

# Program of Physics for International Students (2019)

## I. Introduction

Physics is one of the oldest disciplines of natural science based on experiments, which involves the studies of motions of objects ranging from subatomic to cosmic levels, and the exploring of interactions and transformations of substances. It keeps developing as human explores the Nature. Until the 17th century, the Newtonian mechanics had been established, and the laws of motion of various objects including celestial bodies were well understood. In the late 19th century, physics became a systematic and rigorous discipline that contains mechanics, thermodynamics, electromagnetism, optics, etc., known as classic physics nowadays. The modern physics was developed at the beginning of the 20th century with the establishment of relativity and quantum mechanics. Significant breakthroughs in exploring the fundamental structure of the universe were made that greatly facilitated the development of technology and pushed forward the frontier of human cognition. However, the exploration of nature is far from complete. Many fundamental problems were still not being solved, such as the motion law of celestial objects in cosmic level, a more fundamental structure of elementary particles, and the physics laws of complex and strongly correlated macroscopic materials.

Physics is closely related to many other natural science disciplines. It has been a driving force to various of subjects including mathematics, chemistry, biology, geology, materials science, and information science. In addition, physics also makes great contributions to the revolutions of new technology arising from the theoretical breakthroughs, including nuclear energy, semiconductor, superconductor, laser, aerospace industry, etc. In short, physics plays a very important role in our economy and daily life. Progresses in areas such as fusion energy, novel semiconductor materials, high temperature superconductivity, nanomaterials and quantum information are expected in the foreseeable future, and these progresses will lead to the developments of many other new areas of science and technology.

Physics Department at Southern University of Science and Technology, was established in 2011. It is one of the five earliest departments in SUSTech. At present, its research fields include quantum transport and regulation, surface physics, materials physics, computational physics, condensed matter theory, quantum information and quantum computation, high energy physics and astrophysics (in planning), etc.

## II. Objectives and Learning Outcomes

### (1) Training objectives

The major provides systematic physics training for students, making them ready for advanced study and frontier research in physics and interdisciplinary disciplines in the future, as well as R&D, production, teaching and management in industrial departments, scientific research institutes and educational departments.

### (2) Training requirements

Graduates should meet the requirements of the Ministry of Education on the ideological and political theory and moral education of undergraduates, have certain humanistic literacy and social science knowledge, and meet the following professional training requirements:

1. Solid Mathematical Foundation
2. Systematically and comprehensively grasping the basic theories of Physics
3. Familiar with physics experiment methods and skills
4. Understanding the frontiers and developments of physics or related majors
5. Abundant knowledge of physics and flexible application of physical theory
6. Scientific Spirit, Innovative Awareness and Preliminary Scientific Research Ability
7. Basic knowledge background of related science and Engineering Majors
8. Basic computer programming, application and numerical computing capabilities
9. Ability to consult English documents, write papers and communicate academically
10. Good oral skills and teamwork spirit

### III. Study Length and Graduation Requirements

Study length: Four years

Degree conferred: Bachelor of Science degree

The minimum credit requirement for graduation: 133 credits (not including English courses);

| Category   | Module   | Minimum Credit Requirement |
|--|--|----------------------------|
| General Education (GE)<br>Required Courses<br>(51 credits) | Science  | 31                         |
|  | Physical Education   | 4                          |
|  | Chinese Languages & Culture                                      | 16                         |
| General Education (GE) Elective<br>Courses<br>(10 credits) | Humanities   | 4                          |
|  | Social Sciences  | 4                          |
|  | Arts   | 2                          |
|  | Science  | 0                          |
| Major Course<br>(72 credits)                               | Major Foundational Courses                                       | 26                         |
|  | Major Core Courses   | 19                         |
|  | Major Elective Courses   | 17                         |
|  | Research Projects, Internship and Undergraduate Thesis /Projects | 10                         |
| Total (not including English courses)                      |  | 133                        |

### IV. Discipline

Physics

### V. Main Courses

General Physics B (I) and (II), Modern Optics, Atomic Physic, Mathematical Methods in Physics, Analytical Mechanics, Electrodynamics I and II, Thermodynamics and Statistical Physics I, Statistical Mechanics II, Introduction to Quantum Mechanics and Quantum Mechanics II, Introduction to Solid State Physics, Introduction to Computational Physics.

## VI. Practice-Based Courses

See Table 3.

## VII. Pre-requisites for Major Declaration

| Major Declaration Time   | Course Code | Course Name                              | Prerequisite            |
|--|-------------|--|-------------------------|
| Declare major at the end of First Year   | PHY103B     | General Physics B (I)                    |                         |
|  | PHY105B     | General Physics B (II)                   | PHY103B                 |
|  | MA101B      | Calculus I A                             |                         |
|  | MA102B      | Calculus II A                            | MA101B                  |
|  | MA107A      | Linear Algebra A                         |                         |
| Declare major at the end of Second Year  | PHY203-15   | Mathematical Methods in Physics          | MA102B, PHY105B, MA107A |
|  | PHY205-15   | Analytical Mechanics                     | PHY105B                 |
|  | PHY207-15   | Electrodynamics I                        | PHY203-15               |
|  | PHY204      | Thermodynamics and Statistical Physics I | PHY105B                 |
|  | PHY206-15   | Introduction to Quantum Mechanics        | PHY203-15, PHY205-15    |
|  | PHY210      | Atomic Physics                           | PHY105B                 |
|  | PHY201-15   | Physics Laboratory II                    | PHY103B                 |
|  | PHY202      | Physics Laboratory III                   | PHY103B                 |
| <p>Annotation 1: PHY103B " General Physics B (I)" and PHY105B " General Physics B (II)" can be replaced by PHY103A " General Physics A (I)" and PHY105A " General Physics A (II)" respectively.</p> <p>Annotation 2: MA101B " Calculus I A " and MA102B " Calculus II A " can be replaced by MA101a " Mathematical Analysis I " and MA102a " Mathematical Analysis II " respectively, and the revision of " Mathematical Analysis III" still needs to be completed after entering the Physics major.</p> |             |  |                         |

## VIII. Requirements for GE Required Courses

### (I) Science Module

| Course Code | Course Name                            | Credit | Lab Credits | Hours/week | Term     | Language Instruction | Prerequisite | Dept |
|-------------|--|--------|-------------|------------|----------|----------------------|--------------|------|
| MA101B      | Calculus I A                           | 4      |             | 4          | Spr/Fall | B/E                  | NA           | MATH |
| MA102B      | Calculus II A                          | 4      |             | 4          | Spr/Fall | B/E                  | MA101B       | MATH |
| MA107A      | Linear Algebra A                       | 4      |             | 4          | Spr/Fall | B/E                  | NA           | MATH |
| PHY103B     | General Physics B (I)                  | 4      |             | 4          | Spr/Fall | B/E                  | NA           | PHY  |
| PHY105B     | General Physics B (II)                 | 4      |             | 4          | Spr/Fall | B/E                  | PHY103B      | PHY  |
| CH101B      | General Chemistry B                    | 3      |             | 3          | Spr/Fall | B/E                  | NA           | CHEM |
| BIO102B     | Introduction to Life Science           | 3      |             | 3          | Spr/Fall | B/E                  | NA           | BIO  |
| CS102B      | Introduction to Computer Programming B | 3      | 1           | 4          | Spr/Fall | B/E                  | NA           | CSE  |
| PHY104B     | Experiments of Fundamental Physics     | 2      | 2           | 4          | Spr/Fall | B/E                  | NA           | PHY  |
| Total       |  | 31     | 3           | 34         |          |                      |              |      |

Annotation 1: The B-level course of General Physics can be replaced by the A-level course of General Physics.  
 Annotation 2: The A-level course of Calculus can be replaced by Mathematical Analysis (I-III).  
 Annotation 3: Other general courses of computer, chemistry and biology can also be replaced by higher-level courses. Among them, it is suggested to take Introduction to Computer Programming A for subsequent major elective courses. The credit increase of general courses caused by curriculum replacement cannot replace the credits of Major Required Courses and Elective Courses. Students majoring in physics still need to complete the minimum requirements of compulsory and optional courses in accordance with the regulations.

### (II) Physical Education

| Course Code | Course Name            | Credit | Lab Credits | Hours/week | Term   | Language Instruction | Prerequisite | Dept      |
|-------------|------------------------|--------|-------------|------------|--------|----------------------|--------------|-----------|
| GE131       | Physical Education I   | 1      |             | 2          | 1/Fall | C                    | NA           | PE Center |
| GE132       | Physical Education II  | 1      |             | 2          | 1/Spr  | C                    | NA           |           |
| GE231       | Physical Education III | 1      |             | 2          | 2/Fall | C                    | NA           |           |
| GE232       | Physical Education IV  | 1      |             | 2          | 2/Spr  | C                    | NA           |           |
| Total       |                        | 4      |             | 8          |        |                      |              |           |

### (III) Chinese Languages & Culture

| Course Code | Course Name             | Credit | Hours/week | Term     | Language Instruction | Prerequisite | Dept                |
|-------------|-------------------------|--------|------------|----------|----------------------|--------------|---------------------|
| CLE008      | Elementary Chinese I    | 2      | 4          | 1/Fall   | B                    | NA           | CLE                 |
| CLE009      | Elementary Chinese II   | 2      | 4          | 1/Spr    | B                    | CLE008       |                     |
| CLE027      | Intermediate Chinese I  | 2      | 4          | 2/Fall   | B                    | CLE009       |                     |
| CLE028      | Intermediate Chinese II | 2      | 4          | 2/Spr    | B                    | CLE027       |                     |
| CLE031      | Advanced Chinese I      | 2      | 4          | 3/Fall   | B                    | CLE028       |                     |
| CLE032      | Advanced Chinese II     | 2      | 4          | 3/Spr    | B                    | CLE031       |                     |
| CLE033      | Chinese Culture         | 2      | 2          | Spr/Fall | B/E                  | NA           | CLE/<br>HUM/<br>SSC |
| CLE034      | Chinese History         | 2      | 2          | Spr/Fall | B/E                  | NA           |                     |
| Total       |                         | 16     | 28         |          |                      |              |                     |

### (IV) English Language

All students are required to undertake the English Placement Test before selecting courses, based on which students will be assigned to 3 levels to be ready for the courses with English as the instruction language.

SUSTech English III, English for Academic Purposes are required for Level A.

SUSTech English II, SUSTech English III, English for Academic Purposes for Level B.

SUSTech English I, SUSTech English II, SUSTech English III, English for Academic for Level C.

| Course Code | Course Name                   | Credit | Hours/week | Instruction Language | Prerequisite | Dept |
|-------------|-------------------------------|--------|------------|----------------------|--------------|------|
| CLE021      | SUSTech English I             | 4      | 4          | E                    | NA           | CLE  |
| CLE022      | SUSTech English II            | 4      | 4          | E                    | CLE021       |      |
| CLE023      | SUSTech English III           | 4      | 4          | E                    | CLE022       |      |
| CLE030      | English for Academic Purposes | 2      | 2          | E                    | CLE023       |      |

### IX Requirements for GE Elective Courses

(I) Students are required to complete 4 credits for the Humanities Module and Social Sciences Module respectively, and 2 credits for the Music and Art Module. (Information about the available courses and the instruction language will be announced before the course selection session)

## X. Major Course Arrangement

**Table 1: Major Required Course (Foundational and Core Courses)**

| Course Category            | Course Code | Course Name                                  | Credit | Lab Credits | Hours/week | Term | take the course Advised term to | Instruction language | Prerequisite              | Dept. |
|----------------------------|-------------|--|--------|-------------|------------|------|---------------------------------|----------------------|---------------------------|-------|
| Major Foundational Courses | PHY203-15   | Mathematical Methods in Physics <sup>①</sup> | 4      |             | 4          | Fall | 2/Fall                          | B                    | MA102B, PHY105B, MA107A   | PHY   |
|                            | PHY205-15   | Analytical Mechanics                         | 3      |             | 3          | Fall | 2/Fall                          | C                    | PHY105B                   | PHY   |
|                            | PHY207-15   | Electrodynamics I                            | 3      |             | 3          | Fall | 2/Fall                          | C                    | PHY203-15                 | PHY   |
|                            | PHY201-15   | Physics Laboratory II                        | 2      | 2           | 4          | Fall | 2/Fall                          | B                    | PHY103B                   | PHY   |
|                            | PHY202      | Physics Laboratory III                       | 2      | 2           | 4          | Spr  | 2/Spr                           | B                    | PHY103B                   | PHY   |
|                            | PHY204      | Thermodynamics and Statistical Physics I     | 3      |             | 3          | Spr  | 2/Spr                           | B                    | PHY105B                   | PHY   |
|                            | PHY206-15   | Introduction to Quantum Mechanics            | 3      |             | 3          | Spr  | 2/Spr                           | C                    | PHY203-15, PHY205-15      | PHY   |
|                            | PHY208      | Electrodynamics II                           | 3      |             | 3          | Spr  | 2/Spr                           | C                    | PHY207-15                 | PHY   |
|                            | PHY210      | Atomic Physics                               | 3      |             | 3          | Spr  | 2/Spr                           | E                    | PHY105B                   | PHY   |
|                            | Total       |  | 26     | 4           | 30         |      |                                 |                      |                           |       |
| Major Core Courses         | PHY301      | Physics Laboratory IV                        | 3      | 3           | 6          | Fall | 3/Fall                          | B                    | PHY103B                   | PHY   |
|                            | PHY305      | Quantum Mechanics II                         | 3      |             | 3          | Fall | 3/Fall                          | C                    | PHY206-15                 | PHY   |
|                            | PHY303      | Statistical Mechanics II                     | 3      |             | 3          | Fall | 3/Fall                          | B                    | PHY204                    | PHY   |
|                            | PHY307      | Modern Optics                                | 3      |             | 3          | Fall | 3/Fall                          | B                    | PHY105B                   | PHY   |
|                            | PHY321-15   | Introduction to Solid State Physics          | 4      |             | 4          | Fall | 3/Fall                          | B                    | PHY206-15                 | PHY   |
|                            | PHY336      | Introduction to Computational Physics        | 3      |             | 3          | Spr  | 3/Spr                           | C                    | CS102B, PHY204, PHY321-15 | PHY   |
|                            |             | Total  |        | 19          | 3          | 15   |                                 |                      |                           |       |
| Practice-based Courses     | PHY480      | Research Projects <sup>②</sup>               | 2      | 2           | 4          |      |                                 |                      |                           | PHY   |
|                            | PHY490      | Undergraduate Thesis/Projects                | 8      | 8           | 16         |      |                                 |                      |                           | PHY   |
|                            |             | Total  |        | 10          | 10         | 20   |                                 |                      |                           |       |
| Total                      |             |  | 55     | 17          | 65         |      |                                 |                      |                           |       |

Annotation<sup>①</sup>: students can exempt from “Mathematical Methods in Physics” if they get credits of both “Partial Differential Equations” (MA303) and “Complex Analysis” (MA202). The actual credit of two courses is included into the total Major Required Course, and it is no longer calculated by the Major Elective Course.

Annotation<sup>②</sup>: Students can start their Research Project at terms after the first academic year. The minimum credit hours of the project are 64.

**Table 2: Major Elective Courses**

| Course Category         | Course Code                                       | Course Name                              | Credit | Lab Credits | Hours/week | Term     | take the course Advised term to | Instruction language | Prerequisite              | Dept. |
|-------------------------|---|--|--------|-------------|------------|----------|---------------------------------|----------------------|---------------------------|-------|
| Mathematics             | MA109   | Advanced Linear Algebra                  | 4      |             | 4          | Spr      | 1/Spr                           | B                    | MA107A                    | MATH  |
|                         | MA212   | Probability and Statistics               | 3      |             | 3          | Fall/Spr | 2/Fall                          | B                    | MA102B                    | MATH  |
|                         | MA202   | Complex Analysis                         | 3      |             | 3          | Spr      | 2/Spr                           | B                    | MA203a, MA213             | MATH  |
|                         | MA201b  | Ordinary Differential Equations B        | 4      |             | 4          | Fall/Spr | 2/Spr                           | B                    | MA102B                    | MATH  |
|                         | MA303   | Partial Differential Equations           | 3      |             | 3          | Fall     | 3/Fall                          | C/<br>E/<br>B        | MA201a                    | MATH  |
|                         | MA305   | Numerical Analysis                       | 3      |             | 3          | Fall     | 3/Fall                          | C                    | MA203a, MA213             | MATH  |
| Computer                | CS205   | C/C++ Program Design                     | 3      | 1           | 4          | Fall/Spr | 2/Fall                          | E                    |                           | CSE   |
|                         | CS203B  | Data Structures and Algorithm Analysis B | 3      | 1           | 4          | Fall     | 2/Fall                          | B                    | CS102A                    | CSE   |
|                         | CS303B  | Artificial Intelligence B                | 3      | 1           | 4          | Fall     | 3/Fall                          | B                    | CS102B, CS203B, MA212     | CSE   |
|                         | CS405   | Machine Learning                         | 3      | 1           | 4          | Fall     | 4/Fall                          | B                    | MA107A, MA212             | CSE   |
| Mechanical & Electronic | ME102   | CAD and Engineering Drawing              | 3      | 1.5         | 4.5        | Fall/Spr | 1/Spr                           | C                    |                           | ME    |
|                         | EE104   | Fundamentals of Electric Circuits        | 2      |             | 2          | Spr      | 1/Spr                           | B                    | MA102B, MA107A or MA107B  | EE    |
|                         | EE201-17  | Analog Circuits                          | 3      |             | 3          | Fall     | 2/Fall                          | C                    | PHY105B, EE104            | EE    |
|                         | EE201-17L   | Analog Circuits Laboratory               | 1      | 1           | 2          | Fall     | 2/Fall                          | C                    | EE201-17                  | EE    |
|                         | EE202-17  | Digital Circuits                         | 3      |             | 3          | Spr      | 2/Spr                           | C                    | PHY105B                   | EE    |
|                         | EE202-17L   | Digital Circuits Laboratory              | 1      | 1           | 2          | Spr      | 2/Spr                           | C                    | EE202-17                  | EE    |
| Physical Theory         | ESS314  | Fundamentals of Plasma Physics           | 4      |             | 4          | Fall     | 3/Fall                          | E                    | PHY203-15                 | ESS   |
|                         | MAE303  | Fluid Mechanics                          | 4      |             | 4          | Fall     | 3/Fall                          | E                    | MA102B, PHY105B           | MAE   |
|                         | MAE304  | Elasticity                               | 4      |             | 4          | Spr      | 3/Spr                           | C                    | MAE203 MAE202             | MAE   |
|                         | PHY445  | Quantum Optics                           | 3      |             | 3          | Spr      | 3/Spr                           | B                    | PHY206-15                 | PHY   |
|                         | PHY435  | Advanced Quantum Mechanics               | 4      |             | 4          | Fall     | 4/Fall                          | E                    | PHY206-15                 | PHY   |
|                         | PHY437  | Group Theory for Physicists              | 4      |             | 4          | Fall     | 4/Fall                          | C                    | PHY206-15, MA107A         | PHY   |
|                         | PHY443  | Introduction to Quantum Field Theory     | 4      |             | 4          | Fall     | 4/Fall                          | E                    | PHY305, PHY205-15, MA107A | PHY   |
|                         | PHY441  | Quantum Information                      | 3      |             | 3          | Fall     | 4/Fall                          | E                    | PHY206-15                 | PHY   |
|                         | PHY431  | Quantum Transport Theories               | 3      |             | 3          | Spr      | 4/Spr                           | B                    | PHY321-15, PHY305         | PHY   |
| PHY439                  | General Relativity: from Black Holes to Cosmology | 3  |        | 3           | Spr        | 4/Spr    | E                               | MA107A, PHY205-15    | PHY                       |       |

|   |           |  |     |      |       |      |        |   |                                  |     |
|---|-----------|--|-----|------|-------|------|--------|---|----------------------------------|-----|
|   | PHY442    | Quantum Computation                                      | 3   |      | 3     | Spr  | 4/Spr  | E | PHY206-15                        | PHY |
| Physical Experiments and Applications     | PHY330    | Solid Optoelectronics                                    | 3   |      | 3     | Spr  | 3/Spr  | E | PHY206-15,<br>PHY307             | PHY |
|   | PHY332-15 | Surface Physics  | 4   |      | 4     | Spr  | 3/Spr  | B | PHY321-15                        | PHY |
|   | PHY324    | Laser Fundamentals                                       | 3   |      | 3     | Spr  | 3/Spr  | C | PHY307,<br>PHY210                | PHY |
|   | PHY326-15 | Semiconductor Physics and Devices                        | 4   |      | 4     | Spr  | 3/Spr  | B | PHY321-15                        | PHY |
|   | PHY328    | Low Temperature Physics                                  | 3   | 1    | 4     | Spr  | 3/Spr  | B | PHY204                           | PHY |
|   | PHY423-15 | Physics of Thin Films                                    | 3   |      | 3     | Fall | 4/Fall | E | PHY321-15,<br>PHY204             | PHY |
|   | PHY425    | Modern Techniques in Materials Characterization          | 3   | 1    | 4     | Fall | 4/Fall | B | PHY206-15                        | PHY |
|   | PHY427    | Introduction to Microelectronic Fabrication              | 2   | 1    | 3     | Fall | 4/Fall | E | CH101B,<br>PHY105B               | PHY |
|   | PHY429    | Advanced Electron Microscopy                             | 3   | 1    | 4     | Fall | 4/Fall | E | PHY321-15                        | PHY |
| Physics Comprehensive Development courses | PHYS001   | Open Physics Laboratory I                                | 1   | 1    | 8     | Smr  | 1/Smr  | B |                                  | PHY |
|   | PHY221    | Open Physics Laboratory II                               | 1   | 1    | 2     | Fall | 2/Fall | B |                                  | PHY |
|   | GE351     | Scientific Literature and Writing                        | 1   |      | 1     | Fall | 3/Fall | C |                                  | GE  |
|   | PHYS002   | Lectures on selected Frontiers in Physics                | 2   |      | 8     | Smr  | 3/Smr  | C | PHY105B                          | PHY |
|   | PHY433    | Condensed Matter Physics Forum                           | 3   |      | 3     | Fall | 4/Fall | B | PHY105B                          | PHY |
| Dynamic Course of Summer semester         | PHYS003   | Numerical Algorithms in Physics                          | 1   |      | 4     | Smr  | 3/Smr  | C | PHY321-15,<br>MA305 or<br>PHY336 | PHY |
|   | PHYS004   | Energy transfer in photosynthesis and molecular crystals | 1   |      | 4     | Smr  | 3/Smr  | C |                                  | PHY |
|   | PHYS005   | Crystal Structures and Symmetry Groups                   | 1   |      | 4     | Smr  | 3/Smr  | C |                                  | PHY |
|   | PHYS006   | Science and Society                                      | 1   |      | 4     | Smr  | 3/Smr  | C |                                  | PHY |
|   | PHYS007   | Introduction to differential geometry                    | 1   |      | 4     | Smr  | 3/Smr  | C | MA102B,<br>MA107A,<br>PHY208     | PHY |
|   | PHYS008   | Frontier of Quantum Information Science                  | 1   |      | 4     | Smr  | 3/Smr  | B | PHY206-15                        | PHY |
|   | PHYS009   | Semiconductor Quantum Technologies                       | 1   |      | 4     | Smr  | 3/Smr  | B | PHY206-15,<br>PHY321-15          | PHY |
| <b>Total</b>                              |           |  | 127 | 13.5 | 176.5 |      |        |   |                                  |     |

Annotation 1: Students should report their schemes of major selective courses before the second week, the first term of the third academic year after confirming with their academic advisors. The minimum credit requirement of major elective course is 17.

Annotation 2: The courses whose course codes start with PHYS are summer semester courses. Dynamic course of summer semester may be changed depending on the situation.

Annotation 3: Major elective courses of specific semesters may be changed according to the situation. The number of major elective courses may increase with the development of curriculum construction.

Annotation 4: Students can study mathematics, computer, electronics, chemistry, materials and other courses according to the advice of academic advisors. The credits obtained can be applied for the credits certification of major elective courses in Physics.



**Table 3: Overview of Practice-Based Courses**

| Course Code   | Course Name  | Credit | Lab Credits | Hours/week | Term      | take the course Advised term to | Instruction language | Prerequisite    | Dept. |
|---|--|--------|-------------|------------|-----------|---------------------------------|----------------------|-----------------|-------|
| ME102   | CAD and Engineering Drawing                                | 3      | 1.5         | 4.5        | Spr& Fall | 1/Spr                           | C                    |                 | ME    |
| PHYS001   | Open Physics Laboratory I                                  | 1      | 1           | 8          | Smr       | 1/Smr                           | B                    |                 | PHY   |
| PHY201-15   | Physics Laboratory II                                      | 2      | 2           | 4          | Fall      | 2/Fall                          | B                    | PHY103B         | PHY   |
| PHY221  | Open Physics Laboratory II                                 | 1      | 1           | 2          | Fall      | 2/Fall                          | B                    |                 | PHY   |
| EE201-17L   | Analog Circuits Laboratory                                 | 1      | 1           | 2          | Fall      | 2/Fall                          | C                    | EE201-17        | EE    |
| EE202-17L   | Digital Circuits Laboratory                                | 1      | 1           | 2          | Spr       | 2/Spr                           | C                    | EE202-17        | EE    |
| PHY202  | Physics Laboratory III                                     | 2      | 2           | 4          | Spr       | 2/Spr                           | B                    | PHY103B         | PHY   |
| PHY301  | Physics Laboratory IV                                      | 3      | 3           | 6          | Fall      | 3/Fall                          | B                    | PHY103B         | PHY   |
| PHY328  | Low Temperature Physics Laboratory                         | 3      | 1           | 4          | Spr       | 3/Spr                           | B                    | PHY204          | PHY   |
| PHY425  | Modern Techniques in Materials Characterization Laboratory | 3      | 1           | 4          | Fall      | 4/Fall                          | B                    | PHY206-15       | PHY   |
| PHY427  | Introduction to Microelectronic fabrication Laboratory     | 2      | 1           | 3          | Fall      | 4/Fall                          | E                    | CH101B, PHY105B | PHY   |
| PHY429  | Advanced Electron Microscopy Laboratory                    | 3      | 1           | 4          | Fall      | 4/Fall                          | E                    | PHY321-15       | PHY   |
| PHY480  | Research Projects①   | 2      | 2           | 4          |           |                                 |                      |                 | PHY   |
| PHY490  | Undergraduate Thesis                                       | 8      | 8           | 16         |           |                                 |                      |                 | PHY   |
| Total   |  | 35     | 26.5        | 67.5       |           |                                 |                      |                 |       |
| Annotation ①: Students can start their Research Projects at terms after the first academic year. The minimum credit hours of each project are 64. |  |        |             |            |           |                                 |                      |                 |       |

**Table 4: Overview of Course Hours and Credits**

| <b>Course Category</b>  | <b>Total Course Hours</b> | <b>Total Credits</b> | <b>Credit Requirements</b> | <b>Percentage of the Total*</b> |
|---|---------------------------|----------------------|----------------------------|---------------------------------|
| <b>/General Education (GE) Required Courses (not including English courses)</b> | 864                       | 51                   | 51                         | 38.4%                           |
| <b>General Education (GE) Elective Courses</b>                                  |                           | /                    | 10                         | 7.5%                            |
| <b>Major Foundational Courses</b>   | 480                       | 26                   | 26                         | 19.5%                           |
| <b>Major Core Courses</b>   | 352                       | 19                   | 19                         | 14.3%                           |
| <b>Major Elective Courses</b>   | 2248                      | 127                  | 17                         | 12.8%                           |
| <b>Research Projects, Internship and Undergraduate Thesis/Projects</b>          | 320                       | 10                   | 10                         | 7.5%                            |
| <b>Total (not including English courses)</b>                                    | 4264                      | 233                  | 133                        | /                               |

\* Percentage of the total= Credit requirements of each line / Total credit requirements

## Curriculum Structure of Physics



