



MOREHOUSE
COLLEGE

**DEPARTMENT OF
PHYSICS & DUAL DEGREE
ENGINEERING PROGRAM**

Eddie Red, Ph.D.
Chair and Associate Professor

Fall 2018

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GREETINGS FROM THE DEPARTMENT CHAIR

Dear Students of the Department of Physics & DDEP at Morehouse:

On behalf of the Faculty and Staff of the Department of Physics & DDEP, I extend a warm welcome to you as we begin Academic Year 2018-2019 at Morehouse. We anticipate another exciting year filled with hard work for our students, staff, and faculty. We also expect a number of unforeseen challenges and celebrations that will empower us to grow.

Historically, Morehouse College began offering a major in physics in 1942 while the Department of Physics was created in 1963 to serve the students of physical science and physics. Since 1969, Morehouse College has offered students the option of studying engineering through the Dual Degree Engineering Program (DDEP), which consists of cooperative agreements with 14 engineering schools across the U.S. Thus, we are responsible for all physics, applied physics, and DDEP majors at Morehouse which confirms our name as the Department of Physics & Dual Degree Engineering Program.

From its earliest days, the Department has stressed that graduate school is the next logical step for physics majors after graduation from Morehouse. As a result of this emphasis, Morehouse College has historically been a leader among all colleges and universities in the production of African American graduates in physics who go on to graduate school. In recent years, according to the American Institute of Physics (AIP), Morehouse is ranked as the Nation's #1 producer of under-represented minorities with bachelors' degrees in physics. But *we believe that we can do better!*

Through our Vision 3X, we plan to triple the total number of graduates in physics and applied physics from Morehouse. Furthermore, we believe a degree in physics or applied physics prepares our graduates to accomplish success in any career path they choose. And as a result, many of our alumni are employed in a variety of careers such as education, engineering, industry, medicine, law, business, ministry, etc. Thus, we are refreshing the physics curriculum to emphasize a comprehensive approach leading to a variety of career pathways. The refreshed curriculum will encompass a Physics core with supplementary courses in targeted disciplines such as Astronomy/Astrophysics, Computational Physics, Interdisciplinary Science (including Accelerator Science, Applied Optics, Biophysics/Medical Physics, and Chemical & Energy Physics), Physics Education, and Corporate Physics (including Law and & Politics).

Again, I welcome you to the Department and look forward to interacting with you soon.

Sincerely,

Eddie C. Red, Ph.D.
Chair & Associate Professor

INTRODUCTION

This handbook is intended to provide Physics and Dual Degree Engineering majors with information about department policies and procedures, to acquaint the student with the department faculty, to review requirements for the major and recommended courses and sequences, and to provide information on special programs and opportunities. It also contains a description of courses currently offered in the department. You should familiarize yourself with its content but be reminded that: [1] the information may change, [2] it is important to explore additional sources to supplement this document, and [3] it is the student's responsibility to keep in touch with his adviser and be aware of any changes in policies or requirements.

DEPARTMENT MISSION AND GOALS

The mission of the Morehouse College Department of Physics & Dual Degree Engineering Program (Physics & DDEP) is to enhance our students' intellectual skills through the study of physics. Toward this end, the Department of Physics & DDEP offers a spectrum of courses that reflects both the integral character of physics in the liberal-arts curriculum and its essential role in engineering and technology.

The goals of the Department of Physics & DDEP are to:

1. Prepare its majors for graduate studies in physics and other professional careers;
2. Prepare DDEP majors for matriculation at engineering schools;
3. Support the preparation of students majoring in biology, chemistry, computer science, and mathematics;
4. Assist other majors in satisfying the College's general-education requirements in science.

CAREER OPTIONS AND DEGREES

The most important thing you will do in college is to determine what you enjoy doing and what subjects and activities really excite you. Those are the areas you should pursue. Answering the questions “What do you like?” and “What do you do very well?” are the first steps to pursuing a successful academic career and finding your life’s work. This is more than just taking classes, but getting real life experiences, on and off campus.

What can you do with a degree in Physics or Engineering?

There are many career options available to you and it depends on what degree you have, namely a bachelors, graduate or professional school degree or certification. You should make it a point to *explore the many options* available by talking with Department faculty, exploring Cyber Village (morehouse.edu/cybervillage), attending special seminars, and being aware of career/job-oriented events sponsored by various student services such as the Office of Career Planning and Placement as well as the key organizations listed below.

The degrees that one can earn in physics or engineering are listed below:

1. **Bachelor of Science (B.S.).** This degree can be obtained in four years at an undergraduate institution.
2. **Master of Science (M.S.); Master of Education (M.Ed.).** The master’s degree requires an additional 1-3 years after the bachelor’s degree depending if it is with or without a thesis.
3. **Doctor of Philosophy (Ph.D.).** This is a specialized degree that emphasizes research skills in your major. It takes approximately 5-7 years after the bachelor’s degree. The most versatile degree, it enables the individual to teach, work in private practice, consult, and/or conduct research.

4. **Doctorate in Education (Ed.D.).** The Ed.D. is a Doctoral degree in education. It takes approximately 5 years after the bachelor's degree or 1-3 years after the master's degree. This degree is mainly sought by those interested in a career in administration in the field of education.

These descriptions represent only a small portion of areas of study/work in the field of physics and engineering.

Key Organizations

The **Society of Physics Students (SPS)** is a professional association explicitly designed for students. Membership, through collegiate chapters, is open to anyone interested in physics. The only requirement for membership is that you be interested in physics. Besides physics majors, SPS members include majors in chemistry, computer science, engineering, geology, mathematics, medicine, and other fields. Morehouse has a local chapter of SPS. The national web address for SPS is spsnational.org.

The **Sigma Pi Sigma Physics Honor Society ($\Sigma\Pi\Sigma$)** is the honor society in direct association with SPS. Sigma Pi Sigma exists to honor outstanding scholarship in physics; to encourage interest in physics among students at all levels; to promote an attitude of service of its members towards their fellow students, colleagues, and the public; and to provide a fellowship of persons who have excelled in physics. Morehouse has a local chapter of $\Sigma\Pi\Sigma$. The national web address for $\Sigma\Pi\Sigma$ is sigmapisigma.org.

The **National Society of Black Physicists (NSBP)** seeks to develop and support efforts to increase opportunities for African Americans in physics and to increase their numbers and visibility of their scientific work. It also seeks to develop activities and programs that highlight and enhance the benefits of the scientific contributions that African American physicists provide for the international community. The society seeks to raise the general knowledge and appreciation of physics in the African American community. The web address for NSBP is nsbp.org.

The **National Society of Black Engineers (NSBE)**, with more than 29,900 members,

is one of the largest student-governed organizations in the country. Founded in 1975, NSBE now includes more than 394 College, Pre-College, and Technical Professional/Alumni chapters in the United States and abroad. NSBE's mission is to increase the number of culturally responsible black engineers who excel academically, succeed professionally, and positively impact the community. The AUC Chapter of NSBE has its office located in the AUC DDEP Office. The national web address for NSBE is www.nsbe.org.

Applied Engineering and Response Organization (AERO), a growing and dynamic student organization, was established on Morehouse's Campus in 2006 to provide a mechanism for pre-engineering and science students to enter and compete in national engineering projects.

Morehouse Robotics Club (RoboTigers) was formed in 2015 on Morehouse Campus. Membership is open to all students with interest in robotics, engineering, science and/or technology. Students are involved creating robots and robotic systems that are used to compete in statewide and national robotic engineering competitions.

DEPARTMENT OF PHYSICS & DDEP

Faculty and Staff

FACULTY

01. Dr. Eddie C. Red, Associate Professor and Chair

Ph.D., Florida A&M University

Dansby Hall, Room 114; eddie.red@morehouse.edu; (470) 639-0219

Research Interests

- Materials Science Physics with Electrochemical Applications
- Nuclear Science and Environmental Radiation Studies
- Electron/Photon Interactions with Atoms and Molecules
- Development and Incorporation of Numerical Techniques into High Performance Algorithms

02. Dr. Aakhut E. Bak, Associate Professor

Ph.D., Massachusetts Institute of Technology

Dansby Hall, Room 104-B; aakhut.bak@morehouse.edu; (470) 639-0398

Research Interests

- Particle Physics and Optics

03. Dr. John Howard, Assistant Professor

Ph.D., Georgia Institute of Technology

Dansby Hall, Room 104-D; john.howard@morehouse.edu; (470) 639-0332

Research Interests

- Condensed Matter Physics
- Physics Education

04. Dr. Dwayne Joseph, Assistant Professor

Ph.D., Florida A&M University

Dansby Hall, Room 106-A; dwayne.joseph@morehouse.edu; (470) 639-0721

Research Interests

- Low Energy Atomic Collisions
- Ion-Atomic Current Transfer Interactions

FACULTY (continued)

05. Dr. Emmanuel Karikari, Assistant Professor
Coordinator for the Dual Degree Engineering Program
Ph.D., University of Virginia
Dansby Hall, Room 106-B; emmanuel.karikari@morehouse.edu; (470) 639-0652

Research Interests

- Structural Properties of Materials
- Engineering Education

06. Dr. Carlyle E. Moore, Associate Professor
Ph.D., Georgia Institute of Technology
Dansby Hall, Room 116-B; carlyle.moore@morehouse.edu; (470) 639-0255

Research Interests

- Nuclear and Particle Physics

07. Dr. Wesley D. Sims, Assistant Professor
Ph.D., Alabama A&M University
Dansby Hall, Room 103; wesley.sims@morehouse.edu; (470) 639-0589

Research Interests

- Applied Optics (Nanolithography/Nanomaterials)

08. Dr. Augustine J. Smith, Associate Professor
Ph.D., Oregon State University
Dansby Hall, Room 104-C; augustine.smith@morehouse.edu; (470) 639-0205

Research Interests

- Atomic Physics

PART-TIME INSTRUCTORS

09. Mr. Al (“AC”) Johnson, Instructor
Dansby Hall, Room 102; al.johnson@morehouse.edu; (470) 639-0697

STAFF

Mrs. Renee Carr, Administrative Assistant II
Dansby Hall, Room 114; renee.carr@morehouse.edu; (470) 639-0219

PROGRAM OF STUDY IN PHYSICS

B.S. IN PHYSICS

COURSE REQUIREMENTS FOR PHYSICS MAJORS

A student pursuing the Bachelor of Science degree in Physics must complete a program of study that consists of the following four components: Introductory Sequence, Mathematics Requirements, Core Physics Courses, and Physics Electives.

1. Introductory Sequence – 12 credit hours

An introductory sequence of three (3) elementary courses is offered for students who need preparation prior to beginning the core physics courses.

- PHY 154 Mechanics**
- PHY 253 Electricity and Magnetism**
- PHY 254 Optics and Modern Physics**

2. Mathematics Requirements – 18 credit hours

All physics majors are required to take the following five (5) mathematics courses.

- MTH 161 Calculus I**
- MTH 162 Calculus II**
- MTH 263 Calculus III**
- MTH 271 Introduction to Linear Algebra**
- MTH 321 Introduction to Ordinary Differential Equations**

3. Core Physics Courses – 18 credit hours

All physics majors are required to take the following seven (7) upper-level courses.

- PHY 351 Junior Laboratory**
- PHY 353 Mathematical Physics I**
- PHY 360 Thermodynamics**
- PHY 361 Electromagnetic Theory**
- PHY 362 Classical Mechanics**
- PHY 363 Quantum Mechanics I**
- PHY 450 Senior Seminar**

4. Physics Electives – 9 credit hours

All physics majors are required to take three (3) upper-level courses from one of the following categories.

Traditional Electives

PHY 354 **Mathematical Physics II**
PHY 364 **Quantum Mechanics II**
PHY 367 **Advanced Optics**
PHY 452 **Senior Laboratory**
PHY 460 **Special Problems in Physics**
PHY 470 **Special Relativity**
PHY 473 **Nuclear & Particle Physics**
PHY 474 **Solid-State Physics**

Concentration in Astronomy

PHY 470 **Special Relativity**
ASTRO 3500 **Quantitative Astronomy** (offered at GSU)
PHYS 3021 **Stellar Astrophysics** (offered at Georgia Tech)

Concentration in Computational Physics

CSC 450 **High-Performance Scientific Computing**
CS 3510 **Design and Analysis of Algorithms** (offered at Georgia Tech)
PHYS 3266 **Computational Physics** (offered at Georgia Tech)

Concentration in Interdisciplinary Science (Applied Optics route)

PHY 367 **Advanced Optics**
PHY 460 **Special Problems in Physics** (as Introduction to Lasers)
PHYS 3223 **Geometric Optics** (offered at Georgia Tech)

Concentration in Interdisciplinary Science (Biomedical Physics route)

BIO 215/215L **Molecular Genetics**
BMED 3310 **Biotransport** (offered at Georgia Tech)
PHYS 4251 **Biophysics** (offered at Georgia Tech)

Concentration in Physics Education

SEDU 316 **Exceptional Learners** (offered at Spelman)
SEDU 444 **Curriculum & Methods** (offered at Spelman)
SEDU 458 **Student Teaching** (offered at Spelman)

Concentration in Applications to Society (Law & Politics route)

PSC 348	American Constitutional Law
PSC 350	Race and the Law
PSC 371	Public Management

The concentration in Interdisciplinary Science may be pursued via the routes of accelerator physics, applied optics, biomedical physics, chemical physics, health sciences, or materials science. The concentration in Applications to Society may be pursued via the routes of business & economics, law & politics, mass media, music, or sociology. The list of elective courses will expand eventually to accommodate all these routes. Note that suitable courses not listed here may be approved as electives according to the discretion of the Department Chair.

A student seeking to take traditional electives has no special action to take. A student seeking to pursue one of various concentrations would choose three (3) upper-level courses appropriate for his desired concentration. In choosing these three courses, the student would draw from the courses of relevant disciplines, whether physics or otherwise. Then the student would select his concentration courses in consultation with his physics academic adviser. Finally, the student would seek approval from the Department Chair to confirm his choice of concentration courses.

Each student pursuing a B.S. degree must complete a suitable introductory course from two science departments other than the department of his major. By taking BIO 113 (Comprehensive Biology) and CHE 111 (Elementary Inorganic Chemistry), the major in physics satisfies this B.S. requirement. Students may alternatively take higher-level courses in these disciplines.

In summary, to complete a B.S. degree in Physics, a student must have:

- A total of one hundred twenty (120) academic credit hours;
- A total of thirty-nine (39) credit hours in physics as prescribed;
- A total of eighteen (18) credit hours in mathematics as prescribed;
- A minimum overall GPA of 2.00;
- Satisfactory completion of required courses in the Department;
- Satisfactory completion of general-education courses required in the College's general-education curriculum.

A Minor in Physics

Although the College does not have a set of specific course requirements for a minor, a number of students find it beneficial to take additional courses beyond the introductory sequence in physics. A minor in physics is available to the student who completes 18 hours of relevant coursework at Morehouse College with no grade lower than C. The selection of courses beyond the introductory physics sequence should be made in consultation with the student's academic adviser and should take into consideration the student's major, educational goals, and career goals.

Departmental Honors

A major in physics may be recommended for departmental honors by completing the following requirements: [1] eligibility for college honors (cumulative GPA of 3.0 and above); [2] an average of B or better in all core physics courses; [3] the successful completion of a faculty-supervised research project; and [4] the presentation of acceptable written or oral reports of the project results to the faculty.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Traditional Route**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Free Elective	3 hours
Art & Literature (1 of 1)	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Ideas & Ethics (1 of 2)	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
Ideas & Ethics (2 of 2)	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	14 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
Physics Elective (1 of 3)	3 hours
Physics Elective (2 of 3).....	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

Physics Elective (3 of 3).....	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	15 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Astronomy**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Free Elective	3 hours
Art & Literature (1 of 1)	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Ideas & Ethics (1 of 2)	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
Ideas & Ethics (2 of 2)	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	14 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
ASTR 3500 – Quantitative Astronomy[1] (Physics Elective: 1 of 3).....	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

PHY 470 – Special Relativity (Physics Elective: 2 of 3).....	3 hours
PHYS 3021 – Stellar Astrophysics[2] (Physics Elective: 3 of 3)	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	15 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

1 ASTR 3500 (Quantitative Astronomy) is offered at Georgia State University.

2 PHYS 3021 (Stellar Astrophysics) is offered at Georgia Institute of Technology.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Computational Physics**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Art & Literature (1 of 1)	3 hours
Free Elective	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Ideas & Ethics (1 of 2)	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
CSC 110 – Computer Programming I.....	3 hours
Ideas & Ethics (2 of 2)	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	13 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
PHYS 3266 – Computational Physics[3] (Physics Elective: 1 of 3)	4 hours
CS 3510 – Algorithms[4] (Physics Elective: 2 of 3)	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	13 hours

Spring Term

BIO 113 – Comprehensive Biology.....	4 hours
CSC 450 – Scientific Computing (Physics Elective: 3 of 3).....	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	16 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

3 PHYS 3266 (Computational Physics) is offered at Georgia Institute of Technology.

4 CS 3510 (Design and Analysis of Algorithms) is offered at Georgia Institute of Technology.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Interdisciplinary Science (Applied Optics route)**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Art & Literature (1 of 1)	3 hours
Free Elective	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Ideas & Ethics (1 of 2)	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
Ideas & Ethics (2 of 2)	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	14 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
PHY 367 – Advanced Optics (Physics Elective: 1 of 3).....	3 hours
PHY 452 or PHY 460† or PHYS 3223‡ (Physics Elective: 2 of 3).....	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

PHY 452 or PHY 460 or PHYS 3223 (Physics Elective: 3 of 3).....	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	15 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

† PHY 460 (Special Problems in Physics) as Introduction to Lasers.

‡ PHYS 3223 (Geometric Optics) is offered at Georgia Institute of Technology.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Interdisciplinary Science (Biomedical Physics route)**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Art & Literature (1 of 1)	3 hours
Free Elective	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Ideas & Ethics (1 of 2)	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
Ideas & Ethics (2 of 2)	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	14 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
PHYS 4251 – Biophysics[5] (Physics Elective: 1 of 3).....	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

BIO 215/215L – Molecular Genetics (Physics Elective: 2 of 3)	4 hours
BMED 3310 – Biotransport[6] (Physics Elective: 3 of 3)	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	16 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

5 PHYS 4251 (Biophysics) is offered at Georgia Institute of Technology.

6 BMED 3310 (Biotransport) is offered at Georgia Institute of Technology.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Physics Education**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Society & Culture: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
Society & Culture (2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Summer Term

SEDU 206 – Orientation in Education	4 hours
SEDU 304 – Educational Psychology	<u>3 hours</u>
	7 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Free Elective	3 hours
Ideas & Ethics (1 of 2)	3 hours
Physical Education course (1 of 2)	1 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	17 hours

Summer Term

The student is expected to have an REU in Physics Education or a Summer Experience in Teaching.

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics.....	3 hours
Art & Literature (1 of 1)	3 hours
SEDU 316 – Exceptional Learners (Physics Elective: 1 of 3).....	4 hours
Physical Education course (2 of 2)	1 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	17 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
PSY 304 – Adolescent Psychology	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	17 hours

Summer Term

The student is expected to have an REU in Physics Education or a Summer Experience in Teaching.

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
SEDU 444 – Curriculum & Methods (Physics Elective: 2 of 3)	4 hours
SEDU 451 – Seminar I Student Teaching.....	2 hours
Ideas & Ethics (2 of 2)	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

SEDU 452 – Seminar II Student Teaching	3 hours
SEDU 458 – Student Teaching (Physics Elective: 3 of 3)	<u>12 hours</u>
	15 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

**POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS
Concentration in Applications to Society (Law & Politics route)**

Freshman Year

Fall Term

MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Ideas & Ethics: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
Free Elective	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II.....	4 hours
ENG 102 – English Composition.....	3 hours
Art & Literature (1 of 1)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	17 hours

Sophomore Year

Fall Term

PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
FLX 201 – Intermediate Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 254 – Optics & Modern Physics.....	4 hours
PHY 353 – Mathematical Physics I	3 hours
MTH 271 – Linear Algebra	3 hours
Free Elective	3 hours
PSC 251 – National Government (Society & Culture course: 1 of 2).....	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	16 hours

Junior Year

Fall Term

PHY 351 – Junior Laboratory	3 hours
PHY 360 – Thermodynamics.....	3 hours
PHY 362 – Classical Mechanics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
Free Elective	3 hours
EDU 353 – Crown Forum.....	<u>0 hours</u>
	15 hours

Spring Term

PHY 361 – Electromagnetic Theory.....	3 hours
PHY 363 – Quantum Mechanics I.....	3 hours
BIO 113 – Comprehensive Biology.....	4 hours
Free Elective	3 hours
Physical Education course (2 of 2)	1 hours
EDU 354 – Crown Forum.....	<u>0 hours</u>
	14 hours

Senior Year

Fall Term

PHY 450 – Senior Seminar.....	0 hours
PSC 348 – American Constitutional Law (Physics Elective: 1 of 3).....	3 hours
PSC 350 – Race and the Law (Physics Elective: 2 of 3)	3 hours
Ideas & Ethics (2 of 2)	3 hours
Free Elective	<u>3 hours</u>
	12 hours

Spring Term

PSC 371 – Public Management (Physics Elective: 3 of 3).....	3 hours
Society & Culture (2 of 2)	3 hours
Free Elective	3 hours
Free Elective	3 hours
Free Elective	<u>3 hours</u>
	15 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

THE DUAL DEGREE ENGINEERING PROGRAM

B.S. IN GENERAL SCIENCE
B.S. IN APPLIED PHYSICS
B.S. IN MATHEMATICS
B.S. IN CHEMISTRY

***** All students are listed as Pre-engineering majors until the following courses are completed with a grade of C or better. Note that C- is NOT a passing grade.***

EGR 101 Freshman Engineering Design
PHY 154 Mechanics

INTRODUCTION

Since 1969, Morehouse College has offered students the option of studying engineering through the Dual Degree Engineering Program (DDEP), which consists of cooperative agreements with a number of engineering schools. DDEP originated in 1969 with an agreement between the Atlanta University Center and Georgia Institute of Technology (Georgia Tech). In subsequent years, other engineering institutions have established formal agreements with Morehouse. The participating engineering institutions are:

1. Auburn University
2. Clarkson University
3. Columbia University
4. Dartmouth College (Thayer School of Engineering)
5. Georgia Institute of Technology
6. Indiana University – Purdue University Indianapolis (IUPUI)
7. Missouri University of Science and Technology
8. North Carolina Agricultural & Technical State University
9. Notre Dame University
10. Rensselaer Polytechnic Institute
11. Rochester Institute of Technology
12. University of Alabama – Huntsville
13. University of Michigan – Ann Arbor
14. University of Southern California

The Dual Degree Engineering Program at Morehouse College provides an opportunity for students to obtain both a liberal-arts education and a professional engineering education.

URGENT MATTERS

The Atlanta University Center (AUC) Dual Degree Engineering Program Office acts as the liaison that manages the cooperative academic partnership and facilitates the transfer process between the AUC institutions and the participating engineering institutions. The AUC DDEP Office provides extensive student services designed to promote successful completion of the Dual Degree Engineering Program and to prepare students for success in the workplace.

It is important for you to know:

AUC Dual Degree Engineering Program
156 Mildred Street SW
Atlanta, GA 30314
Phone: (404) 523-5148
aucenter.edu/academic-career-services/ddep

Each DDEP student must register with the AUC DDEP Office every fall term of his matriculation at Morehouse.

Issues relating to a student's academic program must be referred to his Morehouse academic adviser and not to the AUC DDEP Office. Student academic advisement is an important support service aimed at guiding each student to successful completion of his degree program. An academic adviser is assigned to each DDEP student according to his intended area of engineering. See page 56 for details.

***** In order for a student to be considered in DDEP, he must complete the following courses with a grade of C or better. Note that C- is NOT a passing grade.***

EGR 101 Freshman Engineering Design
PHY 154 Mechanics

Prospective students are advised to take these courses at their earliest opportunity.

BACHELOR OF SCIENCE DEGREES UNDER DDEP

Upon completion of all DDEP requirements, the student is awarded two baccalaureate degrees: one from Morehouse and the other from his engineering institution. The degree from Morehouse College is awarded according to one of two options.

Option I – B.S. in General Science

Under Option I, Morehouse grants a Bachelor of Science degree in General Science after successful completion of:

- All general-education requirements at Morehouse College (see pages 65-66);
- All necessary pre-engineering courses at Morehouse College (see pages 63-64);
- The remaining program requirements at the engineering institution.

Option II – B.S. in Applied Physics, Mathematics, or Chemistry

Under Option II, Morehouse grants a Bachelor of Science degree in Applied Physics, Chemistry, or Mathematics after successful completion of:

- All general-education requirements at Morehouse College (see pages 65-66);
- All necessary pre-engineering courses at Morehouse College (see pages 63-64);
- All requirements for the chosen science major at Morehouse College;
- The remaining program requirements at the engineering institution.

Students in the Dual Degree Engineering Program typically spend a minimum of three (3) years in pre-engineering at Morehouse College, followed by at least two (2) years in engineering at an affiliated institution. However, DDEP is not time-driven – it is course-driven! **The DDEP student MUST complete all his general-education and pre-engineering courses at Morehouse College BEFORE transferring to his engineering institution.** In the event that an Option I student is unable to complete the requirements at the engineering institution, he must return to Morehouse College and complete requirements for a liberal-arts major before a baccalaureate degree can be

awarded.

Because of the special nature of the Dual Degree Engineering Program, the baccalaureate degree will not be conferred by either Morehouse College or the engineering institution until all of the requirements established by both institutions have been satisfactorily completed.

In summary, to complete degree requirements in DDEP, a student must have:

- A minimum overall GPA of 2.80 at Morehouse College;
- Satisfactory completion (minimum of 3.00 GPA) of pre-engineering courses;
- Satisfactory completion of general-education courses (minimum of 2.50 GPA) required in the College's general-education curriculum;
- Satisfactory completion of requirements at the engineering institution.

BACHELOR OF SCIENCE DEGREE IN APPLIED PHYSICS

In the fall of 1998, the Department of Physics established a major program in applied physics to meet the increasing interest in applied science and engineering among our students. The Applied Physics Program involves a physics curriculum that complements various fields of engineering and extends the knowledge base in physics for students who pursue this major. The Applied Physics Program is currently available only to DDEP students who are pursuing Aerospace, Architectural, Biomedical, Civil, Computer, Electrical, Environmental, Mechanical, or Nuclear Engineering. All students pursuing these engineering fields should consider the Applied Physics Program. It is attractive from the perspectives of both time and curriculum.

A student pursuing the Bachelor of Science degree in Applied Physics must complete a program of study that consists of the following three components: Pre-Engineering Requirements (same as for Option I), Core Physics Requirements (3 upper-level physics courses according to engineering field, see page 67), and Engineering Requirements (see below).

Engineering Requirements

At the engineering institution, the student must take at least twelve (12) hours of upper-level (that is, junior or senior) engineering courses. At least six (6) of these twelve hours must be at the senior level. Moreover, the student must complete one upper-level laboratory course at the engineering institution. Note that these requirements at the engineering institution are most likely part of his program there.

Upon completion of all degree requirements, the student is awarded a B.S. degree in Applied Physics according to DDEP Option II.

BACHELOR OF SCIENCE DEGREE IN CHEMISTRY AND BACHELOR OF CHEMICAL ENGINEERING

It is possible for students enrolled in Engineering, operated under a joint arrangement between Morehouse College and Georgia Institute of Technology, to earn a joint B.S. in Chemistry and a Bachelor of Chemical Engineering degree. The Chemistry requirements for this dual degree program are CHE 111-112, CHE 231-232, CHE 321-322, CHE 421-422, two additional 400-level chemical engineering courses offered at Georgia Institute of Technology, Auburn University, Boston University, or Rochester Institute of Technology, plus the mathematics and physics courses required under the B.S. in Chemistry program. It is understood that the student must meet all other requirements of the engineering college as well as the requirements of the Dual-Degree Engineering Program.

**POSSIBLE COURSE SEQUENCE FOR DDEP OPTION I:
BACHELOR OF SCIENCE DEGREE IN GENERAL SCIENCE**

Freshman Year

Fall Term

EGR 101 – Freshman Engineering Design.....	3 hours
MTH 161 – Calculus I.....	4 hours
ENG 101 – English Composition.....	3 hours
FYE Course (Ideas & Ethics: 1 of 2)	3 hours
FLX 101 – Beginning Foreign Language.....	3 hours
EDU 153 – Crown Forum.....	<u>0 hours</u>
	16 hours

Spring Term

PHY 154 – Mechanics.....	4 hours
MTH 162 – Calculus II	4 hours
ENG 102 – English Composition.....	3 hours
PHI 302 – Philosophical Ethics (Ideas & Ethics 2 of 2)	3 hours
FLX 102 – Beginning Foreign Language.....	3 hours
Physical Education course (1 of 2)	1 hours
EDU 154 – Crown Forum.....	<u>0 hours</u>
	18 hours

Sophomore Year

Fall Term

EGR 103 – Engineering Graphics.....	3 hours
PHY 253 – Electricity & Magnetism.....	4 hours
MTH 263 – Calculus III.....	4 hours
CHE 111 – General Chemistry I.....	4 hours
Art & Literature (1 of 1)	3 hours
EDU 251 – Crown Forum.....	<u>0 hours</u>
	18 hours

Spring Term

EGR 205 – Engineering Statics.....	3 hours
PHY 254 – Optics & Modern Physics.....	4 hours
MTH 271 – Linear Algebra	3 hours
CHE 112 – General Chemistry II.....	4 hours
Free Elective	3 hours
EDU 252 – Crown Forum.....	<u>0 hours</u>
	17 hours

Junior Year

Fall Term

EGR 308 – Engineering Dynamics	3 hours
MTH 321 – Ordinary Differential Equations	3 hours
CSC 110 – Computer Programming I	3 hours
Free Elective	3 hours
Physical Education course (2 of 2)	1 hours
ECO 201 or ECO 202 – Economics (Society & Culture course: 1 of 2)	3 hours
EDU 353 – Crown Forum	<u>0 hours</u>
	16 hours

Spring Term

BIO 113 – Comprehensive Biology	4 hours
Communications course (<u>one</u> from COM 351, 352, or 353)	3 hours
Free Elective	3 hours
Free Elective	3 hours
PSC 251 – National Government (Society & Culture course: 2 of 2)	3 hours
EDU 354 – Crown Forum	<u>0 hours</u>
	16 hours

Warning: Students who enroll in courses for which they have not met the stated prerequisites are subject to disenrollment by the department regardless of performance or time lapsed.

DEPARTMENT OF PHYSICS & DDEP

Courses Taught

PHYSICS (PHY)

102. Physical Science

3 hours

Survey of the principles and laws of physics. Emphasis is placed on the role of experiment in the development of natural science and on the foundation that physics provides for technology. Explores the interplay between technology and science and the influence of technology in the world community. The approach is primarily conceptual, and physics is presented as an historical and humanistic development of human intellect. This course consists of a lecture component and a laboratory component. *Prerequisite: MTH 100.*

151. General Physics I

4 hours

Noncalculus-based introduction to mechanics, thermodynamics, and sound. Specifically, the topics covered include measurement, vector algebra, kinematics, Newton's laws of motion, energy, momentum and collisions, gravitation, fluid mechanics, vibrations and waves, and sound. This course consists of a lecture component, a laboratory component, and a recitation component. *Prerequisite: MTH 120.*

152. General Physics II

4 hours

Second part of the noncalculus-based introduction to physics. Covers electricity and magnetism, optics, and modern physics. Specifically, the course topics include electric charge, Coulomb's law, the electric field, electric potential, capacitance, Ohm's law, circuit analysis, the magnetic field, the Biot-Savart law, Ampere's law, Faraday's law, induction, alternating currents, Maxwell's equations, electromagnetic waves, geometrical optics, wave optics (interference and diffraction), and special relativity. This course consists of a lecture component, a laboratory component, and a recitation component. *Prerequisite: PHY 151.*

154. Mechanics

4 hours

Introductory, calculus-based course focusing on the field of mechanics. Specifically, the course covers vector algebra, kinematics, dynamics, statics, Newton's laws of motion, conservation of energy and momentum, oscillations, gravitation, and rotational dynamics. This course consists of a lecture component, a laboratory component, and a recitation component. *Prerequisite: MTH 161 or departmental approval.*

253. Electricity & Magnetism**4 hours**

Provides an elementary, calculus-based introduction to the fundamental laws of electricity and magnetism. Begins with the topic of electric charge and builds to a statement of Maxwell's equations in integral form. Topics covered include electric charge, Coulomb's law, the electric field, Gauss's law for electricity, electric potential, capacitance, Ohm's law, circuit analysis, the magnetic field, the Hall effect, Ampere's law, Faraday's law, induction, Gauss' law for magnetism, electromagnetic oscillations, alternating currents, and Maxwell's equations. This course consists of a lecture component, a laboratory component, and a recitation component. *Prerequisites: PHY 154 (C or better) and MTH 162, or departmental approval.*

254. Optics & Modern Physics**4 hours**

Completes the introductory calculus-based sequence. The topics include elastic waves, electromagnetic waves, geometrical optics, wave optics (interference and diffraction), special relativity, wave-particle duality, and Bohr theory of the hydrogen atom. This course consists of a lecture component, a laboratory component, and a recitation component. *Prerequisite: PHY 253.*

351. Junior Laboratory**3 hours**

Modern instrumentation techniques and methods. Experiments in modern physics. *Prerequisite: PHY 254.*

353. Mathematical Physics I**3 hours**

Provides some of the applied mathematics essential to the upper division courses in physics. Topics covered include infinite series, Fourier series, Fourier transforms, Laplace transforms, Legendre's equation, Legendre's associated equation, Bessel's equation, Hermite's equation, Laguerre's equation, and Laguerre's associated equation. *Prerequisite: PHY 253 and MTH 263.*

354. Mathematical Physics II**3 hours**

A continuation of PHY 353 (Mathematical Physics I) and a recommended course for students who plan to attend graduate school in physics. Covers the Sturm-Liouville problem; the gamma, beta, and error functions; partial differential equations; integral equations; and complex variables. *Prerequisite: PHY 353.*

360. Thermodynamics**3 hours**

Primarily involves a study of the laws of thermodynamics. Includes the kinetic theory of gases and an introduction to statistical mechanics. Covers temperature and the zeroth law of thermodynamics, thermodynamic equilibrium, diagrams, equations of state, work, heat, the first law of thermodynamics, kinetic theory, engines, refrigerators, the second law of thermodynamics, reversibility, the Kelvin temperature scale, entropy, thermodynamic potentials, Maxwell relations, phase transitions, and the partition

function. *Prerequisites: PHY 253 and MTH 263.*

361. Electromagnetic Theory **3 hours**

Covers the basic laws of electromagnetism and Maxwell's equations at an advanced undergraduate level. Topics include Coulomb's law, Gauss' law for electricity, Poisson's and Laplace's equations, multipole expansions, energy, capacitance, electric circuits, dielectric materials, electric polarization, method of images, the vector potential, Ampere's law, magnetic materials, Faraday's law, Lenz's law, Maxwell's equations, plane electromagnetic waves, wave guides, radiation, and special relativity. *Prerequisites: PHY 254 and PHY 353.*

362. Classical Mechanics **3 hours**

Encompasses a study of the principles and laws of mechanics at an advanced undergraduate level. Central to the course are Lagrangian dynamics, the calculus of variations and Hamilton's principle, the central force problem, accelerated reference frames, and rigid body motion. Other topics include gravitation, the motion of a system of particles, oscillations, and the mechanics of continuous media. *Prerequisite: PHY 353.*

363. Quantum Mechanics I **3 hours**

Introduction to the basic concepts, postulates and principles of quantum mechanics. Includes a mathematical introduction (linear algebra, Dirac notation, and Fourier transforms) to the postulates of quantum mechanics, solving the Schrodinger equation for some one-dimensional problems, the harmonic oscillator, and the Heisenberg uncertainty relations. *Prerequisite: PHY 254 and PHY 353.*

364. Quantum Mechanics II **3 hours**

A continuation of PHY 363 (Quantum Mechanics I). Topics include systems with N degrees of freedom, identical particles, symmetries, angular momentum, the hydrogen atom, spin, addition of angular momenta, approximation methods (variational method, WKB, perturbation theory), scattering theory, and the Dirac equation. *Prerequisite: PHY 363.*

367. Advanced Optics **3 hours**

A continuation of the topics covered in PHY 254 (Optics & Modern Physics). Designed to sharpen the student's knowledge of calculus and his appreciation of the interrelationship between theory and application. Covers the electromagnetic theory of light, wave optics, fiber optics, polarization, Fourier optics, and holography. *Prerequisite: PHY 254 and PHY 353.*

450. Senior Seminar **0 hours**

Addresses the formal communication of research in the physics community. Students are required to present a seminar on a research problem/topic on which they have worked.

Problems and topics are approved by the instructor. The instructor provides guidelines for papers and oral presentations. *Prerequisites: PHY 353 and at least three courses from among PHY 351, 360, 361, 362, and 363.*

452. Senior Laboratory **3 hours**

Modern instrumentation techniques and methods. Experiments in modern physics. *Prerequisite: PHY 351.*

460. Special Problems in Physics **3 hours**

Designed to add flexibility to the curriculum by allowing the study of special topics in physics that are outside the structured curriculum but have significance in the discipline. *Prerequisite: Senior physics major or permission of the instructor.*

470. Special Relativity **3 hours**

Covers the four-dimensional approach of special relativity, in which is seen the essential unity of quantities that are treated as separate in rudimentary treatments of mechanics and electromagnetic theory. Topics include cartesian transformations, contravariant and covariant vectors, metric tensors, flat spacetime, Lorentz transformations, momentum four-vectors, the electromagnetic field tensor, and Schwarzschild spacetime. *Prerequisites: PHY 361 and PHY 362, or permission of the instructor.*

473. Nuclear and Particle Physics **3 hours**

Provides an introduction to the study of nuclei and particles. Topics from nuclear physics include nuclear properties, nuclear models, the nuclear force, radioactive decay, and nuclear reactions. Topics from particle physics include particle interaction, symmetries, conservation laws, quarks, gluons, and grand unified theories. *Prerequisite: PHY 363.*

474. Solid-State Physics **3 hours**

Designed for the advanced student interested in proceeding to graduate school. Provides strong links between solid state phenomena and the basic laws of quantum mechanics, electromagnetism, and thermodynamics. Covers crystal structure, reciprocal lattice, crystal binding, crystal vibrations, thermal properties, free electron Fermi gas, energy bands, semiconductor crystals, optical processes, and superconductivity. *Prerequisite: PHY 363.*

ENGINEERING (EGR)

101. Freshman Engineering Design

3 hours

Provides an introduction to the engineering profession focusing on the nature of engineering problems and their solutions, the roles of experimentation, the computer and communication skills in engineering practice. Fundamental procedures for tackling new, unsolved, open-ended problems. Essential details of analyzing, synthesizing and implementing design solutions. Importance of teamwork in engineering practice. This course consists of a lecture component and a laboratory component. Computer laboratory and design studio are key parts of this course.

103. Engineering Graphics

3 hours

Covers the visualization and modeling techniques for product design and development. Specifically, the course covers design methodology, graphics standards, projection theory, freehand sketching, and spatial geometry. Includes the fundamentals of computer graphics, with an emphasis on AutoCAD applications to drafting and design. *Prerequisite: MTH 120.*

205. Engineering Statics

3 hours

Elements of statics in two and three dimensions; centroids; analysis of structures and machines; friction; and moments of inertia. *Prerequisites: PHY 154 and MTH 162, or departmental approval.*

206. Mechanics of Materials

3 hours

Fundamental concepts of stress and strain; stress-strain relationships; application to axially loaded members; torsion of circular bars; bending of beams; normal and shear stresses in beams; beam deflection and combined loading; and stability of columns. This course consists of a lecture component and a laboratory component. *Prerequisite: EGR 205.*

308. Engineering Dynamics

3 hours

Kinematics and kinetics of particles and systems of particles; kinematics and kinetics of rigid bodies in plane motion; application of work and energy relationships; impulse-momentum principles, and impact. *Prerequisite: EGR 205.*

PREREQUISITES FOR COURSES TAUGHT

Course	Name	Prerequisite(s)
PHY 102	Physical Science	MTH 100
PHY 151	General Physics I	MTH 120
PHY 152	General Physics II	PHY 151
PHY 154	Mechanics	MTH 161 or departmental approval
PHY 253	Electricity & Magnetism	PHY 154 and MTH 162, or departmental approval
PHY 254	Optics & Modern Physics	PHY 253
PHY 351	Junior Laboratory	PHY 254
PHY 353	Mathematical Physics I	PHY 253 and MTH 263
PHY 354	Mathematical Physics II	PHY 353
PHY 360	Thermodynamics	PHY 253 and MTH 263
PHY 361	Electromagnetic Theory	PHY 254 and PHY 353
PHY 362	Classical Mechanics	PHY 353
PHY 363	Quantum Mechanics I	PHY 254 and PHY 353
PHY 364	Quantum Mechanics II	PHY 363
PHY 367	Advanced Optics	PHY 254 and PHY 353

PREREQUISITES FOR COURSES TAUGHT

Course	Name	Prerequisite(s)
PHY 450	Senior Seminar	PHY 353 and at least 3 courses from 351, 360, 361, 362, and 363
PHY 452	Senior Laboratory	PHY 351
PHY 460	Special Problems in Physics	Senior Physics major or permission of the instructor
PHY 470	Special Relativity	PHY 361 and PHY 362, or permission of the instructor
PHY 473	Nuclear and Particle Physics	PHY 363
PHY 474	Solid-State Physics	PHY 363
EGR 101	Freshman Engineering Design	
EGR 103	Engineering Graphics	MTH 120
EGR 205	Engineering Statics	PHY 154 and MTH 162, or departmental approval
EGR 206	Mechanics of Materials	EGR 205
EGR 308	Engineering Dynamics	EGR 205

THE GENERAL-EDUCATION CORE CURRICULUM

The mission of the General Education Program is to ground students in African and African diasporic heritage while empowering students to integrate knowledge and skills from their academic and co-curricular experiences.

Core Skills

Written Communication

All students must complete one of the following selections:

ENG 101 English Composition
 and
ENG 102 English Composition
(two-semester sequence)
 or
ENG 103 English Composition
(one-semester course)

NOTES:

- *A student may satisfy the English Composition requirement by completing ENG 103. Students are placed into ENG 103 based on SAT/ACT scores. The student who fulfills the English Composition requirement with ENG 103 is awarded only 3 semester hours.*
- *A grade of “C” or above is required for successful completion of ENG 101-102 or ENG 103.*

Mathematical and Quantitative Literacy

All Students must complete one 3 or 4 credit hour math course above College Algebra I.

MTH 110 Finite Math

MTH 115C-116C College Algebra II and Trigonometry

MTH 130 Basic Statistics

MTH 161 Calculus I

NOTE: A grade of “C” or above is required for successful completion of College Algebra I.

Modern Foreign Language

All Students must satisfy the College's Foreign Language Placement Exam prior to enrollment and placement into the following:

MFL 201 or MFL 300 (French, Spanish, German)

Placement into Latin, Japanese, Chinese or Portuguese requires a meeting with the Department Chair of Modern Foreign Languages.

NOTE: Students who are placed into MFL 101 or 102 must pass with a grade of "D" or above before completing MFL 201. Students may pass MFL 201 and 202 with a "D" or above.

Health and Wellness

Students must complete two of the courses listed below. Students must have the Chairperson's approval to enroll in HPED 155 or HPED 156.

HPED 151	Aquatics and Fitness
HPED 152	Badminton and Fitness
HPED 153	Basketball and Fitness
HPED 154	Tennis and Fitness
HPED 155	Fitness for the Non-Traditional Student
HPED 156	Individualized Fitness for the Non-traditional Student
HPED 157	Weight Training and Fitness

Thematic Areas

Students must complete seven thematic courses, one must be a First Year Experience course (FYE)

Art and Literature

Students must select one course from the list below. Students who take these courses as General Education electives must pass with a “D” or better. A course may be taken to fulfill the major requirement as well as general education, in this instance the course must be passed with a “C” or better.

ART 100	Cont. Art of the African Diaspora (FYE)
ART 110	Survey of Visual Art
ART 140	African American Art: Mural Development
ENG 121	Immigrant Voices Beyond the Border (FYE)
ENG 122	Blacks in Wonderland (FYE)
ENG 250	World Literature
FLS 105	Afro-Latin American Experience (FYE)
MUS 111	Masterpieces of Music
MUS 116	The Oral Tradition in African American Folk Music
MUS 114	African American Music: Composers and Performers
MUS 203	Introduction to Church Music
MUS 310	History of Jazz
MUS 404	Survey of African American Music
PSY 390	Psychology of Art and Aesthetics

Society and Culture

Students must complete two courses from two different disciplines. Students who take these courses as General Education electives must pass with a “D” or better. A course may be taken to fulfill the major requirement as well as general education, in this instance the course must be passed with a “C” or better.

ECO 201	Principles of Economics (Macro)
ECO 202	Principles of Economics (Micro)
HIS 111	World History: Topical Approach
HIS 112	World History: Topical Approach
HIS 121	Hist. of the African Diaspora to 1900 (FYE)
HIS 122	Hist. of the African Diaspora Since 1800 (FYE)
PSC 100	Politics and Protest (FYE)
PSC 228	Comparative Politics
PSC 251	National Government
PSC 252	State and Local Government
PSC 285	Introduction to International Relations
PSY 101	Introduction to Psychology as a Social Science
PSY 240	Psychology of the African American Experience
PSY 265	Developmental Psychology
SOC 101	Introduction to Sociology
SOC 102	Cultural Anthropology
SOC 103	Social Problems
SOC 105	African American Worker (FYE)
SOC 156	Men in Society

SOC 215	Criminology
SOC 255	The Family
SOC 259	Women in Society
UST 261	Introduction to Urban Studies
UST 262	Introduction to Urban Studies

Scientific Discovery

*Students pursuing a B.S. degree must complete **two** introductory courses from two different science departments.*

BIO 111	General Biology
	<i>or</i>
BIO 113	Comprehensive Biology (non-biology major)
PHY 151-152	General Physics

Ideas and Ethics

*Students must complete **two** courses from two different disciplines. Students who take these courses as General Education electives must pass with a “D” or better. A course may be taken to fulfill the major requirement as well as general education, in this instance the course must be passed with a “C” or better.*

LSP 101	Thurman, Mays and King (FYE)
LSP 111	Foundations of Leadership
PHI 201	Introduction to Philosophy
PHI 302	Introduction to Philosophical Ethics
REL 201	Introduction to Religion
PSC 294	Introduction to Political Theory

Crown Forum

Students must earn a P or “pass” grade in Freshman Assembly (EDU 153-154); Sophomore Assembly (EDU 251-252); and Junior Assembly (EDU 353-354). In order to earn a “P” in an assembly, students must attend a minimum of six (6) Crown Forum events.

Crown Forum is a series of special events and presentations that celebrate the great heritage and traditions of Morehouse College; bond students to each other and to a common humanity; heighten sensibility to students’ spiritual and inner selves; increase appreciation of the aesthetics; and sharpen intellectual and critical faculties.

DEPARTMENTAL POLICY ON CHEATING

Students at Morehouse College are expected to conduct themselves with the highest level of ethics and academic honesty at all times and to abide by the terms set forth in the Student Handbook and Code of Conduct. Instances of academic dishonesty, including but not limited to plagiarism and cheating on examinations and assignments, are taken seriously and may result in a failing grade for the assignment or course and may be reported to the Honor and Conduct Review Board for disciplinary action.

The Department of Physics & DDEP has adopted the following policy on cheating. This policy serves as a preventative measure by informing students of the consequences of this breach in academic and ethical responsibility. Below is a list of violations that will be penalized. This list presents examples of behaviors that the faculty consider to be violations and is in no way intended to be exhaustive.

VIOLATIONS

The term 'cheating' refers to performing any act that involves intentionally defrauding or violating the rules of your environment. Cheating in the Physics & DDEP Department may entail:

1. Presenting someone else's work as your own.
2. Presenting the same piece of work for two different courses without special arrangements from the instructors.
3. Presenting original material (e.g., journal articles, pages from a book) as your own.
4. Plagiarism: copying the ideas, thoughts, or language of another's work without proper identification of the paraphrased or quoted material.
5. Falsification of data, references, or any other material in a research paper.
6. Looking at another student's paper during an examination.
7. Talking to anyone other than the instructor during an exam.
8. Looking at any material (i.e., notes, textbooks, cell phones, or computers) during an exam without the permission of the instructor.

9. Illegally obtaining tests or other class material.
10. Refusal to turn in your test paper at the end of the exam.

PENALTIES

If caught cheating, you may encounter one or more of the following penalties.

1. You may receive a grade of zero on the exam or project on which the violation occurred.
2. You may receive a grade of "F" in the course in which the cheating occurred.
3. You may be referred to the Dean of Student Affairs for additional sanctions.
4. You may be required to change your academic major.

PROCEDURE

In the event of cheating, the following procedure will be observed.

1. The instructor will inform the student (verbally) of the violation as soon as possible. (If possible, within one week of the detection of the violation).
2. The instructor will then have the option of giving the student a grade of zero on the examination or project or may choose one of the three other penalties listed above.
3. If one of the three remaining penalties is chosen, the instructor will notify (in writing) the student and the department chairperson of the violation and the action taken by the instructor. This will be done within two weeks of the detection of the violation.
4. Documentation of cheating will be turned over to the Dean of Student Affairs for additional sanctions.

CLASS ATTENDANCE POLICY

Students at Morehouse College are expected to attend each class meeting. Students with more than 3 unexcused absences will be referred to the Office of Student Services. Failure to meet minimum attendance requirements may result in loss of the student's financial aid in accordance with federal financial-aid requirements.

Instructors are expected to outline their attendance requirements at the beginning of the term and to include these requirements in the course syllabus issued to the students. They are required to maintain attendance records on all students, and at the request of the Senior Vice President for Academic Affairs, report any student who exceeds the maximum number of unexcused absences.

It is the responsibility of the student to make up scheduled work missed because of officially excused class absences. Absences from unannounced tests and other assignments may be made up at the discretion of the instructor.

ACADEMIC ADVISEMENT POLICY

What is Advising?

Advising is about more than clearance for registration. Advising is a dynamic relationship between a student and adviser. At the center is a shared responsibility for a coherent education plan that incorporates personal, social, academic, and career considerations. Advising focuses on helping students identify life goals, acquire skills and attitudes that promote intellectual growth, and become academically successful. Advising supports the principles and goals of a liberal-arts education as the foundation of a bachelor's degree. We do this by teaching you how your educational experience equips you with broad knowledge, transferable skills and a strong sense of values, ethics, and civic engagement.

What Students can Expect from Academic Advisers

Advisers are:

- Familiar with rules and regulations
- Experienced with designing balanced course loads
- Here to listen to students' concerns and respect individual student values and choices
- Experts in creating educational and professional objectives that suit the students' demonstrated abilities and interests

Advisers will:

- Encourage and guide students as they define and develop realistic goals
- Monitor and accurately document students' progress toward meeting their goals
- Assist students in gaining decision-making skills
- Maintain confidentiality
- Provide accurate information about general-education and major requirements
- Refer students to specialized campus services and resources
- Assist with course selection and registration

What Advisers Expect from Students

Students are expected to:

- Plan ahead and schedule an advising appointment at least twice a term.
- Come in early-when first experiencing difficulty.
- Access and read one's email daily.
- Be open and willing to consider advice from advisers.
- Be respectful of adviser's time and call to cancel or reschedule an appointment.
- Silence any electronic devices while meeting with advisers.
- Take notes during the advising meeting and keep a written record of sessions.
- Be prepared with questions and ideas for possible future coursework, internships, study aboard, etc.
- Accept responsibility for one's decisions and actions.

The Division of Science and Mathematics has an adviser that is here to work with you. Both the Department adviser and Division adviser are here to assist you with organizing your thoughts and planning for your post-Morehouse future. You should talk with them about the various opportunities available during the academic year, summers, and after graduation. These opportunities include preparing for your post-graduate education, internships, jobs, careers, etc.

Once you turn your official declaration of major form in to Mrs. Carr (the Department's Administrative Assistant), you will be assigned a faculty adviser (see page 56). If you wish to change advisers you should talk with the CHAIR of the department, and he will assign you a new adviser.

Poor planning on your part does not necessitate an emergency on your adviser's part. Also, we recommend that you consult with your adviser before changing your schedule.

FACULTY ADVISER ASSIGNMENTS

FACULTY ADVISER	OFFICE LOCATION	ENGINEERING-MAJOR CONCENTRATION	STUDENT LAST NAME ENDS ALPHA CLUSTER
Dr. Aakhut Bak Associate Professor aakhut.bak@morehouse.edu Phone: 470-639-0398	Dansby Hall Room 104-B	Aerospace Engineering Electrical Engineering	A – Z A – L
Dr. John Howard Assistant Professor john.howard@morehouse.edu Phone: 470-639-0332	Dansby Hall Room 104-D	Architectural Engineering Civil Engineering	A – Z A – Z
Dr. Dwayne Joseph Assistant Professor dwayne.joseph@morehouse.edu 470-639-0721	Dansby Hall Room 106-A	Electrical Engineering Mechanical Engineering	M – Z M – Z
Dr. Emmanuel Karikari Assistant Professor Coordinator for Dual Engineering Program emmanuel.karikari@morehouse.edu 470-639-0652	Dansby Hall Room 106-B	Mechanical Engineering DDEP students transferring to engineering institution (Last term at Morehouse)	A – L A – Z
Dr. Carlyle Moore Associate Professor carlyle.moore@morehouse.edu 470-639-0255	Dansby Hall Room 116-B	International students majoring in DDEP or Physics	A – Z
Dr. Eddie Red Assistant Professor eddie.red@morehouse.edu 470-639-0219	Dansby Hall Room 114	Biomedical Engineering Nuclear Engineering	A – Z A – Z
Dr. Wesley Sims Assistant Professor wesley.sims@morehouse.edu Phone: 470-639-0589	Dansby Hall Room 103	Environmental Engineering Industrial Engineering	A – Z A – Z
Dr. Augustine Smith Associate Professor augustine.smith@morehouse.edu 470-639-0205	Dansby Hall Room 104-C	Chemical Engineering Computer Engineering	A – Z A – Z

PHYSICS MAJORS MAY SELECT ANY FACULTY MEMBER IN THE PHYSICS DEPARTMENT AS AN ACADEMIC ADVISER!!

RESEARCH OPPORTUNITIES

Students majoring in the Department of Physics & DDEP, who plan to pursue the Ph.D., are encouraged to become actively engaged in science research and to take part in one of several federally sponsored research training programs open to students. These include HBCU-UP (Historically Black Colleges and Universities Undergraduate Program); the Hopps Scholars Program; MBRS-RISE (Minority Biomedical Research Support Program – Research Initiative for Scientific Enhancement); the Ronald E. McNair Post-Baccalaureate Achievement Program; the NIMH-COR (National Institute of Mental Health – Career Opportunities in Research) Education and Training Program; NIGMS-MARC/U*STAR (National Institute of General Medical Sciences – Minority Access to Research Careers / Undergraduate Student Training in Academic Research Program); and PHSI (Public Health Sciences Institute).

Several of these programs provide research training starting in the freshman year. Two programs starting in the junior year are the NIMH-COR and NIGMS-MARC/U*STAR Programs. These honors research training programs provide juniors and seniors with advanced research training opportunities. For more information, consult the webpage morehouse.edu/cybervillage/programs/yearround.html.

Other research opportunities are available through individual faculty members conducting research. Students interested in any of the aforementioned programs or in conducting research with individual faculty members should consult their adviser for additional information.

FINANCIAL AID

You should complete a Financial Aid Form (FAF) administered by the College Scholarship Service by January 30 in the spring and September 1 in the fall. This form will determine your financial need; the difference between your education costs, such as tuition, fees, room and board, books, personal expenses, and transportation; and the amount that the student and his family can pay. There are several financial aid programs open to students. These include: institutional and federal programs; campus-based programs, such as the Supplemental Educational Opportunity Grant (SEOG), College Work-Study (CWS), and the National Direct Student Loan (NDSL); non-campus based programs, such as the Pell (Basic) Grant, Guaranteed Student Loan (GSL), and Auxiliary Loan Programs; and state programs, such as the Georgia Student Incentive Grants and the Georgia Tuition Equalization Grants. Consult your college catalog to find out about eligibility requirements and deadlines for these grants.

B.S. DEGREE IN PHYSICS [1 of 4]

Worksheet for Departmental Requirements

Name:

Physics Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
INTRODUCTORY SEQUENCE				
PHY 154	Mechanics	4		
PHY 253	Electricity & Magnetism	4		
PHY 254	Optics & Modern Physics	4		
CORE PHYSICS COURSES				
PHY 351	Junior Laboratory	3		
PHY 353	Mathematical Physics I	3		
PHY 360	Thermodynamics	3		
PHY 361	Electromagnetic Theory	3		
PHY 362	Classical Mechanics	3		
PHY 363	Quantum Mechanics I	3		
PHY 450	Senior Seminar	0		
PHYSICS ELECTIVES				
		3		
		3		
		3		

B.S. DEGREE IN PHYSICS [2 of 4]
Worksheet for Departmental Requirements

Name:

Physics Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
MATHEMATICS REQUIREMENTS				
MTH 161	Calculus I	4		
MTH 162	Calculus II	4		
MTH 263	Calculus III	4		
MTH 271	Linear Algebra	3		
MTH 321	Differential Equations	3		
OTHER COURSES				
BIO 113	Comprehensive Biology	4		
CHE 111	General Chemistry I	4		

B.S. DEGREE IN PHYSICS [3 of 4]
Worksheet for General-Education Requirements

Name:

Physics Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
WRITTEN COMMUNICATION				
ENG 101	English Composition I	3		
ENG 102	English Composition II	3		
MODERN FOREIGN LANGUAGE				
FLX 201		3		
HEALTH AND WELLNESS				
PED 15X		1		
PED 15X		1		

B.S. DEGREE IN PHYSICS [4 of 4]

Worksheet for General-Education Requirements

Name:

Physics Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
SOCIETY AND CULTURE				
		3		
		3		
IDEAS AND ETHICS				
		3		
		3		
ART AND LITERATURE				
		3		
CROWN FORUM				
EDU 153	Freshman Assembly I	0		
EDU 154	Freshman Assembly II	0		
EDU 251	Sophomore Assembly I	0		
EDU 252	Sophomore Assembly II	0		
EDU 353	Junior Assembly I	0		
EDU 354	Junior Assembly II	0		

B.S. DEGREE UNDER DDEP [1 of 4] Worksheet for Pre-Engineering Courses

Name:

DDEP Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
ENGINEERING				
EGR 101	Engineering Design	3		
EGR 103	Engineering Graphics	3		
EGR 205	Engineering Statics	3		
EGR 206†	Mechanics of Materials	3		
EGR 308	Engineering Dynamics	3		
PHYSICS				
PHY 154	Mechanics	4		
PHY 253	Electricity & Magnetism	4		
PHY 254	Optics & Modern Physics	4		
MATHEMATICS				
MTH 161	Calculus I	4		
MTH 162	Calculus II	4		
MTH 263	Calculus III	4		
MTH 271	Linear Algebra	3		
MTH 321	Differential Equations	3		

† This course is intended only for Aerospace, Materials, or Mechanical Engineering majors.

B.S. DEGREE UNDER DDEP [2 of 4] Worksheet for Pre-Engineering Courses

Name:

DDEP Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
OTHERS				
BIO 113	Comprehensive Biology	4		
CHE 111	General Chemistry I	4		
CHE 112	General Chemistry II	4		
CSC 110	Computer Programming I	3		
CSC 160‡	Computer Programming II	3		
COM 351 COM 352 COM 353	Prof. Communication Communicating in Sm Grps Interpersonal Comm.	3		

‡ This course is required only for Computer, Electrical, or Industrial Engineering majors.

B.S. DEGREE UNDER DDEP [3 of 4]

Worksheet for General-Education Requirements

Name:

DDEP Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
WRITTEN COMMUNICATION				
ENG 101	English Composition I	3		
ENG 102	English Composition II	3		
MODERN FOREIGN LANGUAGE				
FLX 201		3		
HEALTH AND WELLNESS				
PED 15X		1		
PED 15X		1		

B.S. DEGREE UNDER DDEP [4 of 4]

Worksheet for General-Education Requirements

Name:

DDEP Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
IDEAS AND ETHICS				
PHI 302	Philosophical Ethics	3		
		3		
SOCIETY AND CULTURE				
ECO 201 or ECO 202	Macroeconomics or Microeconomics	3		
PSC 251	National Government	3		
ART AND LITERATURE				
CROWN FORUM				
EDU 153	Freshman Assembly I	0		
EDU 154	Freshman Assembly II	0		
EDU 251	Sophomore Assembly I	0		
EDU 252	Sophomore Assembly II	0		
EDU 353	Junior Assembly I	0		
EDU 354	Junior Assembly II	0		

ADDENDUM FOR B.S. DEGREE IN APPLIED PHYSICS

Name:

DDEP Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
AEROSPACE OR MECHANICAL ENGINEERING				
PHY 353	Mathematical Physics I	3		
PHY 360	Thermodynamics	3		
PHY 361 or PHY 363	Electromagnetic Theory or Quantum Mechanics I	3		
ARCHITECTURAL, CIVIL, OR ENVIRONMENTAL ENGINEERING				
PHY 353	Mathematical Physics I	3		
PHY 360 or PHY 362	Thermodynamics or Classical Mechanics	3		
PHY 361 or PHY 363	Electromagnetic Theory or Quantum Mechanics I	3		
BIOMEDICAL OR NUCLEAR ENGINEERING				
PHY 353	Mathematical Physics I	3		
PHY 360 or PHY 361	Thermodynamics or Electromagnetic Theory	3		
PHY 351 or PHY 460	Junior Laboratory or Special Problems	4		
COMPUTER OR ELECTRICAL ENGINEERING				
PHY 353	Mathematical Physics I	3		
PHY 362	Classical Mechanics	3		
PHY 360 or PHY 363	Thermodynamics or Quantum Mechanics I	3		

ADDENDUM FOR B.S. DEGREE IN MATHEMATICS

Name:

DDEP Adviser:

Mathematics Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
MTH 255	Introduction to Set Theory	3		
MTH 341	Probability & Statistics I	3		
MTH 361	Real Analysis I	3		
MTH 371	Abstract Algebra I	3		
MTH 362 or MTH 372	Real Analysis II or Abstract Algebra II	3		
MTH 497	Senior Seminar	3		
MATHEMATICS ELECTIVES				
		3		
		3		

ADDENDUM FOR JOINT BACHELOR DEGREES IN CHEMISTRY AND CHEMICAL ENGINEERING

Name:

DDEP Adviser:

Chemistry Adviser:

Course Number	Course Name	Credit Hours	Term Completed	Course Grade
CHE 231	Organic Chemistry I	4		
CHE 232	Organic Chemistry II	4		
CHE 321	Physical Chemistry I	4		
CHE 322	Physical Chemistry II	4		
CHE 421	Inorganic Chemistry	4		
CHE 422	Chemical Instrumentation	4		