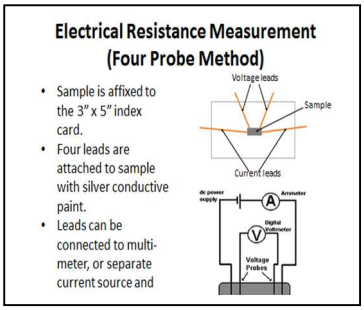
Handbook

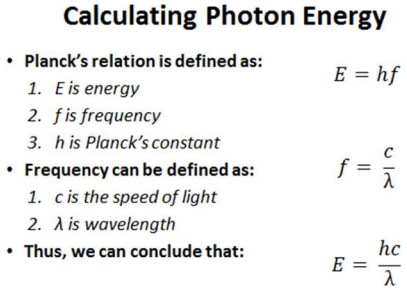
for

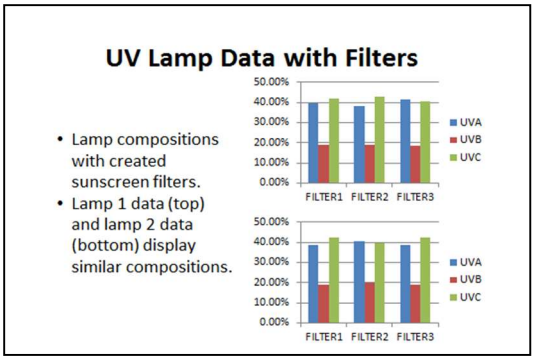
Students Planning to graduate with a

BS degree in Mathematics and Physics

with Physics Concentration







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Physics Program Contact Information

Main Office: Rm 151 William James Hall (enter through Rm 157),
Bldg. 155
Southern University and A&M College
355 Elton Harrison Drive
Baton Rouge, Louisiana 70813
Phone: (225) 771-4130, **Fax:** (225) 771-2310
Internet Website: https://www.subr.edu/page/3082

Letter from the Chairman of the Department of Mathematics and Physics and Physics Program Leader

Dear Student:

Laurence Henry, PhD Physics
Chairman, Department of Mathematics and Physics
Physics Program Leader

Welcome to the Physics Program in the Department of Mathematics and Physics. I am happy that you have chosen to study the interesting and exciting field of Physics. Although the discipline requires much effort and study, it is not impossible to be successful.

Our faculty are dedicated to assisting you to successfully navigate your academic journey to the degree. They are very interested in your success and will do everything in their power to help you achieve that success. They are also available for advice on selecting a specific research area that you would like to focus on. Faculty with a funded research program may also have student support included in their account.

Faculty members are accessible in person at their Office Hours. These times are set aside for meeting with students. They are also accessible via email and telephone. I ask that if you send email to faculty, you allow 24 hours for a reply. This delay is necessary because faculty duties, i.e., teaching and course preparation, research and other activities do take a lot of time and some faculty may not check their email very often during the day.

Every physics major will be assigned to a faculty advisor. As soon as the assignment is communicated to you, I suggest that you make an appointment to meet in person with him or her to plan or review your program. The necessary forms and information are in the ***Addenda*** *section of this handbook. I also encourage that, if you have any problem that can be addressed with help by your advisor, you bring it to him/her. We are very interested that your experience in our program is very positive. Also, feel free to stop by my office as you see fit.*

Although the faculty can be very helpful, your success depends very much on you taking personal responsibility for your success. This includes putting in the necessary effort and study that is needed.

Finally, if there is anything that I can do to make your stay here a positive experience you are very welcome to stop by my office and talk with me.

Sincerely,

Laurence Henry

OBJECTIVE FOR THE HANDBOOK

It is our hope that this handbook will be a useful tool to help you navigate the academic challenges on the way to a degree with a concentration in physics and having achieved that to reap the rewards. Students are strongly encouraged to carefully read the information in the university Catalog under which he/she plans to graduate, in addition to the information in this handbook. This handbook does not replace the university catalog.

PHYSICS PROGRAM MISSION

The physics programs mission is twofold: (a) to affords opportunities for a diverse student body to gain a high quality education in Physics by providing courses in physics, engagement in scholarly scientific research and enabling our graduates to develop the confidence to be successful upon leaving our program and (b) to enable students in other non-physics specific disciplines, for example, the other physical sciences, engineering and computer sciences and non-science related studies, the opportunity to develop a degree of scientific literacy.

PROGRAM OVERVIEW

The Physics Program recognizes that students have a variety of career objectives. Some may intend to enter industry directly or to continue graduate studies. Some students may wish to complete our physics program in preparation for careers in medical disciplines, or, other sciences, or, teaching. Sufficient flexibility is available to the student in planning his/her undergraduate physics program to meet any of these varied objectives while acquiring an effective foundation in physics principles and associated analytical problem-solving skills. In addition, the program seeks to assist the student in developing to their academic and scientific potential. This includes not only the student who enters the program with an excellent academic foundation, but also the student whose foundation may be weak but who has a strong interest and is highly motivated to apply him/herself to the academic work necessary to make up for his/her deficiency. Advisement by faculty in our program aims to address both types of students to enable their success.

ONLINE TRAINING CERTIFICATION

As a result of mandates by the university in response to the Covid pandemic, all faculty in the program have now successfully completed training by Quality Matters® to carry out online instruction.

WHAT IS PHYSICS?

A search on the internet found this definition:

> *"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."*
>
> *https://en.wikipedia.org/wiki/Physics*

Your studies of the core courses in the program will take you into several areas of this vast topic:

Fundamental ideas about the motion of particles and larger systems, i.e., Mechanics and Dynamics (SPHY 213B and SPHY 213LB

Then you will be introduced to gravitation along with Electricity and Magnetism, and Electromagnetic phenomena and Optics. (SPHY 215B and SPHY 214LB)

You are now prepared to appreciate the more advanced topics of Modern Physics, Thermodynamics and Statistical Mechanics.

The above courses provide a good foundation for your appreciation of scientific phenomena. You will then have the opportunity to study the above in more depth and see applications as in solid-state physics and electronics.

Now, where does mathematics enter the picture? Mathematics can help in the understanding of fundamental ideas describing phenomena. For example: having familiarity with techniques from calculus we can describe forces to help in describing the phenomena and communicating results. Understanding differential equations and knowing how to use them helps to understand time dependent phenomena. Another example of the importance of using mathematical techniques to describe physical phenomena are applications of Fourier analysis to solve wave form problems.

As you can see physics and Mathematics are very much related.

In addition to the core courses students have opportunity to investigate some areas that they may have special interest in by taking some elective courses such as Astronomy, Electronics for Scientists and Solid-State Physics, to name a few. In some cases, if there is enough student and faculty interest then a new course representing that area of interest may be developed.

PHYSICS OPPORTUNITIES UPON GRADUATION

What can I do with a BS degree in Mathematics and Physics-Physics Concentration?

- Teaching at middle through high school levels (Grades 6-12)
- To teach at a junior or community college level you will need an MS degree
- Entry level engineering technical positions.
  Examples: A search of the internet yields the following examples
  Bachelor's Degree or higher from an accredited course of study
  in engineering, computer science, mathematics, **physics** or chemistry
  BSc in **Physics**, Mechanical, Electrical or Electro-Mechanical Engineering
- Enrolling in Graduate school: to work on the MS or PhD in physics or a degree in engineering, other science related field and Patent Law. Medical schools also welcome physics graduates looking toward the MD degree.

  With an undergraduate GPA of 3.0 or above graduate study in physics is an option.

  However: if your GPA is less than 3.0 but you want to work toward the MS degree you should still apply to the graduate school of your choice. Some schools will accept you on probation, which gives you the opportunity in your first semester to demonstrate that you can attain a 3.0 GPA in graduate school.

INTRODUCTION TO THE PHYSICS PROGRAM FACULTY AND STAFF

This page introduces the faculty and staff in the Physics Program along with a brief statement about their research area and their contact information.

Professors

Rambabu Bobba, PhD Physics

Contact Information:
Office: Rm. 123 William James Hall

Office Phone: (225) 771-2493
Email: Rambabu_bobba@subr.edu

Research area: Design and development of low cost, efficient materials to facilitate widespread commercialization of clean energy conversion and storage technologies to address the world's energy and environmental challenges.

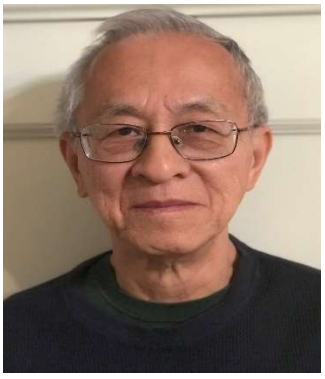
Laurence L. Henry, PhD Physics

Contact Information:
Office: Rm. 153 William James Hall
Rm. 111E, William James Hall
Research Lab: Rm 111D, William James Hall
Office Phone: (225) 771-4130
Email: Laurence_Henry@subr.edu

Research area: Electron transport and magnetic properties of materials and low temperature physics.

Textbook preparation: Writing physics laboratory textbooks

Faculty Sponsor for the Southern University Amateur Radio Club



Pui-Man Lam, PhD Physics

Contact information:
Office
Room 238 William James Hall;
Office Phone #: (225) 771-5757

Email: puiman_lam@subr.edu,

Research area: Statistical physics

Terrence Lee Reese, PhD. Physics

Contact Information:

Office: James Rm 155

Phone: (225) 771-2452

Email: Terrence_Reese@subr.edu

Research Area: Computational Physics and Simulations of Fluids

Director: Timbuktu Academy

Guang-Lin Zhao, Ph.D. Physics

Contact Information:

Office:
Room 128, William James Hall

Office Phone: 225-771-4491

Email: Guang-Lin_Zhao@subr.edu

Research area: Nano materials and nano-technology; Electronic structures of superconductors and semiconductors; Computational materials physics and simulations.

Coordinator for the Mathematics and Physics MS degree - Physics concentration

Stacy

J. Gregory Stacy, PhD, Physics
Joint Faculty Appointment (JFAP)
SUBR and LSU
Teach at SU in the fall semester

Contact Information (SUBR)
Office & Lab:
Room 148B, William James Hall.
Phone

Research Area: Astronomy and astrophysics

Associate Professors

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Assistant Professors

Feng Gao, PhD

Materials Science & Technologies

Contact Information:
Office: Rm. 239, William James Hall
Office Phone: 225-771-2327
Email: Feng_Gao@subr.edu

Research area: Magnetism and Magnetic Materials, Catalysts, Alloys.

Coordinator for the College of Sciences and Engineering Annual Symposium hosted by Mathematics and Physics (2021-2022)

Anthony Stewart, PhD Material Science

Contact Information:
Office: Rm. 156, William James Hall
Office Phone:
Email: Anthony_Stewart@subr.edu

Research Lab:
Rm 129 William James Hall

Research area: energetic materials, alloys, and oxide nanostructures

Faculty Sponsor for the Society of Physics Students (SPS) and Sigma Pi Sigma (ΣΠΣ)

Instructor

Marsha N. Robins, MS Chemistry

Contact Information:
Office: Room 229 William James Hall
Office Phone: 225-771-2002
Email: Marsha_robins@subr.edu or marsha.robins@sus.edu

Adjunct Faculty

Miranda

None Available.

Divina Miranda, PhD Chemistry

Online Class only

Contact Information:

Junsoo Shin, PhD Physics

Contact Information:
Office: Rm. 242, William James Hall
Office Phone: 225-771-4130
Email: junsoo_shin@subr.edu

Research area:
Synthesis and characterization of functional nanostructures of complex oxides

Chern-Simons Gauge Field Theory

Teaching Laboratories Manager

Yuriy Malozovsky, PhD Physics

Contact Information:
Office: Rm. 231, William James Hall

Research Lab: Rm 130, William, James Hall
Office Phone: 225-771-2261
Email: yuriy_malozovsky@subr.edu

Research area: Computational Physics. Electronic properties of materials in terms
of density functional theory (DFT)

Administrative Assistant

Robinson

None available.

Sheryl Robinson

Administrative Assistant for the Physics Program

Office: Rm. 151 William James Hall

Phone: 771-4130

Emeritus faculty

Diola Bagayoko, PhD, Physics (Retired)
SUS Distinguished Professor of Physics,
Affiliations: Timbuktu Academy,
Louis Stokes Louisiana Alliance for
Minority Participation (LS-LAMP)

Office: Rm 231 Skilliam James Hall
Fax: 225-771-4341
E-mail: diola_bagayoko@subr.edu

Area of Research: Electronic and Related Properties of Solids and Clusters

Ali Fazely, PhD Physics (Retired)

Contact information:
https://www.linkedin.com/in/ali-fazely-16856215

Area of Research: High Energy Physics

"ICE CUBE" collaboration

Stephen McGuire, PhD Physics (Retired)
Fellow of the American Physical Society

Research Lab: 212 William James Hall
Office: Room 230, William James Hall
Phone: 225-771-4396 Ext. 23
Fax: 225-771-2310
E-mail: stephen_mcguire@subr.edu
smcguire1@cox.net

Area of Research: Growth and characterization of semiconductors and intermetallics

Chia H. Yang, PhD Physics (Retired)

ACADEMIC PROGRAM

Students are strongly encouraged to carefully review the information in the University Catalog (see internet website https://www.subr.edu/page/1201) that he/she plans to graduate under. Our Physics program requires students to complete a total of 120 credit hours. This averages out to the student successfully completing 15 semester hours each fall and spring semester. It is possible that a student may graduate in less than 4 years if he/she successfully completes courses in the summers in addition to the regular fall and spring semesters. However, students are encouraged to get involved with research activities in the summers. These are good opportunities to gain experience in what physicists do.

Admission Requirement

A student majoring in physics is enrolled in the Department of Mathematics and Physics which is in the College of Sciences and Engineering. For regular admission to the College, as indicated in the University Catalog, under which he/she plans to graduate, the student must have a grade point average of not less than 2.0. This must include six (6) hours of English SENL 101B - 102B; six (6) hours of social sciences including three (3) hours of history; six (6) hours of mathematics, Math SMAT 264B - 265B, and eight (8) hours of science Biology SBIO 101B - 101LB, or Chemistry SCHE 132B - 132LB.

Degree Requirements

The bachelor of science degree is awarded to students who have completed an approved program of studies of not less than 120 semester hours of course work with an overall grade point average of 2.0 or above. Note that students must gain a grade of "C" or above in all courses taken to fulfill the major course requirements.

The completion of the following core of studies which represent the College of Sciences and Engineering minimum:

English	9 hrs.
Mathematics	18 hrs.
Social Science	6 hrs.
History	6 hrs.
Science (including 8 hours of chemistry and 4 hours of biology.)	12 hrs.
Humanities (to be selected from logic, humanities, race relations or philosophy.)	3 hrs.
Foreign Language (same language)	6 hrs.
Health and Physical Education	2 hrs.

Physics Program Requirements

Students are strongly encouraged to develop their course of study with the assistance of a physics advisor at the start of their entry to the university and also at the start of their program of study.

The program requires a minimum of 44 semester hours in physics (see **Addendum I** of this handbook). Additional details of the program are usually developed according to the career interest of the student in consultation with the program advisor. A minimum of four-semester sequence in calculus and differential equations required. All majors must take SPHY 213B - 213LB, SPHY 215B, SPHY 214LB, PHYS 271, PHYS 311, PHYS 341&342, PHYS 345, PHYS 411, PHYS 416, PHYS 425, PHYS 435.

Students must also take the Departmental Comprehensive Examination. Details of this examination given in **Addendum II** of this handbook.

Physics Research Concentrations

Both theoretical physics and experimental physics directions can be explored with faculty. Students are encouraged to discuss their research interests with the department faculty and to choose a research advisor as early as they can.

Various concentrations are available to physics majors. Some are listed below. Some areas of research that are currently in progress are

Nanomaterial and nanotechnology	Dr. Gao and Dr. Zhao
Magnetic and electron transport of materials	Dr. Henry
Low temperature physics and safe cryogen handling	Dr. Henry
Computer modelling	Dr. Zhao
Energy Conversion and Storage Technologies and Solid-State Ionics	Dr. Bobba
Applied electronics in physics	Dr. Henry
Mathematical modelling	Dr. Lam
Computational Physics and Simulations of Fluids	Dr. Reese
Astrophysics	Dr. Stacy
Materials science	Dr. Stewart

STUDENT ADVISING, ACTIVITIES AND FACILITIES

Advising:
Students are encouraged to choose a research advisor as early as they can. However, if a student does not choose an advisor, he/she will be assigned one. The academic advisor will assist you in planning your four-year program. It is strongly recommended that you consult your advisor for any academic scheduling and conflicts. A minimum of three formal conferences per semester with your academic advisor, are recommended.

Transfer credits: A student who wishes to transfer credits from another institition to receive credit at SUBR should complete the Articulation process for the course(s) that is (are) to be transferred by no later than the end of the first semester that that the student is enrolled in the Physics Program at SUBR.

Timbuktu Academy
Student having a 3.0 or above GPA will be invited to membership in the Timbuktu Academy which is a mentoring program and offers student support each semester. For information about this program please see Dr. Terrence Reese in Rm 155 James Hall.

Activities:

- **Society of Physics Students (SPS).**
  All physics majors should be a member of this organization. Annual dues of ---------- (to be determined) is required for membership in the SPS. Activities are planned by the students and are limited only by their imagination.

- **Sigma Pi Sigma Physics (ΣΠΣ)** is a **National Physics Honorary Society** and students are admitted upon attaining the MS degree. An initiation ceremony is held in the spring.

- **Southern University Amateur Radio Club (SUARC).**

This is a student organization that introduces students to amateur radio and worldwide electronic communication techniques and communication electronics. In the past the club has participated with the student LaACES balloon program by providing necessary radio communication. The club offers FCC licensing classes and testing sessions to enable students to obtain their FCC amateur radio licenses. See website WWW.arrl.org on the internet for more information about amateur radio.

Facilities

- **Study/Reading Room**

A library reading room (William James Hall – room 236) is used by physics majors only. This room is available all days and hours that the building is open. Rules for use of the facility will be given to each student and posted on the room door.

- **Computer Access**

The building has Wi-Fi compatibility. RM 113 James Hall has computers available to the students and RM 130 is available for advanced computing use.

- **Refrigerator and Microwave Oven**

There are a refrigerator and a microwave oven for student use in room 236 of William James Hall. There is also a paper shredder for student and faculty use in room 236.

- **Nearby Research Facilities and Collaborations**

In addition to students working in faculty research labs in the program and having access to those facilities, with special arrangements students may also have some access to facilities in the Pinchback Engineering building. There is the possibility for research collaborative efforts with the nearby synchrotron light source, the J. Bennett Johnson Center for Advanced Microstructures and Devices (**CAMD**) and the Laser Interferometer Gravitational-Wave Observatory (**LIGO**). Please check with your research advisor for more information.

ADDENDA

Addendum IA **Student Check Sheet**

This Check Sheet gives the requirements (courses and other activities) that must be successfully completed in order to graduate. Students who transfer from another program or school should discuss with their advisor regarding **Articulating the transfer credits** in the first semester that they transfer to the Physics program.

STUDENT NAME: _____ **STUDENT I.D.: _____**
ADVISOR: _____ **YEAR ENROLLED: _____**

COURSE TITLE	COURSE NUMBER	Cr. Hrs	Grade	Sem. & Yr.
PHYSICS-REQUIREMENTS (35 Hours)				
General Physics Lecture	SPHY 213B	3		
General Physics Lecture	SPHY 215B	3		
General Physics Lab	SPHY 213LB	1		
General Physics Lab	SPHY 214LB	1		
Modern Physics	PHYS 271	3		
Mathematical Physics	PHYS 311	3		
Experimental Physics I	PHYS 341	3		
Experimental Physics II	PHYS 342	3		
Thermodynamics	PHYS 345	3		
Advanced Math Physics	PHYS 411	3		
Advanced Mechanics I	PHYS 416	3		
Electromagnetic Theory I	PHYS 425	3		
Quantum Physics I	PHYS 435	3		
PHYSICS - ELECTIVES (9 Hours)				
Discovery in Physics	PHYS 145	3		
Programming in Physics[1]	PHYS 200	3		
Earth Science I	PHYS 201	4		
Earth Science II	PHYS 202	4		
Intro. to Astronomy	PHYS 206	4		
Electronics for Scientists	PHYS 262	3		
Radiation Physics I	PHYS 281	3		
Radiation Physics II	PHYS 282	3		
The Physics of Waves *	PHYS 331B	3		
Computational Physics[2]	PHYS 400	3		
Physics & Technology of Energy	PHYS 405	3		
Advance Mechanics II	PHYS 417	3		
Electromagnetic Theory II	PHYS 426	3		
Quantum Physics II	PHYS 436	3		
Astrophysics	PHYS 462	3		
Solid State Physics	PHYS 472	3		
Special Problems in Physics	PHYS 491	1		
Special Problems in Physics	PHYS 492	2		
Special Problems in Physics	PHYS 493	3		
Special Problems in Physics	PHYS 494	3		
MATHEMATICS - REQUIRED (18 Hours)				
Calculus I	SMAT 211B	4		
Calculus II	SMAT 212B	4		
Statistics – Sci. & Eng.	MATH 276	3		
Calculus III	MATH 364	4		
One Math elective[4]		3		
SCIENCE ELECTIVES – REQUIRED (12 Hours)				
General Chemistry Lecture	SCHE 132B	3		
General Chemistry Lab	SCHE 132LB	1		

COURSE TITLE	COURSE NUMBER	Cr. Hrs.	Grade	Sem. & Yr.
ENGLISH REQUIREMENTS (9 Hours)				
English Composition I	SENL 101B	3		
English Composition II	SENL 102B	3		
World Literature	SENL 220B	3		
Intro. To African American Literature[3]	SENL 240B	3		
Introduction to Fiction	ENGL204	3		
Introduction to Drama	ENGL 205	3		
HISTORY SEQUENCE (6 Hours)				
History of Civilization I	SHIS 111B	3		
History of Civilization II	SHIS 112B	3		
HUMANITIES ELECTIVES (3 Hours)				
Introduction to Logic	PHIL 210	3		
Introduction to Philosophy	PHIL 200	3		
Humanities I: Three Arts	HUMN 241	3		
Humanities II: Three Arts in History	HUMN 242	3		
Race Relations[3]	HUMN 366	3		
FINE ARTS ELECTIVE (3 Hours)				
Understanding the Arts	ARTS 200	3		
Enjoyment of Music	MUSC 200	3		
History of Jazz[3]	MUSC 353	3		
SOCIAL SCIENCE ELECTIVES (6 Hours)				
Economics	ECON 205	3		
Cultural Geography	GEOG 210	3		
Principles of Geography	GEOG 221	3		
American Government	POLS 200	3		
General Psychology	PSYC 210	3		
Introduction to Sociology	SOCL 210	3		
FOREIGN LANGUAGE SEQUENCE (6 Hours)				
Foreign Language I	_____ 100	3		
Foreign Language II	_____ 101	3		
HEALTH AND PHYSICAL EDUCATION (2 HOURS)				
Health	HLTH 210	2		
Physical Education Elective I		1		
Physical Education Elective II		1		
FREE ELECTIVES (9 Hours)				
CMPS 140 or Higher[1]	CMPS ____	3		
Technical Writing	ENGL 362	3		
Free Elective				
Free Elective				
Free Elective				

[4]At least one free elective will be a three (3) credit course in Mathematics

General Chemistry Lecture	SCHE 133B	3					
General Chemistry Lab	SCHE 133LB	1			**OTHER REQUIREMENTS**	**Date Completed**	**Method**
General Biology	SBIO 101B	3			Dept. Comprehensive Examination		Examination
General Biology	SBIO 101LB	1			Writing Proficiency		Examination
FRESHMAN SEMINAR (2 Hours)					Computer Literacy [1]		Course or Examination
Freshman Seminar I	FRMN 110	1			African American Experience[3]		Course
Freshman Seminar II	FRMN 111	1			Community Service (60 Clock Hours)		**Registered Volunteer**

[1]Physics 200 satisfies the requirement for computer literacy. *If used in that manner, it is no longer counted as a physics free elective.*
Computer literacy may also be established by examination or a passing grade of "C of higher" in CMPS 140 or higher.
[2] Recommended physics Elective to be taken at the same time as PHYS 311.
[3]Satisfies African American Experience requirement (3 Hours).
[4]200 level or above, as required by the Board of Regents. Students must obtain a "C" or higher in all Physics, Math and all Science Courses.
*Offered in Music Department

Approved by: _____ _____ _____ _____
Chair, Department of Mathematics and Physics Date Dean, College of Sciences and Engineering Date

It is very important that students give attention to Prerequisite courses and Co-Requisite courses.

Addendum IB
Incoming freshman course planning guide

The table below facilitates planning for an incoming freshman who plans to graduate with the concentration in Physics. Using this along with the table in Addendum IA, the student can plan his / her academic journey to complete the requirements for the degree in 4 years.

Southern University and A&M College **College of Sciences and Engineering –** **Department of Mathematics and Physics** **Degree: Bachelor of Science in Mathematics and Physics (Physics Concentration)** **Degree Requirements: 120 Credit Hours** **Catalog Year: 2017 – 2020**	**Student's Name:** **Student's S#:** **Semester Entered SU:** **Date:**

First Year

	Course	Course Title	Credits	Semester Taken	Grade Earned	Transfer Institution	Course Notes
1st Semester	PHYS 145	Discovery in Physics	3				
	SMAT 211B	Calculus I	4				Pre-requisites: Placement Score or SMAT121B and 122B with a grade of C or better
	SPHY 213B	General Physics Lecture I	3				Pre/Co-requisite: SMAT 211B
	SPHY 213LB	General Physics Lab I	1				Co-requisite: SPHY 213B
	SENL 101B	Freshman Composition	3				Pre-requisite: Placement Score

	FRMN 110	Freshman Seminar	1				
		Health/PE Activities	2				
	TOTAL SEMESTER HOURS		**17**				

	Course	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
2nd Semester	SPHY 215B	General Physics Lecture II	3				Pre-requisite: SPHY 213B, SMAT 212B
	SPHY 214LB	General Physics Lab II	1				Co-requisite: SPHY 215B
	SMAT 212B	Calculus II	4				Pre-requisite: SMAT 211B
	SCHE 132B	General Chemistry Lecture I	3				Pre-requisites: SMAT121B
	SCHE 132LB	General Chemistry Lab I	1				Co-requisite: SCHE 132B
	SENL 102B	Freshman Composition	3				Pre-requisite: SENL 101B
	FRMN 111	Freshman Seminar	1				Pre-requisite: FRMN 110
	TOTAL SEMESTER HOURS		**16**				

Second Year

	Course	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
1st Semester	SCHE 133B	General Chemistry Lecture II	3				Pre-requisite: SCHE 132B/132LB
	SCHE 133LB	General Chemistry Lab II	1				Pre-requisite: SCHE 132B/132LB
	MATH 364	Calculus III	4				Pre-requisite: SMAT 212B
	PHYS 200	Programming in Physics	3				
	SHIS 111B	History of Civilization	3				
	ENGL XXX	Literature Elective	3				Pre-requisites: SENL 101B, 102B

	TOTAL SEMESTER HOURS		**17**				
2nd Semester	**Course**	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
	PHYS 271	Modern Physics	3				Pre-requisites: SPHY 213B/215B
	PHYS 311	Mathematical Physics	3				Pre-requisites: SPHY 215B
		Humanities Elective	3				
	SHIS 112B	History of Civilization	3				
	SBIO 101B	General Biology I	3				
	SBIO 101LB	General Biology I Lab	1				
	TOTAL SEMESTER HOURS		**16**				
Third Year							
1st Semester	**Course**	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
	PHYS 341	Experimental Physics I	3				Pre-requisite: Ten hours of introductory physics.
	PHYS 416	Advanced Mechanics I	3				Pre-requisites: SPHY 213B/215B, PHYS 311 and department permission.
	MATH 276	Statistics-Sci. & Eng	3				Pre-requisite: SMAT 212B
	PHYS 411	Adv. Math. Physics	3				Pre-requisites: PHYS 311
		Foreign Language Sequence I	3				
	TOTAL SEMESTER HOURS		**15**				
2nd Semester	**Course**	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
	PHYS 342	Experimental Physics II	3				Pre-requisite: Ten hours of introductory physics.

	PHYS 345	Thermodynamics	3				Pre-requisites: PHYS 311
	PHYS 425	Adv. E & M Theory I	3				Pre-requisite: PHYS 311.
	ENGL 362	Technical Writing	3				
		Foreign Language Sequence II	3				Pre-requisite: Foreign Language I
	TOTAL SEMESTER HOURS		**15**				
Fourth Year							
1st Semester	**Course**	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
	PHYS 435	Quantum Physics I	3				Pre-requisites: PHYS 271, 311, and 417.
	MATH XXX	MATH Elective	3				
		Social Science Elective	3				
	PHYS 400	Computational Physics	3				Pre-requisites: PHYS 311
	TOTAL SEMESTER HOURS		**12**				
2nd Semester	**Course**	**Course Title**	**Credits**	**Semester Taken**	**Grade Earned**	**Transfer Institution**	**Course Notes**
	PHYS XXX	Physics Elective	3				
		Free Elective	3				
		Social Science Elective	3				
		Art Elective	3				SFIA 101B or MUSC 200
	TOTAL SEMESTER HOURS		**12**				

Other Graduation Requirements:

Writing Proficiency taken in ENGL 111 unless transferred ENGL 111 then Writing Proficiency must be scheduled;

Students must pass Departmental Comprehensive Examination;

3 Credit Hours of African American Experience;

See Advisor about Service Learning Requirement.

Addendum II The Departmental Comprehensive Examination (DCE)

Preparation guide for the Departmental Comprehensive Examination (DCE) for undergraduates in the Physics program of the Department of Mathematics and Physics

All students working toward the BS degree in Mathematics and Physics and Physics - Physics Concentration must successfully complete the Departmental Comprehensive Examination. This series of examinations cover the topics listed below. The examinations are given each semester and the exam dates will be published at the start of each semester. Students may take an exam whenever it is offered. Students have two attempts at the exam.

The DCE is graded Pass (P) or Fail (F). To pass the DCE **both conditions A. and B.** below **must** be satisfied:

Condition A: The student must receive a score of 50% correct, or, more on each of the six topics below

Condition B: The student must receive a **Cumulative Total score** of 60% correct, or, more on the **entire exam**.

If **only Condition B** is satisfied then the topic(s) where the score is less than 50% must be retaken during the Exam Retake period, or, at a later date.

If **only Condition A** is satisfied then the student has failed the DCE and **all six topics** must be retaken during the retake period, or, at a later date.

The topics that should be included in reviewing for the departmental comprehensive exam are listed below. These topics are taken from the course syllabi for the classes listed.

The examination comprehensively covers the topics of

I. Classical Mechanics (SPHY 213 and SPHY 214)
ii. Electricity and Magnetism (SPHY 214 and SPHY 215)
iii. Modern Physics (PHYS 271)
iv. Mathematical Physics (PHYS 311)
v. Experimental Physics (PHYS 341 & 342)
vi. Thermodynamics (PHYS 345)

at the level of courses listed in the parentheses. The exam includes objective questions and subjective problems.

Examples of Objective type questions and Subjective type problems are given below.

Objective Type Questions

These are questions showing a qualitative knowledge of the subject topic. They requires a very minimum of computation. The following examples illustrate this type of questions.

1. Circle the TRUE answer choice(s) below.

A pendulum on a hinge so it can swing freely is pulled to a maximum height and then released to swing freely, only under the influence of gravity. Air resistance and friction in the hinge are neglected. The reference of potential energy is at the lowest point in the path of the swing.

Answer:

(a) At the maximum height immediately before it is released the pendulum has nonzero potential and kinetic energy.
(b) At the maximum height immediately before it is released the pendulum has only potential energy.
(c) At the lowest point in its swing the pendulum has nonzero potential and kinetic energy.
(d) At the lowest point in its swing the pendulum has only kinetic energy.
(e) All of the above are false because a pendulum is an imaginary device.

2. Circle the FALSE answer choice(s) below.

(a) If an excess of electric charge is put at the very center of a solid metal block, exactly 2/3 of the excess charge will remain inside the block and the remaining 1/3 of the charge will reside on the outer surface of the block.
(b) Electric field lines sometimes intersect to form 90° angles.
(c) Using a polarizer, it is possible to see actual electric field lines.
(d) An electric dipole consists of two separated electric charges that have the same magnitude of charge but opposite polarity.
(e) A virtual image can be projected onto a screen.

Subjective Type problems
These are problem solving type. The following examples illustrate Subjective type problems.

1. A certain light has a wavelength of 625 nm in vacuum. What will be the wavelength of the light in a material that has index of refraction n = 1.89?
Answer:

2. A 300 kg car has an initial velocity of 100 m/s due east. It is brought to a stop in 15.8 s. Assume that the acceleration is constant.
a. How far did it travel before coming to a stop?
b. What was the acceleration (magnitude and direction) that the car experienced?
Answer:

Review Topics

SPHY 213B and 213LB General Physics (Classical Mechanics)
Measurements
Motion along a straight line
Vectors
Motion in two and three dimensions
Force and Motion
Kinetic Energy and Work
Potential Energy and conservation of energy
Center of mass and Linear momentum
Rotation
Rolling, Torque, and angular momentum
Equilibrium and elasticity
Gravity
fluids,
Oscillations
Waves
Temperature, heat and the first law of thermodynamics
The Kinetic theory of gasses
Entropy and the second law of Thermodynamics

SPHY 215B &214LB General Physics (Electricity and Magnetism)
Gravitational fields
Electric charge
Electric fields
Gauss Law
Electric potential and electric potential energy
Capacitance
Electric current, resistance and resistivity, power
Electric circuit calculations
Magnetic force and fields
General calculations of magnetic field that are due to electric currents
Inductance
R-L circuits including charging and decay of charge in R-L circuits
Electromagnetic oscillations and alternating current
Waves
Electromagnetic waves
Images
Interference and Diffraction

PHYS 271 Modern Physics
Special relativity: time dilation, length contraction, Lorentz transformations
Experimental Basis for Quantum Theory: Black body Radiation, Photoelectric Effect, Compton effect, Heisenberg Uncertainty Principle
Wave properties of matter, The Bohr model of the hydrogen atom
Many electron atoms/ Frank Hertz Experiment
Quantum theory/Schrodinger's equation and applications Particle in a box, tunneling
Structure of the hydrogen atom
Solid state Physics
Solids, semiconductor theory
Nuclear physics
General Relativity

PHYS 311 Mathematical Physics
Polynomials and the Fundamental Theorem of Algebra. Linear Equations, Determinants and Matrix Operations; Special Matrices (Orthogonal, Unitary, Symmetric, Hermitian);
Set of Linear Equations: Row Reduction, Determinants, Cramer's Rule, Linear Combinations, General Theorem of Sets of Linear Equations.
Complex Analysis: Real and Imaginary parts of Complex Numbers, Complex Plane, Complex Algebra, Complex Series, Circle of Convergence, Euler's Formula, Power and Roots of Complex Numbers,
Trigonometric Functions, Hyperbolic Functions, Logarithms Functions.
Mathematical Series: General, Geometric, Harmonic, Alternating, and Power Series; Absolute, Conditional, and Uniform Convergences
Taylor's theorem and power series expansion, the uniqueness theorem and applications of the binomial theorem and of the uniform convergence for power series expansions.
Differential Equations: Generalities and basic nomenclature (Linear & non-linear, homogeneous & inhomogeneous, and ordinary and partial differential equations of nth order).
Orthogonal Functions and Polynomials: General Survey, Legendre and other polynomials. Survey of Orthogonal Functions. Introduction to expansions in terms of orthogonal functions.
Fourier Series: Simple Harmonic Motion, Average Value of a Function; the Dirichlet Theorem and Fourier Expansion, Fourier Coefficients, Complex Form of Fourier Series, Even and Odd Functions.
Vector Analysis: Vector Multiplication, Differentiation of Vectors, Vector Fields (Gradient, Divergence, and Curl), Line Integrals, Green's Theorem, Divergence Theorem, Stokes Theorem Generation of Poisson, Laplace, and Wave equations from Maxwell's equation.
Coordinate Transformations.
Series Solution of Ordinary Differential Equations
Partial Differential Equations: Laplace, Diffusion, Wave, and Poisson Equations and Others. Applications of the Frobenius method following the separation of variables.

PHYS 341/342 Experimental Physics
Laboratory Uses of the Oscilloscope
Atomic Spectroscopy (Rydberg constant measurement)
Photoelectric Effect (Planck’s constant measurement)
e/m measurement
Electron spin resonance
Frank-Hertz Experiment
Electron Diffraction (de Broglie principle)
Nuclear Science
Nuclear counting statistics
Absorption of gamma radiation in matter
Absorption of beta radiation in matter
Gamma- and X-ray spectroscopy
Nuclear Magnetic Resonance
X-Ray Tube Physics

Absorption of X-rays
Michelson Interferometry
Moseley's Law
Fine Structure measurements

PHYS 345 Thermodynamics
Equations of State (ideal gas, van der Waals)
Thermodynamic Processes and work
First and second Laws and applications
Entropy and the third law
Thermodynamic potentials
Kinetic theory of an ideal gas
molecular velocity and speed distributions
Equipartition of energy
Maxwell - Boltzmann statistics and simple applications
Fermi - Dirac Statistics and simple applications
Bose - Einstein statistics and simple applications

In addition to your class notes the following introductory physics texts provide excellent questions at the level of the DCE in addition to the texts used in the classes that you have taken.
Fundamentals of Physics, Authors: Halliday, Resnick and Walker, publisher Wiley.
Physics for Scientists and Engineers (Authors: Serway, publisher Saunders, HBJ
Several good review texts, including some of the above, are located in the physics reading room RM 236 on the second floor of William James Hall.

The above texts are standard undergraduate physics texts and provide good presentations of the topics and questions at the expected level. These texts are in general use at many universities and colleges.

Addendum III

Student Advising Record

Faculty Advisor:_____ Student Advisee: _____

Date	Time Start	End	Topic Discussed	Initials Stu/Adv.

NOTES