physics 106 will be renumbered to Physics 101 after the transitory period).

This proposal also reflects the revised GE requirements approved by the BOR in October 2017.

II. Summary of Proposed Changes

The proposed changes are:

A. Institution of Courses
B. Change in Program Requirements

Institution of courses		
1. App Physics 157 Computational Analysis and Modeling in Physics		
2. App Physics 167 Applied Optics		
3. App Physics 184 Physical Electronics and Instrumentation		
Change in program requirements		
Nature	Existing	Proposed
1. Change in GE requirements	Core – 18 units *AH – 9 units* *MST – 3 units* *SSP – 6 units* Program-prescribed – 3 units *MST – 3 units* Free GE – 18 units *AH – 6 units* *SSP – 9 units* Total = 36 units	Core – *21 units* Program-prescribed – *3 units* Free GE – *0 units* Total = 24 units
2. Deletion of courses from the program	1. Math 14 Trigonometry or Math 17 Algebra and Trigonometry 2. Math 53 Elementary Analysis I 3. Math 54 Elementary Analysis II 4. Math 55 Elementary Analysis III 5. Math 121.1 Elementary Differential Equations 6. BIO 11 (old course) 7. Chem 16 (old course) 8. Chem 17 (old course) 9. Physics 101 Fundamental Physics I 10. Physics 102 Fundamental Physics II 11. Physics 103 Fundamental Physics III 12. Physics 104 Modern Physics I 13. Physics 101.1 Fundamental Physics I Laboratory 14. Physics 102.1 Fundamental Physics I Laboratory 15. Physics 103.1 Fundamental Physics III Laboratory 16. Physics 104.1 Modern Physics I Laboratory 17. Physics 111 Mathematical Physics I 18. Physics 112 Mathematical Physics II 19. Physics 113 Mathematical Physics III 20. Physics 121 Theoretical Mechanics I 21. App Physics 156 Computer Methods in Physics II 22. App Physics 186 Instrumentation Physics II 23. Physics 166 Optical Physics II 24. App Physics 187 Photonics and Applied Optics 25. App Physics 182 Physical Electronics II 26. App Physics 183 Control Systems Approach to Physics	

	Modeling 27. App Physics 185 Instrumentation Physics I 28. App Physics 173 Solid State Physics
4. Addition of required courses to the program	1. Math 21 Elementary Analysis I 2. Math 22 Elementary Analysis II 3. Math 23 Elementary Analysis III 4. Math 122 Differential Equations and Applications 5. Chem 16 General Chemistry I 6. Chem 16.1 General Chemistry I Laboratory 7. BIO 11 Fundamentals of Biology I 8. BIO 11.1 Fundamentals of Biology I Laboratory 9. Science/Math Elective (3 u. – 5 u.) 10. Physics 106 Fundamental Physics I 11. Physics 107 Fundamental Physics II 12. Physics 108 Fundamental Physics III 13. Physics 106.1 Fundamental Physics I Laboratory 14. Physics 107.1 Fundamental Physics II Laboratory 15. Physics 116 Mathematical Physics I 16. Physics 117 Mathematical Physics II 17. Physics 126 Theoretical Mechanics I 18. Physics 142 Quantum Physics II 19. Physics 170 Condensed Matter 20. App Physics 157 Computational Analysis and Modeling in Physics 21. App Physics 167 Applied Optics 22. App Physics 184 Physical Electronics and Instrumentation
6. Addition of elective courses	1. BIO 12 Fundamentals of Biology II 2. BIO 12.1 Fundamentals of Biology II Laboratory 3. Chem 17 General Chemistry II 4. Chem 17.1 General Chemistry II Laboratory 5. Geol 41 Elementary Mineralogy and Microscopy 6. Marine Science 101 Oceans 7. Marine Science 102 The Marine Sciences 8. Math 109 Fundamental Concepts of Mathematics 9. MBB 10 Introduction to Molecular Biology 10. Meteorology 101 General Meteorology
7. Change in course sequence	1. Chem 16 2. BIO 11 3. App Physics 155 4. App Physics 181 5. Physics 141 6. Physics 161 7. Physics 165 8. Physics 191 9. Physics 192 10. Physics 196 11. App Physics 199 12. App Physics 200 13. PE

	14. NSTP 1 15. NSTP 2 16. PI 100	
8. Change in total number of units	179	148-150
9. Change in number of years of the program	5	4

III. Institution of Courses

1. **App Physics 157 Computational Analysis and Modeling in Physics.** Computational models in physics; numerical simulations of physical systems; stochastic simulation and algorithms; image processing; multidimensional detection techniques; pattern recognition

   Prerequisite: Applied Physics 155
   Meeting Type: Lecture / Laboratory
   Credit: 4 u. (3h lec, 3h lab)
   Justification: Hands-on experience in using numerical/computational techniques for solving problems in applied physics is emphasized in this course. It covers the more advanced topics of simulating physical systems and multidimensional detection methods. A background in numerical computing as covered in App Physics 155 is required in this course.

   Programs affected: BS Physics

2. **App Physics 167 Applied Optics.** Microscopy, holography and interferometry, Fourier optics, spectroscopy and nonlinear optics, imaging optics, 3D imaging

   Prerequisite: Physics 165
   Meeting Type: Lecture
   Credit: 3 u. (3h)
   Justification: This course covers essential topics in optics and photonics with an emphasis in imaging and optical characterization. An adequate background in optics (covered in Physics 165) is needed in this course.

   Programs affected: BS Physics

3. **App Physics 184 Physical Electronics and Instrumentation.** Analog-digital conversion and multiplexing; computer hardware and interfacing; microprocessors and machine language programming; applications of microprocessors. Sensors, transducers, and measurement techniques for various physical variables; signal conditioning, digitization and sampling; signal processing and reliability of data.

Prerequisite: App Physics 181
Credit: 4 u. (3h lec, 3h lab)
Meeting Type: Lecture / Laboratory
Justification: This course consolidates the core physical concepts in understanding digital instrumentation. Topics include conversion of analog to digital signals, signal processing, conditioning, analysis and control. A background in elementary electronics as covered in App Physics 181 (Physical Electronics I) is needed in this course.

Programs affected: BS Physics, BS Applied Physics (Instrumentation Physics)

IV. Change in Program Requirements

A. Change in GE Requirements

From:

	AH	MST	SSP	Total
Required GE	Comm 3 Eng 10 Fil 40 9 units	STS 3 units	KAS 1 Philo 1 6 units	 18 units
Program-prescribed		Physics 10 3 units		 3 units
Free Choice	6 units	0 units	9 units	15 units
TOTAL	**15 units**	**6 units**	**15 units**	**36 units**

To:

Required GE	ENG 13 / Speech 30 FIL 40 ARTS 1 DRMAPS / STS 1 Soc Sci 1 / Soc Sci 2 KAS 1 Philo 1	**21 units**
Program-prescribed	Physics 10	**3 units**
GE Elective		**0 units**
TOTAL		**24 units**

Justification: The changes reflect the revision of the GE framework approved by the BOR in October 2017. The list of required GE courses is updated. Physics 10 is retained as a program-prescribed GE course, as it covers topics that are not included in the majors courses.

A. Deletion of Courses

1. **Math 14 Trigonometry or Math 17 Algebra and Trigonometry**
2. **Math 53 Elementary Analysis I**
3. **Math 54 Elementary Analysis II**
4. **Math 55 Elementary Analysis III**
5. **Math 121.1 Elementary Differential Equations**

Justification: The K12 stream for Math, Science and Engineering majors is assumed to adequately prepare the students for the BS Physics program. These Math courses have been abolished by the Institute of Math and replaced by Math 21-23, and Math 122.

6. **Chem 16 General Chemistry I (old course)**
7. **Chem 17 General Chemistry II (old course)**
8. **BIO 11 Fundamentals of Biology I (old course)**

Justification: Chem 16 (old course) is replaced by the new offering Chem 16 / Chem 16.1. BIO 11 (old course) is replaced by the new offering BIO 11/ BIO 11.1. Chem 17 (old course) is deleted, while Chem 17 / Chem 17.1 is added to the list of Science / Math electives.

9. **Physics 101 Fundamental Physics I**
10. **Physics 102 Fundamental Physics II**
11. **Physics 103 Fundamental Physics III**
12. **Physics 104 Modern Physics I**

Justification: This program is affected by the changes instituted in the BS Physics program, wherein the Physics 101-103 (Fundamental Physics) and Physics 104-105 (Modern Physics) series are replaced by the Physics 106-108 series (Fundamental Physics).

13. **Physics 101.1 Fundamental Physics I Laboratory**
14. **Physics 102.1 Fundamental Physics II Laboratory**
15. **Physics 103.1 Fundamental Physics III Laboratory**

Justification: This program is affected by the changes instituted in the BS Physics program, wherein the Physics 101.1-103.1 (Fundamental Physics I-III Laboratory) are replaced by Physics 106.1 and Physics 107.1 (Fundamental Physics I & II Laboratory).

16. **Physics 104.1 Modern Physics I Laboratory**

Justification: This program is affected by the changes instituted in the BS Physics program, wherein the Physics 104.1 (Modern Physics Laboratory) has been absorbed in Physics 191-192 (Experimental Physics I-II).

17. **Physics 111 Mathematical Physics I**
18. **Physics 112 Mathematical Physics II**
19. **Physics 113 Mathematical Physics III**

Justification: This program is affected by the changes instituted in the BS Physics program, wherein Physics 111-113 (Mathematical Physics I-III, 3 x 3 u.) are replaced by Physics 116-117 (Mathematical Physics I & II, 2 x 5 u.).

20. Physics 121 Theoretical Mechanics I

Justification: This program is affected by the changes instituted in the BS Physics program, wherein Physics 121 (3 u.) is replaced by Physics 126 (Theoretical Mechanics I, 4 u.).

21. App Physics 156 Computer Methods in Physics II
22. App Physics 186 Instrumentation Physics II

Justification: App Physics 156 (4 u.) covers advanced computer programming methods, numerical modeling and simulatons, discrete models, stochastc methods, and current approaches in numerical modeling. App Physics 186 (4 u.) covers imaging systems and image processing, multdimensional detecton techniques, and pattern recogniton. Due to the computational nature of both courses, all essential topics in these courses are covered more efficiently in the newly instituted App Physics 157 (Computational Analysis and Modeling in Physics, 4 u.).

23. Physics 166 Optical Physics II
24. App Physics 187 Photonics and Applied Optics

Justification: Physics 166 (3 u.) covers coherence theory, Fourier optcs and imaging, basic microscopy, spectroscopy, and nonlinear optics. App Physics 187 (4 u.) covers the design of data acquisiton systems (DAQ)/signal processing-based instrumentaton systems, current topics and techniques for engineering and design of optcal instruments, non-destructve testng/measurement using optcal methods, and interferometry. All essential topics in these courses are covered more efficiently in the newly instituted App Physics 167 (Applied Optics, 3 u.) and the revised Physics 161 (Introductory Laser Physics and Photonics, 3 u.). Essential lab experiments in App Physics 187 (4 u.) are absorbed in Physics 191-192 (Experimental Physics I-II).

25. App Physics 182 Physical Electronics II
26. App Physics 183 Control Systems Approach to Physics Modeling
27. App Physics 185 Instrumentation Physics I

Justification: Signal detection, conditioning, processing, analysis, and control are the core ideas needed by an undergraduate Applied Physics major to tackle problems in instrumentation. With the recent advances in commodity-pricing of microprocessors, microcontrollers, and sensors (e.g. Arduino, RasPi) and the availability of high-level languages for implementation, the essential topics in these courses are

now more efficiently covered in the newly instituted App Physics 184 (Physical Electronics and Instrumentation, 4 u.).

28. App Physics 173 Solid State Physics

Justification: The topics in Physics 170 covers all the topics of App Physics 173, thus can appropriately replace the course. App Physics 173 (3 u.) cover crystal structure of solids; lattice vibratons; band theory of solids; metals; semiconductor materials and devices; dielectric, magnetic, thermal, optical, and mechanical propertes of solids; and superconductors. Physics 170 (Condensed Matter, 3 u.) covers crystal structure; mechanical, thermal, electric, and magnetic propertes of solids; band theory of solids; metals, insulators, and semiconductors; lattice vibratons; imperfections; superconductivity and superfluidity.

B. Addition of Required Courses

1. **Math 21 Elementary Analysis I**
2. **Math 22 Elementary Analysis II**
3. **Math 23 Elementary Analysis III**
4. **Math 122 Differential Equations and Applications**

Justification: Math 21-23 replaces the Math 53-55 series, while Math 122 replaces Math 121/121.1 (Elementary Differential Equations), which were abolished by the Institute of Math.

5. **Chem 16 General Chemistry I**
6. **Chem 16.1 General Chemistry I Laboratory**
7. **BIO 11 Fundamentals of Biology I***
8. **BIO 11.1 Fundamentals of Biology I Laboratory***

*subject to approval

Justification: The addition of these courses reflect the updated course number of the (old course) Chem 16 (General Chemistry 5 u.) to one with separate numbering for the lecture and lab components (Chem 16, 3u. and Chem 16.1, 2u). The same is true for BIO 11 (BIO 11, 3u. and BIO 11.1, 2u).

9. **Science/Math Elective (3 u. – 5 u.)**

Justification: With their increased background preparation, students will be allowed, with the consent of their adviser, to select from a broader range of science fundamental courses, such as BIO 12 and/or BIO 12.1, Chem 17 and 17.1, Geol 40, Marine Science 101, Marine Science 102, Math 109, Meteorology 101, or any fundamental science/math course for which he/she has satisfied the prerequisite, that would allow him/her to gain a deeper understanding of the core concepts of another field.

10. Physics 106 Fundamentals Physics I
11. Physics 107 Fundamental Physics II
12. Physics 108 Fundamental Physics III

Justification: This program is affected by the changes instituted in the BS Physics program, wherein the Physics 101-103 (Fundamental Physics) and Physics 104-105 (Modern Physics) series are replaced by the Physics 106-108 series (Fundamental Physics) in light of the increased preparedness of students who have gone through the K12 program.

13. Physics 106.1 Fundamental Physics I Laboratory
14. Physics 107.1 Fundamental Physics II Laboratory

Justification: This program is affected by the changes instituted in the BS Physics program, wherein Physics 101.1-103.1 (Fundamental Physics Labs, 3 x 1 u.) are replaced by Physics 106.1 and Physics 107.1 (Fundamental Physics I & II Lab, 2 x 1 u.) in light of the increased preparedness of students who have gone through the K12 program.

15. Physics 116 Mathematical Physics I
16. Physics 117 Mathematical Physics II

Justification: This program is affected by the changes instituted in the BS Physics program, wherein Physics 111-113 (Mathematical Physics I-III, 3 x 3 u.) are replaced by Physics 116-117 (Mathematical Physics I & II, 2 x 5 u.)

17. Physics 126 Theoretical Mechanics I

Justification: This program is affected by the changes instituted in the BS Physics program, wherein Physics 121 is replaced by Physics 126 (Theoretical Mechanics I).

18. Physics 142 Quantum Physics II

Justification: Completing the Quantum Physics series (Physics 141-142) allows students to better appreciate the more advanced topics in Physics 170 (Condensed Matter).

19. Physics 170 Condensed Matter

Justification: Physics 170 covers all the topics of App Physics 173 (Solid State Physics, 3 u.), and is an apt replacement for the latter.

20. App Physics 157 Computational Analysis and Modeling in Physics

Justification: This newly instituted course more efficiently covers the essential topics that are currently in App Physics 156 (Computer

Methods in Physics II) and App Physics 186 (Instrumentation Physics II).

21. App Physics 167 Applied Optics

Justification: In conjunction with the revised Physics 161 (Introductory Laser Physics and Photonics, 3 u.) and Physics 192 (Experimental Physics II, 4u.), this newly instituted lecture course replaces Physics 166 (Optical Physics II, 3 u.) and App Physics 187 (Photonics and Applied Optics, 4 u.).

22. App Physics 184 Physical Electronics and Instrumentation

Justification: This newly instituted course cover the essential topics of instrumentation more efficiently than the courses it will be replacing, namely: App Physics 182 (Physical Electronics II, 4 u.), App Physics 183 (Control Systems Approach to Physics Modeling, 3 u.), App Physics 185 Instrumentation Physics I, 4 u.).

C. Change in Course Classification from Required to Elective

1. Chem 17 General Chemistry II

Justification: The core topics chemistry needed by a BS Applied Physics (Instrumentation Physics) major is adequately covered in Chem 16 and Chem 16.1. Chem 17 and Chem 17.1 are now included as an option in the Science/Math Elective elective.

D. Addition of Science/Math Elective Courses

1. BIO 12 Fundamentals of Biology II and/or BIO 12.1 Fundamentals of Biology II Laboratory
2. Chem 17 General Chemistry II and Chem 17.1 General Chemistry II Laboratory
3. Geol 40 Elementary Mineralogy
4. Marine Science 101 Oceans
5. Marine Science 102 The Marine Sciences
6. Math 109 Fundamental Concepts of Mathematics
7. MBB 10 Introduction to Molecular Biology
8. Meteorology 101 General Meteorology
9. Any foundational course, with the approval of the adviser, offered by units of the College of Science for which the student has satisfied the prerequisite.

Justification: Listed are some of the introductory courses in the math and sciences that may be taken as the Science/Math Elective, provided that the student satisfies the course prerequisite.

E. Change in Course Sequence

1. Chem 16
   From: 1st year, 2nd sem
   To: 1st year, 1st sem

2. BIO 11
   From: 2nd year, 2nd sem
   To: 1st year, 2nd sem

3. App Physics 155
   From: 3rd year, 2nd sem
   To: 3rd year, 1st sem

4. App Physics 181
   From: 3rd year, 2nd sem
   To: 2nd year, 2nd sem

5. Physics 141
   From: 3rd year, 2nd sem
   To: 3rd year, 1st sem

6. Physics 161
   From: 5th year, 1st sem
   To: 4th year, 2nd sem

7. Physics 165
   From: 4th year, 1st sem
   To: 3rd year, 2nd sem

8. Physics 191
   From: 4th year, 1st sem
   To: 3rd year, 2nd sem

9. Physics 192
   From: 4th year, 2nd sem
   To: 4th year, 1st sem

10. Physics 196
    From: 5th year, 2nd sem
    To: 4th year, 2nd sem

11. App Physics 199
    From: 5th year, 1st sem
    To: 4th year, 1st sem

12. App Physics 200
    From: 5th year, 2nd sem
    To: 4th year, 2nd sem

Justification: The resequencing of these courses take into account the reduction in the number of years of the program, along with the earlier time at which the prerequisite courses are satisfied.

13. PE
From: 2nd year, 1st sem
To: 3rd year, 1st sem

14. NSTP 1
From: 4th year, 1st sem
To: 3rd year, 1st sem

15. NSTP 2
From: 4th year, 2nd sem
To: 3rd year, 2nd sem

16. PI 100
From: 5th year, 2nd sem
To: 4th year, 2nd sem

Justification: The resequencing of these courses take into account the reduction in the number of years of the program, along with balancing the course load of the students.

F. Change in Total Number of Units

From: 179 units

To: 148-150 units

Justification: The change in the number of units reflects the streamlining of required Physics courses (reduced by 11-13 u.), as well as a reduction in the number of required GE courses (reduced by 12 u.), and non-Physics science/math required courses (reduced by 6 u.).

	Existing	Proposed	Reduction
GE + PI 100	39	27	12
Sci/Math (sans Physics)	38	32	6
Physics (w/ 3-5u. Physics/App Physics elective)	102	89 -- 91	13
Total	179	148 - 150	31

G. Change in Number of Years

From: 5 years

To: 4 years

Justification: The increased preparation of the students coming out of the K12 program, along with the streamlining of Physics and Applied Physics courses and the change in the GE framework permits this reduction.

	Existing	Proposed
Fund. Physics (lecture)	16 units in 4 sems	15 units in 3 sems
Fund. Physics (lab) +Exp. Physics (lab)	4 units in 4 sems + 4 units in 2 sems (adv)	2 units in 2 sems +4 units in 2 sems (adv)
Math. Physics (11x)	9 units in 3 sems	10 units in 2 sems
Core to Elective	Chem 17	Sci/Math elective (3-5u)
Merged	AP 156, 186 (8u) AP 182, 183, 185 (11u) Phys 166, AP 187 (7u)	AP 157 (4u) AP 184 (4u) AP 167 (3u) + [P191/192]

V. Checklist of Existing and Proposed Curriculum

BACHELOR OF SCIENCE IN APPLIED PHYSICS (INSTRUMENTATION PHYSICS)

College of Science

Approval of Existing Curriculum:
First Semester, AY 2012-2013
Existing (179 units)

Proposed date of effectivity:
First Semester, AY 2017-2018
Proposed (148-150 units)

FIRST YEAR

1st Semester	18 units
Math 14*	3
Math 53*	5
Geol 11	3
Geol 11.1	1
GE (AH1) English 10	3
GE (MST1) Physics 10	3
PE	(2)

1st Semester	19 units
Math 21	4
Geol 11	3
Geol 11.1	1
Chem 16	3
Chem 16.1	2
GE 1 Physics 10	3
GE 2 KAS 1	3
PE	(2)

2nd Semester	18 units
Physics 101	4
Physics 101.1	1
Math 54	5
Chem 16	5
GE (AH2) Comm 3	3
PE	(2)

2nd Semester	18 units
Physics 106	5
Physics 106.1	1
Math 22	4
BIO 11	3
BIO 11.1	2
GE 3 Eng 13 / Speech 30	3
PE	(2)

Midyear	0 units

Midyear	3-5 units
Science/Math Elective*	3-5

SECOND YEAR

1st Semester	19 units
Physics 102	4
Physics 102.1	1
Physics 111	3
Math 55	3
Chem 17	5
GE (SSP1) Philo 1	3
PE	(2)

2nd Semester	19 units
Physics 103	4
Physics 103.1	1
Physics 112	3
Math 121.1	3
Bio 11	5
GE (SSP2) Kas 1	3
PE	(2)

Midyear	0 units

1st Semester	18 units
Physics 107	5
Physics 107.1	1
Physics 116	5
Math 23	4
Math 122	3

2nd Semester	18 units
Physics 108	5
Physics 117	5
Physics 126	4
App Physics 181	4
PE	(2)

Midyear	6 units
GE 4 ARTS 1	3
GE 5 Philo 1	3

THIRD YEAR

1st Semester	17 units
Physics 104	4
Physics 104.1	1
Physics 113	3
Physics 121	3
Physics 131	3
GE (AH3) Free Choice	3

2nd Semester	20 units
Physics 132	3
Physics 141	3
App Physics 155	4
App Physics 181	4
GE (AH4) Free Choice	3
GE (SSP3) Free Choice	3

1st Semester	16 units
App Physics 155	4
Physics 131	3
Physics 141	3
GE 6 Fil 40	3
GE 7 Soc Sci 1 / Soc Sci 2	3
NSTP	(3)
PE	(2)

2nd Semester	17 units
Physics 132	3
Physics 142	3
Physics 165	3
Physics 191	4
App Physics 157	4
NSTP	(3)

Midyear	0 units

FOURTH YEAR

1st Semester	19 units
Physics 165	3
Physics 191	5
App Physics 156	4
App Physics 173	3
App Physics 182	4
NSTP	(3)

1st Semester	17 units
Physics 170	3
Physics 192	4
App Physics 167	3
App Physics 184	4
App Physics 199	3

2nd Semester	16 units
Physics 151	3
Physics 166	3
Physics 192	3
App Physics 183	3
App Physics 185	4
NSTP	(3)

2nd Semester	16 units
Physics 151	3
Physics 161	3
Physics 196	1
App Physics 200	3
PI 100	3
GE 8 DRMAPS/ STS 1	3

FIFTH YEAR

1st Semester	17 units
Physics 161	3
App Physics 186	4
App Physics 187	4
App Physics 199	3
GE (MST2) STS	3

1st Semester	0 units

2nd Semester	16 units
Physics 196	1
App Physics 200	3
GE (AH5) Fil 40	3
GE (SSP4) Free Choice	3
GE (SSP5) Free Choice	3
PI 100	3

2nd Semester	0 units

1. Math 14 and Math 53 are to be taken together provided the student has passed the APE in Math 11. Otherwise the student must take Math 17 in the 1st year/1st semester (in place of Math 14 and Math 53); Math 53 in the 1st year/2nd semester (in place of Math 54); and Math 54 in the immediately following summer session.

* Kas 1 & Fil 40 satisfy the 6-unit Philippine Studies requirement

Note: As a requirement for graduaton, all students must take six (6) units in one of the Natonal Service Training Program (NSTP) components: Civic Welfare Training Service (CWTS), Literacy Training Service (LTS), and Reserved Officer's Training Corps Military Science (ROTC Mil Sci). These are offered by UPD.

* May be chosen, upon the consent of the adviser, from courses in natural sciences or mathematics

All students required to take Math 21 must have passed any of the following: (1) Pre-Calculus from the STEM or equivalent strand of K-12; (2) the Validation Examination for Math 20 (Pre-Calculus: Functions and their Graphs) administered by the UPD Institute of Mathematics; or (3) Math 20 as a non-credit course

Notes: As a requirement for graduation, all students must take six (6) units in one of the National Service Training Program (NSTP) components: Civic Welfare Training Service (CWTS), Literacy Training Service (LTS), and Reserved Officer's Training Corps Military Science (ROTC Mil Sci). These are offered by UPD.

The University regularly reviews course curricula and may revise them. Students admitted into this program shall follow the existing curriculum until such time that a new curriculum replacing it has been duly approved for implementation. All courses prescribed and taken under this existing curriculum shall be credited under the new curriculum.

1

UNIVERSITY OF THE PHILIPPINES DILIMAN

BACHELOR OF SCIENCE IN APPLIED PHYSICS (INSTRUMENTATION PHYSICS)

College of Science

UC Approval:
149th UPD UC : 19 June 2018

Date of effectivity:
1st Semester of AY 2018-2019

FIRST YEAR

1st Semester	19 units
GE 1 : Physics 10	3
GE 2 : KAS 1	3
Math 21	4
Geol 11	3
Geol 11.1	1
Chem 16	3
Chem 16.1	2
PE	(2)

2nd Semester	18 units
GE 3 : ENG 13/Speech 30	3
Physics 106	5
Physics 106.1	1
Math 22	4
BIO 11	3
BIO 11.1	2
PE	(2)

Midyear	3-5 units
Science/Math Elective*	3-5

SECOND YEAR

1st Semester	18 units
Physics 107	5
Physics 107.1	1
Physics 116	5
Math 23	4
Math 122	3

2nd Semester	18 units
Physics 108	5
Physics 117	5
Physics 126	4
App Physics 181	4
PE	(2)

Midyear	6 units
GE 4 : ARTS 1	3
GE 5 : Philo 1	3

THIRD YEAR

1st Semester	16 units
GE 6 : Fil 40	3
GE 7 : Soc Sci 1/Soc Sci 2	3
App Physics 155	4
Physics 131	3
Physics 141	3
NSTP	(3)
PE	(2)

2nd Semester	17 units
Physics 132	3
Physics 142	3
Physics 165	3
Physics 191	4
App Physics 157	4
NSTP	(3)

FOURTH YEAR

1st Semester	17 units
Physics 170	3
Physics 192	4
App Physics 167	3
App Physics 184	4
App Physics 199	3

2nd Semester	16 units
GE 8 : DRMAPS / STS 1	3
Physics 151	3
Physics 161	3
Physics 196	1
App Physics 200	3
PI 100	3

TOTAL	148-150 units

Notes:

*May be chosen, upon the consent of the adviser, from courses in natural sciences or mathematics.

All students required to take Math 21 must have passed any of the following: (1) Pre-Calculus from the STEM or equivalent strand of K-12; (2) the Validation Examination for Math 20 (Pre-Calculus: Functions and their Graphs) administered by the UPD Institute of Mathematics; or (3) Math 20 as a non-credit course.

Notes: As a requirement for graduation, all students must take six (6) units in one of the National Service Training Program (NSTP) components: Civic Welfare Training Service (CWTS), Literacy Training Service (LTS), and Reserved Officer's Training Corps Military Science (ROTC Mil. Sci). These are offered by UPD.

The University regularly reviews course curricula and may revise them. Students admitted into this program shall follow the existing curriculum until such time that a new curriculum replacing it has been duly approved for implementation. All courses prescribed and taken under this existing curriculum shall be credited under the new curriculum.

NATIONAL INSTITUTE OF PHYSICS
College of Science
University of the Philippines, Diliman, Quezon City

PROPOSAL FOR THE INSTITUTION OFAPPLIED PHYSICS 157
COMPUTATIONAL ANALYSIS AND MODELING IN PHYSICS

A. Course Catalogue Description

1. **Course number:** App Physics 157
2. **Course Title:** Computational analysis and modeling in Physics
3. **Course Description:** Computational models in physics; numerical simulations of physical systems; stochastic simulation and algorithms; image processing; multidimensional detection techniques; pattern recognition
4. **Prerequisite:** App Physics 155 (or equiv.)
5. **Semester Offered:** 2nd semester
6. **Course Credit:** 4.0
7. **Number of Hours:** 3h (lec), 3h (lab)
8. **Meeting Type:** Lecture / Laboratory
9. **Course Goals:** To show how Monte Carlo methods, complex network tools, and image and video processing methods can be used as tools for solving applied physics problems.

B. Rationale

Hands-on experience in using numerical/computational techniques for solving problems in applied physics is highlighted in this course. It covers the core topics of Applied Physics 156 (Computer Methods in Physics II) and Applied Physics 186 (Instrumentation Physics II), both of which will be removed from the 4-year program.

C. Course Outline

1. **Course Outcomes (CO)**

Upon completion of the course, students must be able to:

- CO 1. Perform calculations involving nonlinear systems using Monte Carlo methods;
- CO 2. Use individual-based methods in modeling physical systems;
- CO 3. Use network-based methods in analyzing physical systems;
- CO 4. Measure physical variables from images and video;
- CO 5. Enhance images and other digitized signals;
- CO 6. Extract features and recognize patterns in images and video.

2. **Course Content**

Lecture/Lab Topics	No. of Hours (lec + lab)
Monte Carlo methods	6 + 6
Individual-based models: Cellular automata, agent-based models	6 + 6
Graphs and networks in physical models	9 + 9

Space-domain image processing	9 + 9
Fourier-domain image processing	9 + 9
Introduction to machine learning	12 + 12

3. Course Coverage

Week	CO	TOPIC	ESSENTIAL/ KEY QUESTIONS	Suggested Teaching and Learning Activities (Lecture-Lab work on)	Suggested Assessment Tools
1-2	CO 1	Monte Carlo methods	How do you use random numbers to perform numerical simulations? How do you evaluate outputs of Monte Carlo simulations?	Population dynamics, Diffusion-limited aggregation, Ising model	Machine Problems, Report, Exam
3-4	CO 2	Individual-based models: Cellular automata, agent-based models	What is an agent-based model? What are cellular automata models? How do you evaluate outputs of agent-based models?	Agent-based modeling, Probability distributions and ABMS	
5	CO 3	Graphs and networks in physical models	How do you describe networks?	Erdos-Renyi, Watts-Strogatz, Barabasi-Albert networks	
6			How do you extract network properties from real-world networks?	Using the SNAP database	
7	CO 4 CO 5 CO 6	Space-domain image processing	What are the different spatial (morphological) transformation techniques?	Edge detection, noise reduction, histogram manipulation	
8-9			What is the appropriate scale for applying transformations? How do you pick a suitable technique?	Image segmentation, blob analysis, feature extraction	
10-13	CO 4 CO 5 CO 6	Fourier-domain image processing	What are the properties of the Discrete Fourier	1D & 2D DFT, FT model of image formation, applications of FFT	

			Transform (DFT)? How does one perform phase filtering? When is it appropriate to use FFT on images?		
13	CO 4 CO 5 CO 6	Introduction to machine learning	What is principal components analysis? When is it appropriate?	Signal compression, spectral imaging	
14			What is a Bayes theory-based classifier?	Make a classifier using Bayes theory	
15-16			What are neural networks? When are they appropriate?	Make a classifier using neural networks	

4. **Course Requirements**
   Machine Problems
   Integration Activities
   Exams

D. References

- S. Theodoridis and K. Koutroumbas (2008). *Pattern Recognition, 4th ed.* Academic Press.
- S. Theodoridis (2015). *Machine Learning: A Bayesian and Optimization Perspective.* Academic Press.
- R. Gonzalez and R. Woods (2017). *Digital Image Processing, 4th ed.* Pearson.
- W. Kinzel, G. Reents (1997). Physics by Computer: Programming of Physical Problems Using Mathematica and C. Springer.
- A. B. Downey (2012). *Think Complexity: Complexity Science and Computational Modeling.* O'Reilly.
- C. Bishop (2011). *Pattern Recognition and Machine Learning.* Springer.

E. List of faculty members who can teach the course:

Assoc. Prof. Johnrob Bantang, Ph.D.
Prof. May Lim, Ph.D.
Prof. Caesar Saloma, Ph.D.
Prof. Maricor Soriano, Ph.D.
Prof. Giovanni Tapang, Ph.D.

NATIONAL INSTITUTE OF PHYSICS
College of Science
University of the Philippines, Diliman, Quezon City

PROPOSAL FOR THE INSTITUTION OF APPLIED PHYSICS 167
APPLIED OPTICS

I. Course Catalogue Description

1. **Course number:** App Physics 167
2. **Course Title:** Applied Optics
3. **Course Description:** Microscopy, holography and interferometry, Fourier optics, spectroscopy and nonlinear optics, imaging optics, 3D imaging
4. **Prerequisite:** Physics 165
5. **Semester Offered:** 1st semester
6. **Course Credit:** 3 units
7. **Number of Hours:** 3 h
8. **Meeting Type:** Lecture
9. **Course Goals:** To demonstrate an understanding of the principles of different optical systems and methods

COURSE OBJECTIVES

At the end of the course, the learner is expected to be able to:

1. Demonstrate advanced understanding of the principles of different optical systems and methods
2. Derive intrinsic and extrinsic parameters of optical systems
3. Design and test optical metrology systems
4. Perform measurements using optical systems

II. COURSE OUTLINE

Week	Topics
1	Review of diffraction and coherence • Fresnel Kirchhoff diffraction formula and Fresnel approximation • Temporal and spatial coherence, speckle effect
2	Wavefront reconstruction via Holography • Hologram recording and reconstruction • Digital Holography
3	Digital holographic Interferometry • Double-exposure technique • Fringe Processing and phase unwrapping
4	Fourier optics • Fourier treatment of wave propagation • 4F setup and spatial filtering
5	Spectroscopy • Emission, absorption, detection

	• Fluorescence
6	Basic microscopy • Microscopy imaging system • Numerical aperture and resolution
7	Nonlinear optics • Second harmonic generation and frequency generation • Atoms in intense fields
8-11	Camera Intrinsic and Extrinsic Parameters • Pinhole camera model • Aberrations • Modulation transfer function • Camera response function and high dynamic range imaging
12	3D Imaging • Shape from shadows • Shape from stereo • Shape from structured illumination
13-16	Colorimetry I. Properties of the human visual system I. Color order systems and color matching functions /. Color appearance phenomena /. Color difference specification I. Camera spectral sensitivity

III. COURSE REQUIREMENTS

1. Quizzes, seatwork, and problem sets
2. Projects
3. Exams

IV. REFERENCES

1. Optical Society of America (2010). Handbook of Optics, 3rd ed. Vol. I. OSA
2. P.E. Debevec, and J. Malik (2008). "Recovering high dynamic range radiance maps from photographs." *ACM SIGGRAPH 2008 classes*. ACM.
3. P. Hariharan (2007). *Basics of Interferometry 2nd ed.*, Academic Press
4. E. Hecht (2016). *Optics 5th ed.*, Pearson
5. C. Herrera, J. Kannala, and J. Heikkilä (2012). "Joint depth and color camera calibration with distortion correction." *IEEE Transactions on Pattern Analysis and Machine Intelligence* 34, pp. 2058-2064.
6. J. Goodman (2004). *Introduction to Fourier Optics 3rd ed.*, Roberts and Company Publishers.
7. R. J. Schalkoff (1989). *Digital image processing and computer vision*. vol 286. New York: Wiley.
8. T. Zimmermann (2005). "Spectral imaging and linear unmixing in light microscopy." *Microscopy techniques*. pp. 245-265. Springer Berlin Heidelberg

V. List of faculty members who can teach the course:

Prof. Percival Almoro, Ph.D.
Prof. Wilson Garcia, Ph.D.
Assoc. Prof. Nathaniel Hermosa, Ph.D.
Prof. Caesar Saloma, Ph.D.
Prof. Maricor Soriano, Ph.D.
Prof. Giovanni Tapang, Ph.D.

PROPOSAL FOR THE INSTITUTION OF APPLIED PHYSICS 184

Physical Electronics and Instrumentation II

I. Identifying and Descriptive Information

A. Course Catalogue Description

1. **Course number:** App Physics 184
2. **Course title:** Physical electronics and instrumentation II
3. **Course description:** Analog-digital conversion and multiplexing; computer hardware and interfacing; microprocessors and machine language programming; applications of microprocessors. Sensors, transducers, and measurement techniques for various physical variables; signal conditioning, digitization and sampling; signal processing and reliability of data.
4. **Prerequisite:** App Physics 181
5. **Semester offered:**
6. **Course credit:** 4.0
7. **Number of hours:** 3h lec; 3h lab
8. **Meeting type:** Lecture, Laboratory
9. **Course goals:** To teach students how to understand digital electronics concepts, to design and implement data acquisition for physical systems, as well as process the acquired signals into usable digital information.

B. Rationale

C. Course Outline

1. Course outcomes

Upon completion of the course, students must be able to:

a. Design and implement data acquisition for physical systems;

b. Process various signals into usable digital information for experiments.

2. Course content

Lecture/Lab Topics	Hours Lec	Hours Lab
Basic of logic concepts and combined logic, feedback and sequential logic.	15 hrs	15 hrs
Counters, Registers, and State Machines, Analog to Digital Conversion	15 hrs	15 hrs
Microcontrollers: Interfacing and application	15 hrs	15 hrs
Sensors and measurements, sampling and signal processing	3 hrs	3 hrs

3. Course coverage

Week	CO	TOPIC	ESSENTIAL/ KEY QUESTIONS	Suggested Teaching and Learning Activities (Lecture-Lab work on)	Suggested Assessment Tools
1	CO.a	Boolean arithmetic, truth tables, gates,	What are binary systems? What are	Expt.1- Introduction to	Quiz Lab Report

		logic operations, Combinatorial logic circuits	truth tables? What is the difference between AND, OR, NOT, NAND, and NOR gates?	microcontrollers	
2	CO.a	TTL and CMOS, Truth tables, Karnaugh Maps	What is the difference betweem truth tables and Karnaugh Maps? How do we construct a half- and a full-adder?	Expt.2 : Construction of a half and a full adder	Lab Report
3	CO.a	Number systems: Binary, BCD, Gray codes, binary arithmetics, ring oscillators and debouncers	How do we represent numeric information within digital systems? What are oscillators and debouncers?		Quiz
4	CO.a	Flip flops RS and JK	How does a digital circuit acquire memory?		Quiz
5	CO.a	Edge triggered FF Latches and registers	What are the use of bistables in constructing memory and shift registers?	Expt. 3 Shift registers from flip-flops	Quiz Lab Report
6	CO.a	Counters, shift registers, and state machines, analog to digital conversion	What are asynchronous and synchronous counters? What are the characteristics of analogue-to-digital converters?	Expt. 4: Random number generator	Quiz Lab Report
7-8	CO.a	Parallel encoding successive approximation	What are the similarities and differences between successive approximation ADC and counter ADC?	Expt. 5: Signal generator using A/D converters	Quiz Lab Report
9-10	CO.a	CMOS and TTL interfacing, Addreses and data decoders; Multi-segment LEDs pulse width	What are the characteristics of various members of the TTL and CMOS logic circuit families?	Expt. 6 : LED Matrix addressing and interfacing	Quiz Lab Report

		modulation debouncer	How do we provide continuous control of power using pulse width modulation?		
11-12	CO.a	Microprocessors, machine language, microcontrollers analog-to-digital conversion PLLs psuedo-random noise generation	What are resolution, accuracy, setting time,and sampling rate in the context of data conversion? How do we generate pseudo-random noise?	Expt. 7: Construction of running lights	Quiz Lab Report
13-14	CO.a	Sampling, quantization, coding, aliasing; Interface electronics	What are the major components of a typical data-acquisition system?	Expt. 8 Digital acquisition system	Quiz Lab Report
15	CO.b	Frequency analysis of continuous and discrete time signals; The discrete fourier transform, properties and applications	What is the Fourier transform? What are its real-world applications?	Expt. 9: Signal processing of temporal signals	Quiz Lab Report
16	CO.b	Physical principles of sensings; Calibration,; Calibration techniques	What are the role of sensorDigitts in electronic systems? How are range, resolution, accuracy, linearity and sensitivity affects sensor design?	Expt. 10: Sensors	Quiz Lab Report

4. Course Requirements

1. Midterm and final exams
2. Quizzes
3. Lab reports
4. Project

D. REFERENCES

- R. Bracewell (1978). *Fourier Transforms and Its Applications. 2nd ed.* McGraw Hill
- E.O. Brigham (1988). *The Fast Fourier Transform and its Applications.* Prentice Hall
- J. Fraden (2016). *Handbook of Modern Sensors: Physics, Design and Applications 5th ed.* Springer
- P. Horowitz and W. Hill (2015). *Art of Electronics 3rd ed.* Cambridge Univ. Press
- J. Proakis & I. Manolakis (2000), *Digital Signal Processing 3rd ed.* Pearson
- Snoke (2014), *Electronics: A Physical Approach* Pearson

- N. Storey (2017). *Electronics: A Systems Approach* 6th ed. Pearson
- J. Weber and H. Eren (editors) (2014). *Measurement, Instrumentation, and Sensors Handbook* 2nd ed. CRC Press

E. LIST OF FACULTY MEMBERS WHO CAN TEACH THE COURSE

Prof. Percival Almoro, Ph.D.
Prof. Elmer Estacio, Ph.D.
Asst. Prof. Marvin Flores, Ph.D.
Prof. Wilson Garcia, Ph.D.
Prof. Caesar Saloma, Ph.D.
Prof. Maricor Soriano, Ph.D.
Prof. Giovanni Tapang, Ph.D.