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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 2016-2017 at Morehouse. We expect another exciting year full of 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 pre-engineering 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. And in recent years, Morehouse is the Nation’s #1 producer of under-represented minorities with bachelor degrees in physics according to the American Institute of 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 Big Data Analytics, Sustainable Energy Materials, Accelerator Science, Astronomy/Astrophysics, and Corporate Physics.

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

Sincerely,

Willie S. Rockward, 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 OF PHYSICS & DDEP
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 Physics & DDEP Department offers a spectrum of course 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 Dual Degree Engineering Program (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 (ΣΠΣ) 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 ΣΠΣ. The national web address for ΣΠΣ 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 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.
FACULTY

1. **Dr. Willie Rockward**, Associate Professor and Chair  
   Ph.D., Georgia Institute of Technology  
   Dansby Hall, Room 114; willie.rockward@morehouse.edu; (404) 215-2615

   *Research Interests*  
   - Micro/Nano Optics and Lasers  
   - Nanolithography  
   - Meta-materials

2. **Dr. Aakhut E. Bak**, Associate Professor  
   Ph.D., Massachusetts Institute of Technology  
   Dansby Hall, Room 104-B; aakhut.bak@morehouse.edu; (404) 681-6518

   *Research Interests*  
   - Particle Physics and Optics

3. **Dr. John Howard**, Assistant Professor  
   Ph.D., Georgia Institute of Technology  
   Dansby Hall, Room 104-D; john.howard@morehouse.edu; (404) 681-6511

   *Research Interests*  
   - Condensed Matter Physics  
   - Physics Education

4. **Dr. Dwayne Joseph**, Assistant Professor  
   Ph.D., Florida A&M University  
   Dansby Hall, Room 103; dwayne.joseph@morehouse.edu; (404) 681-5535

   *Research Interests*  
   - Low Energy Atomic Collisions  
   - Ion-Atomic Current Transfer Interactions
5. **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; (404) 681-6513

*Research Interests*  
- Structural Properties of Materials  
- Engineering Education

6. **Dr. Carlyle E. Moore**, Associate Professor  
Ph.D., Georgia Institute of Technology  
Dansby Hall, Room 116-B; carlyle.moore@morehouse.edu; (404) 681-6514

*Research Interests*  
- Nuclear and Particle Physics

7. **Dr. Oyekale ('Kale) Oyedeji**, Professor  
Ph.D., Howard University  
Dansby Hall, Room 116-A; oye kale.oyedeji@morehouse.edu; (404) 681-6515

*Research Interests*  
- Solid State and Dynamical Systems – Nonlinear

8. **Dr. Eddie C. Red**, Assistant Professor  
Ph.D., Florida A&M University  
Dansby Hall, Room 106-A; eddie.red@morehouse.edu; (404) 681-6517

*Research Interests*  
- Electron/Photon Interactions with Atoms and Molecules  
- Quantum Control of Molecular Reactions Development and Incorporation of Numerical Techniques into High Performance Algorithms  
- Nuclear Science

9. **Dr. Augustine J. Smith**, Associate Professor  
Ph.D., Oregon State University  
Dansby Hall, Room 111; augustine.smith@morehouse.edu; (404) 681-6516

*Research Interests*  
- Atomic Physics
STAFF

1. Mrs. Renee Carr, Administrative Assistant II  
   Dansby Hall, Room 114; renee.carr@morehouse.edu; (404) 215-2615

2. Dr. Natasha M. Crosby, Division Academic Adviser Specialist  
   Ph.D., Indiana University  
   Nabrit-Mapp-McBay, Room 108; natasha.crosby@morehouse.edu; (404) 954-6599
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 includes twenty-seven (27) credit hours of courses in physics and eighteen (18) credit hours of mathematics. This program of study consists of the following four components: Introductory Sequence, Core Physics Courses, Physics Electives, and Mathematics Requirements.

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. 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

3. Physics Electives – 9 credit hours
All physics majors are required to take any three (3) of the following upper-level courses.

   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
4. 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

To complete a B.S. degree in Physics, a student must have:

- a total of 120 academic credit hours
- a total of 27 credit hours in physics as prescribed
- a total of 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 core curriculum

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.

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.
POSSIBLE COURSE SEQUENCE FOR
BACHELOR OF SCIENCE DEGREE IN PHYSICS

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.

Freshman Year

Fall Term
- MTH 161 – Calculus I .................................................................................4 hours
- ENG 101 – English Composition .................................................................3 hours
- HIST 111 – World History ...........................................................................3 hours
- MFL 201 – Intermediate Foreign Language .................................................3 hours
- Humanities course ......................................................................................3 hours
- EDU 151 – Freshman Orientation .................................................................0 hours
- EDU 153 – Crown Forum ............................................................................0 hours
  16 hours

Spring Term
- PHY 154 – Mechanics .................................................................................4 hours
- MTH 162 – Calculus II ..................................................................................4 hours
- ENG 102 – English Composition .................................................................3 hours
- HIST 112 – World History ...........................................................................3 hours
- MFL 202 – Intermediate Foreign Language ..................................................3 hours
- EDU 152 – Freshman Orientation .................................................................0 hours
- EDU 154 – Crown Forum ............................................................................0 hours
  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
- Humanities course ......................................................................................3 hours
- Physical Education course (one from PED 151 through 157) ......................1 hours
- EDU 251 – Crown Forum ............................................................................0 hours
  16 hours

Spring Term
- PHY 254 – Optics & Modern Physics ............................................................4 hours
- PHY 353 – Mathematical Physics I ...............................................................3 hours
- MTH 271 – Linear Algebra ..........................................................................3 hours
- ENG 250 – World Literature .......................................................................3 hours
- Social Science course ..................................................................................3 hours
- EDU 252 – Crown Forum ............................................................................0 hours
  16 hours

- 14 -
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
Humanities course..................................................................................3 hours
EDU 353 – Crown Forum........................................................................0 hours

Spring Term
PHY 361 – Electromagnetic Theory ........................................................3 hours
PHY 363 – Quantum Mechanics I .........................................................3 hours
BIO 113 – Comprehensive Biology .......................................................4 hours
Communications course (one from ENG 350 through 353).................3 hours
Physical Education course (one from PED 151 through 157)..............1 hour
EDU 354 – Crown Forum........................................................................0 hours

Senior Year

Fall Term
PHY 450 – Senior Seminar.......................................................................0 hours
PHY Elective............................................................................................3 hours
PHY Elective............................................................................................3 hours
Humanities course..................................................................................3 hours
Free Elective............................................................................................3 hours

Spring Term
PHY Elective............................................................................................3 hours
Social Science course..............................................................................3 hours
Free Elective............................................................................................3 hours
Free Elective............................................................................................3 hours
Free Elective............................................................................................3 hours
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) 978-2180
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 41 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 page 50);
- All necessary pre-engineering courses at Morehouse College (see page 48);
- 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 page 50);
- All necessary pre-engineering courses at Morehouse College (see page 48);
- 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.

To complete degree requirements in DDEP for Morehouse, a student must have:

- a minimum overall GPA of 2.80
- satisfactory completion (minimum of 3.00 GPA) of pre-engineering courses
- satisfactory completion of general-education courses (minimum 2.50 GPA) required in the College core curriculum

Note that each engineering institution has its own minimum requirements. Please consult your academic adviser for relevant details.

**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 with majors in Aerospace, Architectural, Biomedical, Civil, Computer, Electrical, Environmental, Mechanical, or Nuclear Engineering. All students with majors in these engineering fields should consider the Applied Physics Program. It is attractive from the perspectives of both time and curriculum.
In addition to completing the College’s general-education requirements, 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 52), 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 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
BACHELOR OF SCIENCE DEGREE IN GENERAL SCIENCE

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.

Freshman Year

Fall Term
- EGR 101 – Freshman Engineering Design .................................................. 3 hours
- MTH 161 – Calculus I .................................................................................. 4 hours
- ENG 101 – English Composition ................................................................. 3 hours
- HIST 111 – World History .......................................................................... 3 hours
- MFL 201 – Intermediate Foreign Language .............................................. 3 hours
- EDU 151 – Freshman Orientation .............................................................. 0 hours
- EDU 153 – Crown Forum ........................................................................... 0 hours
16 hours

Spring Term
- PHY 154 – Mechanics ................................................................................ 4 hours
- MTH 162 – Calculus II ............................................................................... 4 hours
- ENG 102 – English Composition ................................................................. 3 hours
- HIST 112 – World History .......................................................................... 3 hours
- MFL 202 – Intermediate Foreign Language .............................................. 3 hours
- Physical Education course (one from PED 151 through 157)................. 1 hours
- EDU 152 – Freshman Orientation .............................................................. 0 hours
- EDU 154 – Crown Forum ........................................................................... 0 hours
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
- ENG 250 – World Literature ..................................................................... 3 hours
- EDU 251 – Crown Forum .......................................................................... 0 hours
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
- Humanities course ...................................................................................... 3 hours
- EDU 252 – Crown Forum .......................................................................... 0 hours
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
- Humanities course .....................................................................3 hours
- Physical Education course (one from PED 151 through 157) ........1 hours
- Social Science course (ECO 201 or ECO 202) ............................3 hours
- EDU 353 – Crown Forum ............................................................0 hours

16 hours

Spring Term

- BIO 113 – Comprehensive Biology ..........................................4 hours
- Communications course (one from ENG 350 through 353) ..........3 hours
- Humanities course .....................................................................3 hours
- Humanities course .....................................................................3 hours
- Social Science course (PSC 251) ...............................................3 hours
- EDU 354 – Crown Forum ............................................................0 hours

16 hours
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, Lentz’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 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

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<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Prerequisite(s)</th>
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<tr>
<td>PHY 102</td>
<td>Physical Science</td>
<td>MTH 100</td>
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<td>PHY 151</td>
<td>General Physics I</td>
<td>MTH 120</td>
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<td>PHY 152</td>
<td>General Physics II</td>
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<tr>
<td>PHY 154</td>
<td>Mechanics</td>
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<td>PHY 253</td>
<td>Electricity &amp; Magnetism</td>
<td>PHY 154 and MTH 162, or departmental approval</td>
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<td>PHY 254</td>
<td>Optics &amp; Modern Physics</td>
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<td>PHY 351</td>
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<tr>
<td>PHY 450</td>
<td>Senior Seminar</td>
<td>PHY 353 and at least 3 courses from 351, 360, 361, 362, and 363</td>
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<tr>
<td>PHY 452</td>
<td>Senior Laboratory</td>
<td>PHY 351</td>
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<tr>
<td>PHY 460</td>
<td>Special Problems in Physics</td>
<td>Senior Physics major or permission of the instructor</td>
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<tr>
<td>PHY 470</td>
<td>Special Relativity</td>
<td>PHY 361 and PHY 362, or permission of the instructor</td>
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<td>PHY 473</td>
<td>Nuclear and Particle Physics</td>
<td>PHY 363</td>
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<td>PHY 474</td>
<td>Solid-State Physics</td>
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<td>EGR 101</td>
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<td>Engineering Graphics</td>
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<td>PHY 154 and MTH 162, or departmental approval</td>
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<td>EGR 206</td>
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<tr>
<td>EGR 308</td>
<td>Engineering Dynamics</td>
<td>EGR 205</td>
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THE GENERAL-EDUCATION CORE CURRICULUM

The General-Education Core Curriculum consists of 53 hours and is designed to provide educational experiences in the humanities, natural and physical sciences, mathematics, and social sciences, plus some early experience in the area of the student’s chosen major.

**English (Composition)**

All students must satisfy the General-Education core curriculum requirement in composition by completing one of the following selections:

- ENG 101 and 102 – English Composition (two-term sequence)
- OR –
- ENG 103 – English Composition (one-term course)

**NOTES**

- A student may satisfy the English Composition requirement by completing ENG 103. Only students who successfully pass the English Placement examination will be permitted to enroll in ENG 103. The student who fulfills the English Composition requirement with ENG 103 is awarded only 3 credit hours.
- A grade of “C” or better is required for successful completion of ENG 101-102 or ENG 103.
- Students who are placed into ENG100/w200 must pass with a grade of “C” or better before completing ENG 101-102.

**English (Literature)**

ENG 250    World Literature

**NOTE:** For students who have already successfully completed either ENG 251 or ENG 252 this will substitute for ENG 250.

**History**

HIS 111    World History: Topical Approaches
HIS 112    World History: Topical Approaches

**NOTE:** A grade of “D” or better is required to complete HIS 111 and HIS 112. Students who place into REA 098 must complete this course with a grade of “C” or better before completing HIS 111-112.
**Humanities**

Students will take four courses as follows: Introduction to Religion (REL 201); Survey of Visual Arts (ART 110); either Introduction to Philosophy (PHI 201) or Philosophical Ethics (PHI 302); and one of the music courses in the list below. Students who take these courses as General-Education electives must pass with a “D” or better. Students who take these courses as a core also in the Major must pass with a “C” or better.

- 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

**Kinesiology, Sports Studies, and Physical Education**

Students must complete two of the courses listed below. Students must have the Chairperson’s approval to enroll in HPED 155 or HPED 156. Students who take these courses as General-Education electives must pass with a “D” or better. Students who take these courses as a core also in the Major must pass with a “C” or better. See Department chairs for the exceptions.

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

**NOTE:** Prior to enrolling in PED 155 or PED 156, each student must receive approval from the Wellness Center and the Department Chair a written explanation of the problem from a physician including limitations and a suggested plan to follow based on the medical problem or disability.
**Mathematics**

All Students must satisfy the General-Education core curriculum requirement in mathematics by completing **two math courses**:

- MTH 100 College Algebra
- MTH 120 Pre-calculus

**NOTES**

- A grade of “C” or better is required for successful completion of MTH 100.
- A grade of “C” or better is required for successful completion of MTH 120, but with approval by Department Chair of Mathematics, a grade of “D” or better is required for successful completion of MTH 120.
- Students who are placed into MTH 090 must pass with a grade of “C” or better before completing MTH 100 or MTH 120.

All additional sequences must be approved by the Department of Mathematics.

**Modern Foreign Language**

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

- MFL 201 and 202 – Intermediate French or Spanish

Placement into German, Italian, Japanese, etc. 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 better before completing MFL 201 and 202. Students may pass MFL 201 and 202 with a “D –” or better.

**Science**

Students pursuing a B.S. degree must complete **two introductory courses from two different science departments**. Students majoring in biology, chemistry, computer science, engineering, mathematics, or physics must select two courses from departments other than their major department.

- BIO 111 General Biology
- BIO 113 Comprehensive Biology (aimed at non-biology majors)
- CHE 111 Inorganic Chemistry
- CHE 112 Inorganic Chemistry
**Social Sciences**

Students must complete **two** courses from among those listed below. Psychology majors must take two **non-psychology** social-science courses to fulfill this requirement.

- ECO 201 Principles of Economics (Macro)
- ECO 202 Principles of Economics (Micro)
- PSC 228 Comparative Politics
- PSC 251 National Government
- PSC 252 State and Local Government
- PSC 285 Introduction to International Relations
- UST 261 Introduction to Urban Studies
- UST 262 Introduction to Urban Studies
- SOC 101 Introduction to Sociology
- SOC 102 Cultural Anthropology
- SOC 103 Social Problems
- SOC 156 Men in Society
- SOC 215 Criminology
- SOC 255 The Family
- SOC 259 Women in Society
- PSY 101 Introduction to Psychology as a Social Science
- PSY 260 Psychology of the African American Experience
- PSY 287 Developmental Psychology

**Reading**

A student’s SAT or ACT reading scores may place him into one of the following options:

- REA 098 Fundamental College Reading and Study Skills I
- REA 099 Fundamental College Reading and Study Skills II

  -- OR --

- REA 099 Fundamental College Reading and Study Skills II
- REA 100 Advanced College Reading and Study Skills

Students must pass with a grade of “C” or better.

**NOTE:** One term of reading is required for students who place into REA 099. The second term for students in REA 099 is required only upon recommendation of the staff or at the discretion of the student, at which time he may take an upper level reading course as an elective.

**Freshman Orientation**

Freshmen must earn a “P” or “pass” grade in each term of this two-term (EDU 151-152) orientation to academic and social life at Morehouse.
**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). To earn a “P” or “pass” grade 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.

**Computer Literacy and Information Fluency**

Each student must demonstrate competency in the basic use of computers by passing: (1) a required departmental course, if your major is Business and Economics, Chemistry, Computer Science, Music, Psychology or Sociology; (2) CSC 101; or (3) General-Education’s Computer Literacy and Information Fluency Test.

**Oral Communication Effectiveness**

Students may take one of the courses listed below to satisfy the oral communication effectiveness requirement.

- ENG 350 Principles of Speech Communication
- ENG 351 Professional Communication
- ENG 352 Communicating in Small Groups and Teams
- ENG 353 Public Speaking

**Writing Requirement**

All students will complete two writing intensive courses within their major programs.
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 Success and may be administratively withdrawn from the course. 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 abroad, 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 41). 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

<table>
<thead>
<tr>
<th>FACULTY ADVISER</th>
<th>OFFICE LOCATION</th>
<th>ENGINEERING-MAJOR CONCENTRATION</th>
<th>STUDENT LAST NAME ENDS ALPHA CLUSTER</th>
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<tbody>
<tr>
<td>Dr. Aakhut Bak</td>
<td>Dansby Hall Room 104-B</td>
<td>Electrical Engineering, Aerospace Engineering</td>
<td>A – L</td>
</tr>
<tr>
<td>Associate Professor</td>
<td></td>
<td></td>
<td>A – Z</td>
</tr>
<tr>
<td><a href="mailto:aakhut.bak@morehouse.edu">aakhut.bak@morehouse.edu</a></td>
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<td></td>
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</tr>
<tr>
<td>Dr. John Howard</td>
<td>Dansby Hall Room 104-D</td>
<td>Architectural Engineering, Civil Engineering</td>
<td>A – Z</td>
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<tr>
<td>Assistant Professor</td>
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<td>A – Z</td>
</tr>
<tr>
<td><a href="mailto:john.howard@morehouse.edu">john.howard@morehouse.edu</a></td>
<td></td>
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</tr>
<tr>
<td>Dr. Dwayne Joseph</td>
<td>Dansby Hall Room 103</td>
<td>Mechanical Engineering, Biomedical Engineering</td>
<td>M – Z</td>
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<tr>
<td>Assistant Professor</td>
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<tr>
<td><a href="mailto:dwayne.joseph@morehouse.edu">dwayne.joseph@morehouse.edu</a></td>
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<tr>
<td>Dr. Emmanuel Karikari</td>
<td>Dansby Hall Room 106-B</td>
<td>DDEP students transferring to engineering institution (Last term at Morehouse), Mechanical Engineering</td>
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<td>A – L</td>
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<tr>
<td><a href="mailto:emmanuel.karikari@morehouse.edu">emmanuel.karikari@morehouse.edu</a></td>
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<tr>
<td>Dr. Carlyle Moore</td>
<td>Dansby Hall Room 116-B</td>
<td>Industrial Engineering, International students majoring in DDEP or Physics</td>
<td>A – Z</td>
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<tr>
<td>Associate Professor</td>
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<tr>
<td><a href="mailto:carlyle.moore@morehouse.edu">carlyle.moore@morehouse.edu</a></td>
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<tr>
<td>Dr. ‘Kale Oyedeji</td>
<td>Dansby Hall Room 116-A</td>
<td>Environmental Engineering, International students majoring in DDEP or Physics</td>
<td>A – Z</td>
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<tr>
<td>Professor</td>
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<td>M - Z</td>
</tr>
<tr>
<td><a href="mailto:kale.oyedeji@morehouse.edu">kale.oyedeji@morehouse.edu</a></td>
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<tr>
<td>Dr. Eddie Red</td>
<td>Dansby Hall Room 106-A</td>
<td>Nuclear Engineering, Biomedical Engineering</td>
<td>A – Z</td>
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<tr>
<td>Dr. Augustine Smith</td>
<td>Dansby Hall Room 104-C</td>
<td>Computer Engineering, Chemical Engineering</td>
<td>A – Z</td>
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<tr>
<td>Associate Professor</td>
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<tr>
<td><a href="mailto:augustine.smith@morehouse.edu">augustine.smith@morehouse.edu</a></td>
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**PHYSICS MAJORS MAY SELECT ANY FACULTY MEMBER IN THE PHYSICS DEPARTMENT AS 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

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**MATHEMATICS REQUIREMENTS**

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

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

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

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† 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**

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‡ 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

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### ADDENDUM FOR B.S. DEGREE IN APPLIED PHYSICS

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DDEP Adviser:

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<td>Thermodynamics or Electromagnetic Theory</td>
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<td>PHY 351 or PHY 460</td>
<td>Junior Laboratory or Special Problems</td>
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<td>PHY 362</td>
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# ADDENDUM FOR B.S. DEGREE IN MATHEMATICS

Name: 
DDEP Adviser: 
Mathematics Adviser: 

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<td>Introduction to Set Theory</td>
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<td>MTH 341</td>
<td>Probability &amp; Statistics I</td>
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<td>MTH 361</td>
<td>Real Analysis I</td>
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<td>MTH 371</td>
<td>Abstract Algebra I</td>
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<td>MTH 362 or MTH 372</td>
<td>Real Analysis II or Abstract Algebra II</td>
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<td>MTH 497</td>
<td>Senior Seminar</td>
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## MATHEMATICS ELECTIVES

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ADDENDUM FOR JOINT BACHELOR DEGREES IN CHEMISTRY AND CHEMICAL ENGINEERING

Name: DDEP Adviser: Chemistry Adviser:

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<td>CHE 421</td>
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<td>CHE 422</td>
<td>Chemical Instrumentation</td>
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