Physics and Technology

ABOUT THE DEPARTMENT

The Physics and Technology department is committed to preparing students who are interested in careers in technical fields as well as students who continue their education in the physical sciences and all branches of engineering. We stress academic excellence and value our role as an educational leader, embracing change and responding to the complex needs of the community we serve. To this end, we strive to maintain the relevance of our programs by creating partnerships with industry and updating our curricular offerings so that our students are well positioned to begin their professional careers upon graduation.

Professor and Chairperson: Dr. Jalil Moghaddasi
Professors: J. Malinsky
Associate Professors: B. Grossman, A. Lal
Assistant Professors: A. Romito, A. Sana, I. Zelikovich
Lecturers: H. Khan, G. Patchoros, V. Rigaglia, A. Szabo
Higher Education Officer: C. Drummond
Assistant Higher Education Officer: K. Registe
Senior College Laboratory Technicians: N. Trotman
College Laboratory Technicians: R. Troise, J. Perez (Substitute)
Approximately 38 adjuncts per semester

DEGREE PROGRAMS

Automotive Technology, A.A.S.
Electronic Engineering Technology, A.A.S.
Energy Services and Technology, A.A.S.
Engineering Science, A.S.
Liberal Arts and Sciences, Physics Option, A.S.
Nuclear Medicine Technology, A.A.S.
Telecommunications Technology, A.A.S.
Telecommunications Technology (Verizon), A.A.S.

CERTIFICATE PROGRAM

Automotive Mechanic, Certificate

COURSES

Astronomy (AST)
Automotive Technology (ACS)
Electronic Engineering Technology (ELC)
Energy Services and Technology (EST)
Engineering (EGR)
Nuclear Medicine Technology (NMT)
Physics (PHY)
Telecommunications (TEC)

Industrial Advisory Committee
Travers M. Dennis
Engineering Supervisor, Distribution Engineering
Consolidated Edison Co. of New York, Inc.
Gary Geiger, Director, Biomedical Engineering
Jacobi Medical Center
Maria Duran, Deputy Chief, Location Services Unit NYC
Department of Environmental Protection
Anthony J. Sucich, Quality Assurance
Next Step Program, Verizon
Peter Aro, Borough Chief Engineer
Maintenance Engineer, NYS, MTA
John Santiago, Acting Supervisor,
Environmental Control Technicians
NYC Department of Environmental Protection
Andres Valencia, Retired Supervisor,
Environmental Control Technicians
NYC Department of Environmental Protection, Consultant

Nuclear Medicine Advisory Committee
Irina Agrest. B.S., R.T. (N), CNMT,
Department of Nuclear Medicine and Ultrasound
NY Presbyterian Medical Center
Angelina Almonte, M.S., RT(N), CNMT
Department of Nuclear Medicine, Brooklyn Hospital Center
Geraldine Burghart, M.A., RT(N) (M) (MR)
Associate Professor
BCC Radiologic Technology Program
Charito Love, M.D., Attending, Department of Nuclear Medicine, Montefiore Medical Center
Lynette Blunt, A.A.S.
Department of Nuclear Medicine, Montefiore Medical Center
Man Yu Chen, M.S., RSO
Department of Environmental Safety, Montefiore Medical Center
Mario DiDea, B.S., R.T. (N), CNMT,
Department of Nuclear Medicine, Montefiore Medical Center
Margaret Doonan, M.S., R.T. (N), CNMT, Regional Manager,
Nuclear Diagnostic Products
Emilia Enriquez, R.T. (N), CNMT
Department of Nuclear Medicine, Montefiore Medical Center
Virginia Mishkin, M.S., R.T. (R)(M)(QM), Associate professor
BCC Radiologic Technology Program Director
Jalil Moghaddasi, Ph.D, Chairperson
Physics and Technology, BCC
Luis Montenegro, Ph.D, Interim Associate Dean
Academic Affairs, BCC
Alfred Romito, M.S., R.T. (N), CNMT, Assistant Professor
BCC Nuclear Medicine Technology Program Director
Ted Rubel, B.S., R.T. (N), CNMT, President and CEO
JRT Associates
AUTOMOTIVE MECHANIC
Certificate Program
Physics and Technology Department

The Automotive Mechanic program is designed to develop basic automotive skills required for entry-level in most automotive repair shops. The program integrates automotive theory with an emphasis on shop experience. Upon successful completion of this program, students receive a certificate and are encouraged to complete the requirements for the A.A.S. degree in Automotive Technology.

Curriculum Coordinator: Clement Drummond

Automotive Mechanic Curriculum
30 Credits required for Certificate

Core Requirements

- ACS 10 Introduction to Automotive Technology (1 Credit)
- ACS 11 Engine Repair (4 Credits)
- ACS 12 Brake Systems (3 Credits)
- ACS 13 Engine Performance (3 Credits)
- ACS 14 Manual Drive Train and Axles (3 Credits)
- ACS 24 Electrical Systems (3 Credits)

TOTAL 17

Required Areas of Study

- ACS 21 Steering and Suspension (3 Credits)
- ACS 22 Automatic Transmission and Transaxle (4 Credits)
- ACS 23 Heating and Air-Conditioning (3 Credits)
- ACS 35 Alternate Fuel Technology OR ACS 45 Diesel Technology (3 Credits)

TOTAL 13

For information regarding gainful employment, please visit: http://www.bcc.cuny.edu/Gainful-Employment-Disclosure/?page2=GedtAM

AUTOMOTIVE TECHNOLOGY
Associate in Applied Sciences Degree | Career Program
Physics and Technology Department

The Automotive Technology curriculum, the only one of its kind in the City University of New York, prepares the student for a career as an automotive technician. This curriculum develops understanding of operational principles, service sequences and diagnostic techniques for the automobile. Upon completion of this curriculum, the graduate is prepared for entry-level positions in various areas of the automotive industry dealing with development, testing, diagnosis and service of mechanical, hydraulic, electrical and thermodynamic automotive systems.

Automotive Technology graduates are employed in a variety of automotive-oriented positions including test technician, diagnostician, equipment sales and service, independent business administrator, dealership service manager, service writer, engine machinist, fuel injection, automatic transmission and engine management specialist, as well as general service technician.

Further training and education can lead to careers in technical education, engineering, insurance appraisal, and accident investigation, and other specialties. The program articulates with SUNY Empire State College. See the Transfer Planning web site for more information

Curriculum Coordinator: Clement Drummond

Automotive Technology Curriculum (Pathways)
60 Credits required for A.A.S. Degree

Required Core

A. English Composition
- ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
- ENG 12 Composition and Rhetoric II (3 Credits)

B. Life and Physical Sciences
- CHM 11 General Chemistry I OR CHM 17 Fundamentals of General Chemistry I (4 Credits)

Flexible Core

A. World Cultures and Global Issues
- HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)

D. Individual and Society
- COMM 11 Fundamentals of Interpersonal Communication (3 Credits)

E. Scientific World
- PHY 11 College Physics I (4 Credits)

A-D. 3 credits of Humanities Restricted Electives must be selected to fulfill Pathways Flexible Core requirements. Choose courses from Flexible Core Areas A through D.

SUBTOTAL 23

Required Areas of Study

- MTH 10 Trigonometry and College Algebra (3 Credits)
- PEA Physical Education Activity Course OR WFA 10 Workplace First Aid (1 Credit)
- ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
- ELC 15 Computer Applications in Technology (2 Credits)

SUBTOTAL 7

Specialization Requirements

- ACS 10 Introduction to Automotive Technology (1 Credits)
- ACS 11 Engine Repair (4 Credits)
- ACS 12 Brake Systems (3 Credits)
- ACS 13 Engine Performance (3 Credits)
- ACS 14 Manual Drive Train and Axle (3 Credits)
- ACS 21 Steering and Suspension Systems (3 Credits)
- ACS 22 Automatic Transmission and Transaxle (4 Credits)
- ACS 23 Heating and Air-Conditioning (3 Credits)
- ACS 24 Electrical Systems (3 Credits)
- ACS 35 Alternate Fuel Systems OR ACS 45 Diesel Technology (3 Credits)

SUBTOTAL 21
AUTOMOTIVE TECHNOLOGY (PRE-PATHWAYS)

Associate in Applied Sciences Degree | Career Program
Physics and Technology Department

If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Curriculum Coordinator: Clement Drummond

Automotive Technology Curriculum
60 Credits required for A.A.S. Degree

Core Requirements

- ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
- CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
- HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
- MTH 13 Trigonometry and College Algebra (3 Credits)
- PEA Physical Education activity course OR WFA 10 Workplace First Aid (1 Credit)
- CHM 11 General College Chemistry I OR CHM 17 Fundamentals of General Chemistry (4 Credits)

TOTAL 17

Required Areas of Study

- ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
- PHY 21 Physics for Engineering Technology I (4 Credits)
- ELC 15 Computer Applications in Technology (2 Credits)
- HUMANITIES ELECTIVES* (6 Credits)

TOTAL 13

Specialization Requirements

- ACS 10 Introduction to Automotive Technology (1 Credit)
- ACS 11 Engine Repair (4 Credits)
- ACS 12 Brake Systems (3 Credits)
- ACS 13 Engine Performance (3 Credits)
- ACS 14 Manual Drive Train and Axles (3 Credits)
- ACS 21 Steering and Suspension Systems (3 Credits)
- ACS 22 Automatic Transmission and Transaxle (4 Credits)
- ACS 23 Heating and Air-Conditioning (3 Credits)
- ACS 24 Electrical Systems (3 Credits)
- ACS 35 Alternate Fuel Technology (3 Credits) OR ACS 45 Diesel Technology (3 Credits)

TOTAL 30

NOTE: At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

* Select from Art, Communication, English, Geography, History, Music, Modern Languages, or Social Sciences (one selection must be from English).

ELECTRONIC ENGINEERING TECHNOLOGY

Associate in Applied Sciences Degree | Career Program
Physics and Technology Department

Curriculum Coordinator: Dr. Jalil Moghaddasi

Electrical and electronic technicians build, test and maintain complex electronic equipment such as computers, control systems, communication networks, power systems, and medical devices. The Electronic Engineering Technology (EET) program at Bronx Community College prepares graduates to join the workforce as technical professionals in a variety of industries and services or to transfer to a four-year baccalaureate program in engineering technology.

The technical curriculum is combined with a program of general education to assure that graduates of the EET program have the prerequisite skills in reading, writing, and communication that are necessary to function effectively in the workplace. The Electronic Engineering Technology program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology: 111 Market Place, Suite 1050, Baltimore Md. 21202-4012; Telephone: (410) 347-7700. http://www.abet.org/

Electronic Engineering Technology students who plan to continue their studies may transfer directly to New York City College of Technology or other colleges offering the baccalaureate degree in Engineering Technology. Graduates' transfer credits for technology courses taken at BCC will be evaluated by each college.

Program Objectives

Within two or more years after graduation from Bronx Community College:

- students in the Electronic Technology Program are expected to be graduates of a four-year baccalaureate program in Engineering Technology or pursuing additional formal education;
- gainfully employed as engineering technologists; attaining increasing levels of responsibility in their chosen career;
- and respectful of cultural diversity and practicing the profession in an ethical manner.

Graduate Outcomes

Upon graduation from Bronx Community College:

- students in Electronic Engineering Technology will be able to join the workforce as engineering technologists;
• work effectively in a team environment; read and write effectively;
• use mathematics to solve problems in electronics; analyze and interpret technical data;
• read circuit schematics, select electronic components, solder and assemble circuits and printed circuit boards (PCBs);
• and simulate electronic circuits.

Annual student enrollment and graduation data for students in the Electronic Engineering Technology program

<table>
<thead>
<tr>
<th>Semester and Year</th>
<th>Enrollment</th>
<th>Academic Year</th>
<th>Graduates</th>
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<tr>
<td>Fall 2009</td>
<td>122</td>
<td>2008 - 2009</td>
<td>14</td>
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<tr>
<td>Fall 2010</td>
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<td>14</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>139</td>
<td>2012 - 2013</td>
<td>6</td>
</tr>
</tbody>
</table>

Electronic Engineering Technology Curriculum (Pathways)
66 Credits required for A.A.S. Degree

Required Core
A. English Composition
• ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
• ENG 12 Composition and Rhetoric II (3 Credits)
B. Mathematical and Quantitative Reasoning
• MTH 30 Pre-Calculus Mathematics (4 Credits)
C. Life and Physical Sciences
• PHY 11 College Physics I (4 Credits)

Flexible Core
A. World Cultures and Global Issues
• HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
D. Individual and Society
• COMM 11 Fundamentals of Interpersonal Communications (3 Credits)
E. Scientific World
• PHY 12 College Physics II (4 Credits)

Required Areas of Study
• ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
• MTH 31 Calculus and Analytical Geometry I (4 Credits)
• PEA Physical Education Activity Course (1 Credit)
• FREE ELECTIVE (1 Credit)

Specialization Requirements
• ELC 11 DC Circuit Analysis (4 Credits)
• ELC 15 Computer Applications in Technology (2 Credits)

ELECTRONIC ENGINEERING TECHNOLOGY (PRE-PATHWAYS)
Associate in Applied Sciences Degree | Career Program Physics and Technology Department

If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Curriculum Coordinator: Dr. Jalil Moghaddasi

Electronic Engineering Technology Curriculum
66 Credits required for A.A.S. Degree

Core Requirements
• ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
• CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
• HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
• MTH 13* Trigonometry and College Algebra (3 Credits)
• PEA Physical Education activity course (1 Credit)

TOTAL 13

Required Areas of Study
• ENG 223 Scientific and Technical Writing (3 Credits)
• ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
• MTH 14* College Algebra and Introduction to Calculus (3 Credits)
• MTH 15* Calculus (3 Credits)
• PHY 21**Physics for Engineering Technology I (4 Credits)
• PHY 22*** Physics for Engineering Technology II (4 Credits)

TOTAL 18

Specialization Requirements
• ELC 11 DC Circuit Analysis (4 Credits)
• ELC 15 Computer Applications in Technology (2 Credits)
• ELC 18 Computer Programming for Engineering Technology (2 Credits)
• ELC 21 AC Circuit Analysis (4 Credits)
**ENERGY SERVICES AND TECHNOLOGY**

**Associate in Applied Sciences Degree | Career Program**

*Physics and Technology Department*

The Energy Services and Technology program is a specialized building science technology program created to meet the needs of the real estate, property management, utility and energy services, construction, contracting, equipment operations and maintenance, and performance contracting industries. Technicians entering the field become members of a team working with supervision by more experienced technicians or engineering personnel. They can be found working in building management; engineering and construction companies; heating, ventilation, and air conditioning (HVAC) and utility companies; energy service companies (ESCOs); and building automation system suppliers such as Johnson Controls, Siemens, and Honeywell. They use and interpret information for building instrumentation and field assessment tools including temperature and pressure gauges, flow meters, BTU meters, electric meters and test equipment, building automation system logs, data loggers, infra-red cameras, air hoods, blower doors, tachometers, anemometers, light meters, combustion test kits and carbon monoxide monitors. They are also called upon to interpret energy bills, demand charges, and load profiles. The work environment requires technicians to be well trained in analytical and computer methods as applied to the operation of building systems and equipment, as well as to job safety, health and environment regulations. Please note that the program articulates with SUNY Empire State College. Please visit the Transfer Planning web site for more details.

Curriculum Coordinator: Dr. Akhil Lal

**Energy Services and Technology Curriculum (Pathways)**

60 Credits required for A.A.S. Degree

**Required Core**

- A. English Composition
- B. Mathematical and Quantitative Reasoning
  - MTH 23 Probability and Statistics (3 Credits)
- C. Life and Physical Sciences
  - PHY 11 College Physics I (4 Credits)

**Flexible Core**

- A. World Cultures and Global Issues
  - HIS 10 History of the Modern World OR
  - HIS 11 Introduction to the Modern World (3 Credits)

**Required Areas of Study**

- BUS 10 Introduction to Business OR
  - BUS 51 Business Organization and Management (3 Credits)
- COMM 12 Voice and Diction: Business and Professional Speech (2 Credits)
- ECO 12 Macroeconomics OR ECO 11 Microeconomics (3 Credits)
- ELC 15 Computer Applications in Technology (2 Credits)
- MTH 13 Trigonometry and College Algebra (3 Credits)

**Specialization Requirements**

- EST 11 Introduction to Energy Technology (2 Credits)
- EST 15 Energy Economics (3 Credits)
- EST 21 Energy Analysis of Mechanical and Electrical Equipment (2 Credits)
- EST 31 Building Systems I (3 Credits)
- EST 32 Building Systems II (3 Credits)
- EST 41 Principles of Energy Management I (3 Credits)
- EST 42 Principles of Energy Management I (3 Credits)

**NOTE:** At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

**A. English Composition**

- ELC 25 Electronics I (4 Credits)
- ELC 35 Electronics II (4 Credits)
- ELC 51 Electronic Controls (3 Credits)
- ELC 81 Electronic Communications (4 Credits)
- ELC 94 Laser and Fiber Optic Communications (4 Credits)
- ELC 96 Digital Systems I (4 Credits)

**TOTAL 35**
DEGREE REQUIREMENTS AND EXPLANATION OF CREDIT

2014-2015 COLLEGE CATALOG

Required Areas of Study

Note:

1. This program has received a waiver to require students to take MTH 30 or MTH 31 to fulfill Required Core Area B, PHY 31 to fulfill Required Core Area C, PHY 32 to fulfill Flexible Area E, and CHM 11 to fulfill the 6th Flexible Area course. Note that MTH 30 is a prerequisite to MTH 31. If students

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)</td>
</tr>
<tr>
<td>CMS 11 Fundamentals of Interpersonal Communication (3 Credits)</td>
</tr>
<tr>
<td>HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)</td>
</tr>
<tr>
<td>MTH 13* Trigonometry and College Algebra (3 Credits)</td>
</tr>
<tr>
<td>ECO 11 Microeconomics OR ECO 12 Macroeconomics (3 Credits)</td>
</tr>
<tr>
<td>OCD 01 Orientation and Career Development (0 Credit)</td>
</tr>
</tbody>
</table>

TOTAL 19

Required Areas of Study

• MTH 23* Probability and Statistics (3 Credits)
• BUS 10 Introduction to Business OR BUS 51 Business Organization and Management (3 Credits)
• ELC 11 DC Circuit Analysis (4 Credits)
• ELC 15 Computer Applications in Technology (2 Credits)
• CMS 12 Voice and Diction: Business and Professional Speech (2 Credits)
• ENG 23 Scientific and Technical Writing (3 Credits)
• ENV 11 Introduction of Environmental Health OR CHM 11 General College Chemistry I (4 Credits)
• RESTRICTED ELECTIVE** (1 Credit)

TOTAL 22

Specialization Requirements

• EST 11 Introduction to Energy Technology (2 Credits)
• EST 15 Energy Economics (3 Credits)
• EST 21 Energy Analysis of Mechanical and Electrical Equipment (2 Credits)
• EST 31 Building Systems I (3 Credits)
• EST 32 Building Systems II (3 Credits)
• EST 41 Principles of Energy Management I (3 Credits)
• EST 42 Principles of Energy Management II (3 Credits)

TOTAL 19

NOTE: At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

*Students planning on transferring to a four-year program may substitute MTH 30 and MTH 31 for MTH 13 and MTH 23.

**Choose from ART 10, MUS 10, any PEA one credit course, CPR 10, or WFA 10.

ENGINEERING SCIENCE

Associate in Science Degree | Transfer Degree

The Engineering Science curriculum is designed for students with a special interest in engineering and provides a thorough preparation in mathematics and physical science.

Graduates of this program may transfer to a senior college to continue their education in engineering and earn a baccalaureate degree in engineering.

Curriculum Coordinator: Dr. A. Lal

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. English Composition (6 Credits)</td>
</tr>
<tr>
<td>B. Mathematical and Quantitative Reasoning¹</td>
</tr>
<tr>
<td>MTH 30 Pre-Calculus Mathematics OR MTH 31 Analytic Geometry and Calculus I (4 Credits)</td>
</tr>
<tr>
<td>C. Life and Physical Science¹</td>
</tr>
<tr>
<td>PHY 31 Physics I (4 Credits)</td>
</tr>
</tbody>
</table>

SUBTOTAL 14

Flexible Core

A. World Cultures and Global Issues² (3 Credits)
B. US Experience and its Diversity² (3 Credits)
C. Creative Expression³ (3 Credits)
D. Individual and Society³ (3 Credits)
E. Scientific World¹
• PHY 32 Physics II AND
• CHM 11 General Chemistry I (8 Credits)

SUBTOTAL 20

Specialization Requirements

• EGR 11 Introduction to Engineering Design (1 Credit)
• EGR 21 Analysis Tools for Engineers OR EGR 31 Circuit Analysis (2-3 Credits)
• MTH 31 Analytic Geometry and Calculus I (0-4 Credits)
• MTH 32 Analytic Geometry and Calculus II (5 Credits)
• MTH 33 Analytical Geometry and Calculus III (5 Credits)
• MTH 34 Differential Equations and Selected Topics in Advanced Calculus (4 Credits)
• PHY 33 Physics III (4 Credits)
• RESTRICTED ELECTIVES³ (0-5 Credits)

SUBTOTAL 26

¹ This program has received a waiver to require students to take MTH 30 or MTH 31 to fulfill Required Core Area B, PHY 31 to fulfill Required Core Area C, PHY 32 to fulfill Flexible Area E, and CHM 11 to fulfill the 6th Flexible Area course.

² Note that MTH 30 is a prerequisite to MTH 31. If students
transferring into this program complete different courses in these areas, they will be certified as having completed the Common Core requirements, but it may not be possible for them to finish their degree within the regular number (60) of credits.

2 In choosing courses to fulfill Pathways Flexible Core requirements for Areas A, B, C, and D, students are strongly advised to select courses from no fewer than three (3) different departments.

3 Select from the following:
   - CHM 12 General Chemistry II (4 Credits) or
   - CHM 22 General Chemistry II with Qualitative Analysis (5 Credits)
   - CHM 31 Organic Chemistry I (5 Credits)
   - EGR 21 Analysis Tools for Engineers (2 Credits)
   - EGR 31 Circuit Analysis (3 Credits)
   - ENG 223 Scientific and Technical Writing (3 Credits)
   - ENG 96 Digital Systems I (4 Credits)

ENGINEERING SCIENCE (PRE-PATHWAYS)
Associate in Science Degree | Transfer Degree
Physics and Technology Department

If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Curriculum Coordinator: Dr. A. Lal

Engineering Science Curriculum
60 Credits required for A.S. Degree

Core Requirements
   - ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
   - CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
   - HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
   - CHM 11 General College Chemistry I (4 Credits)

TOTAL 13

Required Areas of Study
   - ENG 12 Composition and Rhetoric II (3 Credits)
   - MTH 31* Analytic Geometry and Calculus I (4 Credits)
   - HUMANITIES ELECTIVE** (3 Credits)

TOTAL 10

Specialization Requirements
   - EGR 11 Introduction to Engineering Design (1 Credit)
   - MTH 32 Analytic Geometry and Calculus II (5 Credits)
   - MTH 33 Analytic Geometry and Calculus III (5 Credits)
   - MTH 34 Differential Equations and Selected Topics in Advanced Calculus (4 Credits)
   - PHY 31 Engineering Physics I (4 Credits)
   - PHY 32 Engineering Physics II (4 Credits)
   - PHY 33 Engineering Physics III (4 Credits)
   - RESTRICTED ELECTIVES (10 Credits)

Select from the following:
   - CHM 12 General College Chemistry II (4 Credits)
   - CHM 22 General Chemistry II with Qualitative Analysis (5 Credits)
   - CHM 31 Organic Chemistry I (5 Credits)
   - EGR 21 Analysis Tools for Engineers (2 Credits)
   - EGR 31 Circuit Analysis (3 Credits)
   - ELC 96 Digital Systems I (4 Credits)
   - ENG 23 Scientific and Technical Writing (3 Credits)

TOTAL 37

NOTE: At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

* MTH 30 or equivalent is a corequisite for EGR 11 and the restricted elective ELC 96 and a prerequisite for MTH 31

**ENG 23 is not to be taken to fulfill this requirement. Students who are considering transferring to the Grove School of Engineering at CCNY must select from the following list of courses: ART 11, ECO 11, ECO 12, FRN 11, FRN 12, MUS 11/12, POL 11, POL 51, PSY 11, PSY 22, PSY 31, SOC 11, SOC 33, SOC 34, SOC 37, and HIS 13.

LIBERAL ARTS AND SCIENCES
Associate in Science Degree | Transfer Degree

Physics Option
A student interested in the Associate in Science (A.S.) degree in Liberal Arts and Sciences has to choose one of four options: Biology, Chemistry, Earth Systems and Environmental Science, or Physics. Each option prepares students for transfer to a complementary four-year degree program. Students in the Physics option usually transfer to colleges offering bachelor’s degrees in engineering (civil, electrical, mechanical, etc.) or in the physical sciences. Enrichment programs are offered to encourage students to continue their education beyond the bachelor degree by attending graduate or other professional schools. Please note that the option articulates with SUNY Empire State College. Please visit the Transfer Planning web site for more details.

Curriculum Coordinator: Dr. Akhil Lal

Liberal Arts and Sciences Curriculum (Pathways)
60 Credits required for A.S. Degree

Required Core
A. English Composition (6 Credits)
B. Mathematical and Quantitative Reasoning
   - MTH 30 Pre-Calculus Mathematics OR
   - MTH 31 Analytic Geometry and Calculus I (4 Credits)
C. Life and Physical Science
   - CHM 11 General Chemistry I (4 Credits)

SUBTOTAL 14

Flexible Core
A. World Cultures and Global Issues (3 Credits)
B. US Experience and its Diversity (3 Credits)
C. Creative Expression (3 Credits)
D. Individual and Society (3 Credits)
E. Scientific World
- CHM 12 General Chemistry II (4 Credits)
  *Restricted Elective Select one course from Area A-E.
  (3 Credits)

SUBTOTAL 19

Specialization Requirements
- MTH 31 Analytic Geometry and Calculus I** (0 - 4 Credits)
- MTH 32 Analytical Geometry and Calculus II (5 Credits)
- FREE ELECTIVES (0 - 5 Credits)

SUBTOTAL 27

Physics Option
- PHY 31 General Physics I (4 Credits)
- PHY 32 General Physics II (4 Credits)
- PHY 33 General Physics III (4 Credits)
- MTH 33 Analytic Geometry and Calculus III (5 Credits)

SUBTOTAL 17

1 This program has obtained a waiver to require STEM variant courses in Required Core Area B and Area C and Flexible Core Area E. If students transferring into this program complete different courses in these areas, they will be certified as having completed the Common Core requirements, but it may not be possible for them to finish their degree within the regular number (60) of credits.

* Restricted Elective: must select one course from Flexible Core A-E. No more than two courses in any discipline or interdisciplinary field.

**For students that take MTH 30 to fulfill the Required Core.

LIBERAL ARTS AND SCIENCES
(PRE-PATHWAYS)

Associate in Science Degree | Transfer Degree

Physics Option
If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Curriculum Coordinator: Dr. Akhil Lal

Liberal Arts and Sciences Curriculum
60 Credits required for A.S. Degree

Core Requirements
- ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
- ENG 12 Composition and Rhetoric II (3 Credits)
- CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
- HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
- PEA Physical Education OR HLT 91 Critical Issues in Health (1-2 Credits)

TOTAL 13-14

Required Areas of Study
- CHM 11 General Chemistry I (4 Credits)
- CHM 22 General Chemistry II with Qualitative Analysis (5 Credits)
- MTH 31 Analytic Geometry and Calculus I (4 Credits)
- MTH 32 Analytic Geometry and Calculus II (5 Credits)
- ART 11 Introduction to Art OR MUS 11 Introduction to Music OR Humanities OR Social Sciences** (3 Credits)
- MODERN LANGUAGE† (0-8 Credits)

TOTAL 21-29

Specialization Requirements #

Physics Option
- PHY 31 General Physics I (4 Credits)
- PHY 32 General Physics II (4 Credits)
- PHY 33 General Physics III (4 Credits)
- MTH 33 Analytic Geometry and Calculus III (5 Credits)

TOTAL 17

**See your advisor to determine the appropriate course from an approved list of Humanities or Social Science courses.

†Modern Language is a requirement for students planning to transfer to a CUNY four-year college and major in biology, chemistry, earth science or physics. Students planning to transfer should see the language requirements for the four-year degree program at the senior college.

NUCLEAR MEDICINE TECHNOLOGY

Associate in Applied Sciences Degree | Career Program

Physics and Technology Department
Affiliated with Montefiore The University Hospital for the Albert Einstein College of Medicine
Program Director: Professor Alfred Romito

This rewarding technology field involves collaboration and interactions with highly specialized people, the operation of sophisticated instruments, and excellent salaries. Nuclear Medicine is a relatively new branch of medicine that uses isotopes for the diagnosis and treatment of certain diseases.

The Nuclear Medicine Technologist assists the physician in the operation of the gamma camera, the positioning of patients under the gamma camera, and in the calculation of the isotope doses to the patients.
In recent years, improved diagnoses of many important diseases have been achieved by methods used in Nuclear Medicine. These include diseases involving the liver, gastrointestinal tract, and spleen; disorders of the bone vertebral column, and the heart and cardiovascular system; and localization of tumors using the new and exciting field of Position Emission Tomography. The number of nuclear medicine procedures in hospitals has been increasing over the past few years.

The Nuclear Medicine Technology program is accredited by the Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT), nationally recognized by the Council for Higher Education Accreditation (CHEA).

The minimum acceptable cumulative G.P.A. for entering specialization requirement courses of the Nuclear Medicine Technology Program is 2.7 (B-). For students transferring from another college, grades received from transferred courses will be used in the calculation of their effective index. Transferred courses may not include NMT designated courses.

Upon the completion of the program at Bronx Community College, students are required to pass one of two national registry examinations to become identified as a Registered Nuclear Medicine Technologist and to practice as a Nuclear Medicine Technologist. Further study in this field is possible in institutions offering a baccalaureate degree in Nuclear Medicine Technology. The program articulates with New York City College of Technology and SUNY Empire State College. Visit the Transfer Planning web site for more information.

Nuclear Medicine Graduate Outcomes
Percentage of Students Successfully Passing the American Registry of Radiologic Technologists (ARRT) and the Nuclear Medicine Technology Certification Board (NMTCB)Accreditation Exams:

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<th>ARRT</th>
<th>Passed</th>
<th>%</th>
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<tr>
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<td>2013</td>
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<tr>
<td>2012</td>
<td>7</td>
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<tr>
<td>2013</td>
<td>10</td>
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<table>
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<th>Year of Program Entry</th>
<th>Graduation Rate (%)</th>
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<td>61%</td>
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<td>2011</td>
<td>43%</td>
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<tr>
<td>2012</td>
<td>50%</td>
</tr>
<tr>
<td>2013</td>
<td>77%</td>
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</table>

Average Graduation Rate: 58%
D. Individual and Society
  • COMM 11 Fundamentals of Interpersonal Communication (3 Credits)
E. Scientific World
  • BIO 24 Human Anatomy and Physiology II (4 Credits)
Additional Flexible Core course
  • CHM 17 Fundamentals of General Chemistry I (4 Credits)
  
**SUBTOTAL 25**

**Required Areas of Study**

- ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
- BIO 22 Medical Terminology (2 Credits)
- LAW 45 Medical Law (3 Credits)
- PHY 24 Principles of General Physics (4 Credits)
  
**SUBTOTAL 10**

**Specialization Requirements**

- NMT 78 EKG - Interpretation and Techniques (2 Credits)
- NMT 79 Phlebotomy (2 Credits)
- NMT 71 Nuclear Medicine Laboratory (1 Credit)
- NMT 81 Orientation to Nuclear Medicine (3 Credits)
- NMT 82 Radio-Pharmaceutical Chemistry (3 Credits)
- NMT 83 Radiation Physics and Dosimetry (3 Credits)
- NMT 84 Radiation Biology (2 Credits)
- NMT 85 Nuclear Medicine Procedures (2 Credits)
- NMT 86 Didactic Nuclear Medicine (1 Credit)
- NMT 87 Clinical Nuclear Medicine I (3 Credits)
- NMT 88 Senior NMT Seminar (3 Credits)
- NMT 90 Clinical Nuclear Medicine II (3 Credits)
  
**SUBTOTAL 28**

1 Parts or all of these courses are taught at Montefiore Medical Center including NMT 78, 79, NMT 71 and 81-88 are taught sequentially, although listed concurrently. These instructional hours for NMT 81-84 generally extend from January through May, just prior to the start of clinical training. Students may not register for any NMT course without permission of the Program Director.

**NUCLEAR MEDICINE TECHNOLOGY (PRE-PATHWAYS)**

**Associate in Applied Sciences Degree | Career Program Physics and Technology Department**

If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Affiliated with Montefiore The University Hospital for the Albert Einstein College of Medicine
Program Director: Professor Alfred Romito

**Nuclear Medicine Technology Curriculum**

63 Credits required for A.A.S. Degree

**Nuclear Medicine Technology Curriculum**

63 Credits required for A.A.S. Degree

**Core Requirements**

- ENG 10 Fundamentals of Composition and Rhetoric OR ENG 11 Composition and Rhetoric I (3 Credits)
- OCD 01 Orientation and Career Development (0 Credit)
- MTH 30 Pre-Calculus Mathematics (4 Credits)
- BIO 23 Human Anatomy and Physiology I (4 Credits)
- CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
- HIS 10 History of the Modern World OR HIS 11 Introduction to the Modern World (3 Credits)
  
**TOTAL 17**

**Required Areas of Study**

- ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
- BIO 24 Medical Terminology (2 Credits)
- CHM 17 Fundamentals of General Chemistry I (4 Credits)
- BIO 22 Medical Terminology (2 Credits)
- LAW 45 Medical Law (3 Credits)
- PHY 24 Principles of General Physics (4 Credits)
  
**TOTAL 18**

**Specialization Requirements**

- NMT 78 EKG - Interpretation and Techniques (2 Credits)
- NMT 79 Phlebotomy (2 Credits)
- NMT 71 Nuclear Medicine Laboratory (1 Credit)
- NMT 81 Orientation to Nuclear Medicine (3 Credits)
- NMT 82 Radio-Pharmaceutical Chemistry (3 Credits)
- NMT 83 Radiation Physics and Dosimetry (3 Credits)
- NMT 84 Radiation Biology (2 Credits)
- NMT 85 Nuclear Medicine Procedures (2 Credits)
- NMT 86 Didactic Nuclear Medicine (1 Credit)
- NMT 87 Clinical Nuclear Medicine I (3 Credits)
- NMT 88 Senior NMT Seminar (3 Credits)
- NMT 90 Clinical Nuclear Medicine II (3 Credits)
  
**TOTAL 28**

1 Parts or all of these courses are taught at Montefiore Medical Center including NMT 78, 79, NMT 71 and 81-88 are taught sequentially, although listed concurrently. These instructional hours for NMT 81-84 generally extend from January through May, just prior to the start of clinical training. Students may not register for any NMT course without permission of the Program Director.

**NOTE:** At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

* Parts or all of these courses are taught at Montefiore Medical Center including NMT 78, 79, NMT 71 and 81-88 are taught sequentially, although listed concurrently. These instructional hours for NMT 81-84 generally extend from January through May, just prior to the start of clinical training. Students may not register for any NMT course without permission of the Program Director.
**TELECOMMUNICATIONS TECHNOLOGY**

**Associate in Applied Sciences Degree | Career Program**

Physics and Technology Department

The Telecommunications Technology curriculum provides training in the expanding field of telecommunications. For students interested in technology, the program will provide state-of-the-art training for fulfilling telecommunications careers. In addition, the program aims to retrain telecommunications workers with technological advances in the field. The program also provides a smooth transition to baccalaureate programs of four-year schools, specifically the bachelor’s degree program in Telecommunications at CUNY New York City Technical College. Graduates can expect to be hired by various companies ranging from small businesses to telecommunication giants such as AT&T, Verizon, MCI and cable television companies.

Curriculum Coordinator: Dr. Ajaz Sana

**Telecommunications Technology Curriculum (Pathways)**

65 Credits required for A.A.S. Degree

**Required Core**

A. English Composition
   • ENG 10 Fundamentals of Composition and Rhetoric OR
     ENG 11 Composition and Rhetoric I (3 Credits)
   • ENG 12 Composition and Rhetoric II (3 Credits)

B. Mathematical and Quantitative Reasoning
   • MTH 30 Pre-Calculus Mathematics (4 Credits)

C. Life and Physical Sciences
   • PHY 11 College Physics I (4 Credits)

Flexible Core

A. World Cultures and Global Issues
   • HIS 10 History of the Modern World OR
     HIS 11 Introduction to the Modern World (3 Credits)

D. Individual and Society
   • COMM 11 Fundamentals of Interpersonal Communication (3 Credits)

E. Scientific World
   • PHY 12 College Physics II (4 Credits)

**SUBTOTAL 24**

**Required Areas of Study**

• ART 10 Art Survey OR MUS 10 Music Survey (1 Credit)
• MTH 31 Calculus and Analytical Geometry I (4 Credits)
• PEA Physical Education activity course (1 Credit)
• FREE ELECTIVE (1 Credit)

**SUBTOTAL 7**

**Specialization Requirements**

• ELC 11 DC Circuit Analysis (4 Credits)
• ELC 15 Computer Applications in Technology (2 Credits)
• ELC 21 AC Circuit Analysis (4 Credits)
• ELC 25 Electronics I (4 Credits)
• ELC 96 Digital Systems I (4 Credits)
• TEC 11 Voice Communications (4 Credits)
• TEC 21 Data Communications (4 Credits)
• TEC 31 Local Area Networks (4 Credits)
• TEC 41 Advanced Topics in Telecommunications (4 Credits)

**SUBTOTAL 34**

NOTE: At least two courses must be taken from a list designated as “Writing Intensive” as published each semester in the Registration Guide and Schedule of Classes.

**TELECOMMUNICATIONS TECHNOLOGY (PRE-PATHWAYS)**

**Associate in Applied Sciences Degree | Career Program**

Physics and Technology Department

If you began studying at BCC in or after Fall 2013, Pathways applies. Pathways also applies to students who have returned to CUNY after an absence of more than one semester. If you are a continuing student who entered before Fall 2013, you will be able to choose whether you remain with your existing requirements or change to Pathways. You should consult with an academic advisor.

Curriculum Coordinator: Dr. Ajaz Sana

**Telecommunications Technology Curriculum**

65 Credits required for A.A.S. Degree

**Core Requirements**

• ENG 10 Fundamentals of Composition and Rhetoric OR
  ENG 11 Composition and Rhetoric I (3 Credits)
• CMS 11 Fundamentals of Interpersonal Communication (3 Credits)
• HIS 10 History of the Modern World OR
  HIS 11 Introduction to the Modern World (3 Credits)
• MTH 13* Trigonometry and College Algebra (3 Credits)
• PEA Physical Education (one activity course) (1 Credit)

**TOTAL 13**

**Required Areas of Study**

• ENG 23 Scientific and Technical Writing (3 Credits)
• MTH 14 College Algebra and Introduction to Calculus (3 Credits)
• MTH 15 Calculus (3 Credits)
• PHY 21** Physics for Engineering Technology I (4 Credits)
• PHY 22 Physics for Engineering Technology II (4 Credits)
• MUS 10 Music Survey OR ART 10 Art Survey (1 Credit)

**TOTAL 18**

**Specialization Requirements**

• ELC 15 Computer Applications in Technology (2 Credits)
• ELC 11 D.C. Circuit Analysis (4 Credits)
• ELC 21 A.C. Circuit Analysis (4 Credits)
• ELC 25 Electronics I (4 Credits)
• ELC 96 Digital Systems I (4 Credits)
• TEC 11 Voice Communications (4 Credits)
• TEC 21 Data Communications (4 Credits)
• TEC 31 Local Area Networks (4 Credits)
• TEC 41 Advanced Topics in Telecommunications (4 Credits)

**TOTAL 34**
*Students may choose to take MTH 30, 31, and 32 in lieu of MTH 13, 14, and 15 if they plan to continue their studies at CCNY after completing the A.A.S. degree.

** Students may choose to take PHY 31 and 32 in lieu of PHY 21 and 22 if they plan to continue their studies at CCNY after completing the A.A.S. degree.

** COURSES **

** Astronomy **

AST 11 2 lect 1 rec 2 lab 4 cr

**Stellar Astronomy**

This course covers early astronomy; astronomical coordinate systems; structure and evolution of the sun, stars and stellar systems; spectroscopy; the Milky Way and external galaxies; and cosmological models and implications. Prerequisite: MTH 05 or CUNY math proficiency. Corequisite: ENG 02 or RDL 02 if required.

AST 12 2 lect 1 rec 2 lab 4 cr

**Planetary Astronomy**

History of astronomy: Structure of the universe; origin and evolution of the solar system including the sun, planets, and minor bodies; architecture of the solar system with emphasis on orbital motions, planetary surfaces, atmospheres and internal structures; the expanding universe. Prerequisite: ENG 02 or RDL 02; MTH 05 or CUNY Math Proficiency.

AST 10 1 cr

**Laboratory Exercises in Stellar Astronomy**

This course is the laboratory component of AST 11. Experiments are designed to explore the major discoveries in astronomy including the laws of planetary motion, the nature of light, telescopes, the internal dynamics of the sun, classification and evolution of stars, the Milky Way and external galaxies; and the evolution of the universe. Prerequisite: ENG 02 or RDL 02; MTH 05 or CUNY math proficiency.

AST 111 2 lect 1 rec 3 cr

**Stellar Astronomy**

This course covers early astronomy; astronomical coordinate systems; structure and evolution of the sun, stars and stellar systems; spectroscopy; the Milky Way and external galaxies; and cosmological models and implications. Prerequisite: MTH 05 or CUNY Math Proficiency. Corequisite: ENG 02 or RDL 02.

**Required Core - Life and Physical Sciences**

AST 112 2 lect 1 rec 3 cr

**Planetary Astronomy**

History of astronomy; ground-based observation and space exploration; physical processes in the solar system including the sun, planets, and minor bodies; architecture of the solar system with emphasis on orbital motions, planetary surfaces, atmospheres and internal structures; formation and evolution of the solar system. Prerequisite: ENG 02 or RDL02; MTH 05 or CUNY Math Proficiency.

**Flexible Core - Scientific World**

**Automotive Technology**

ACS 10 3 lab 1 cr

**Introduction to Automotive Technology**

This course will introduce students to career choices in, and basic skills related to, the automotive industry. Topics covered include basic shop safety, overview of electrical principles and automotive systems and proper use of tools and diagnostic instrumentation. Corequisites: ENG 02, RDL 02, MTH 05, if required.

ACS 11 2 rec 4 lab 4 cr

**Engine Repair**

A study of the modern internal combustion gasoline engine including basic principles of design and operation. This course covers disassembly, inspection and precision measuring and continues with reassembly including fitting and reconditioning parts. It also includes material covering engine support systems including cooling, lubrication and basic ignition system fundamentals and engine lubricants. Corequisite: ACS 10

ACS 12 1 rec 4 lab 3 cr

**Brake Systems**

This course will study the design, operation and maintenance of the automotive brake system including diagnostics and servicing of rotors and drums, measuring and resurfacing. Anti-lock brake systems, traction control systems and front wheel drive axle shaft service are also covered. Corequisite: ACS 10

ACS 13 2 rec 2 lab 3 cr

**Engine Performance**

This course begins with engine operation including conventional ignition systems and focuses on modern ignition techniques, engine, transmission and body control systems and other computer control systems. It explores modern diagnostic test techniques, equipment and procedures, and provides a thorough understanding of modern vehicle fuel control systems. Prerequisites: ACS 11, ACS 24

ACS 14 1 rec 4 lab 3 cr

**Manual Drive Train and Axle**

This course covers both conventional rear-drive systems and front-drive configurations. It concentrates on transmission maintenance, service and repair, and includes drive line service and repair of clutch, ring gear and pinion, differential case...
assembly, drive shaft, half shaft and four wheel drive systems.

Prerequisites: ACS 11, ACS 24

ACS 21 2 rec 3 lab 3 cr

Steering and Suspension Systems
A study of the design, operating principles and service of automotive suspension and steering systems including McPherson strut and multi-link designs, solid axle and independent systems. Tire construction, wear diagnosis and service are covered and emphasis is placed on wheel alignment procedures, including computerized four-wheel alignment. New technologies are covered including four-wheel steering, electronic steering, and computerized suspension systems.

Prerequisites: ACS 10, ACS 24

ACS 22 2 rec 3 lab 3 cr

Automatic Transmission and Transaxle
This course begins with the basics of hydraulics and how they are applied to traditional automatic transmissions with rear drive vehicles and focuses on modern computer controlled transaxle applications. It includes in-car and out-of-vehicle service, maintenance, repair and adjustment using modern diagnostic techniques and equipment.

Prerequisites: ACS 11, ACS 24.

ACS 23 2 rec 3 lab 3 cr

Heating and Air Conditioning
A study of vehicle climate control systems including heating and air conditioning. Includes theory, operational specifics, test procedures and service of factory and aftermarket equipment. It touches briefly on R12 system service and upgrades and focuses on 134A systems including testing, diagnosis, parts replacement and charging of A/C systems and troubleshooting electrical, electronic and mechanical heating and cooling system controls.

Prerequisites: ACS 10, ACS 24.
ACS 24 2 rec 2 lab 3 cr

Electrical Systems
This course begins with the basics of electrical theory and advances through the operation of all 12 Volt systems used in the modern automobile including: storage batteries, alternator/charging systems, starter circuitry, wiring harnesses lighting and body accessories. The course places emphasis on the use of both DVOM technology and computer based diagnostics.

Corequisite: ACS 10

ACS 35 2 rec 3 lab 3 cr

Alternative Fuel Technology
This course will overview alternative fuels: ethanol, methanol, compressed natural gas (CNG), liquid natural gas (LNG), propane (LPG), hydrogen, electricity (including hybrids), and fuel cells. It will explain the sources and processing of alternative fuel. It will discuss alternative fuels currently in use and under development, and compare the benefits and drawbacks of each. It will explain lean burn technology, how combustion is different with a gaseous fuel, and major policies and regulations pertaining to the installation, operation and inspection of alternate fuel vehicles.

Prerequisite: ACS 11 and AVS 34

ACS 36 2 rec 3 lab 3 cr

Hybrid / Electric Vehicles
This course begins with the introduction of Hybrid vehicles and their impact on the environment. It explores the different kind of hybrid vehicles and their configurations. The course also focuses on modern battery technology, the safety concerns associated with high voltage components and a thorough understanding of regenerative braking systems. The course also includes a review of electric motors and charging system, and a review of first responder procedures.

Prerequisites: ACS 11, ACS 24

ACS 45 2 rec 2 lab 3 cr

Diesel Technology
This course introduces the student to diesel technology theory and operation starting with early designs and construction but focuses mostly on modern diesel engine design and controls. It explores modern diagnostic test techniques and provides a thorough understanding of the importance of maintenance procedures and modern diesel engine control systems.

Prerequisites: ACS 11, ACS 24

ACS 45 2 rec 2 lab 3 cr

Air Brakes and Suspension
This course begins with the introduction of compressed air systems for the activation of brakes and suspension on trucks and trailers. It explores the different components for the production and storage of air under pressure as well as the various control valves. The course also focuses on dehumidifiers, air driers, and foundation brake components for both, tractors and trailers as well as ABS and traction control systems. The course also looks at the rules and regulations from DOT concerning air brakes specification and safety for heavy duty trucks.

Prerequisites: ACS 10 and ACS 12

ACS 46 2 rec 2 lab 3 cr

Diesel Engine Performance
This course begins with engine operation including conventional diesel injection, but focuses on modern common rail injection techniques. The course will explore the GM Duramax system, the Ford Powerstroke Systems, the Cummins PT and common rail systems, as well as Bosh Systems used by several manufacturers. The course explores modern diagnostic and test techniques, equipment and procedures and provides a thorough exposure to modern diesel electronic control systems.

Prereq: ACS 13, ACS 45

ACS 47 2 rec 2 lab 3 cr

Air Brakes and Suspension
This course begins with the introduction of compressed air systems for the activation of brakes and suspension on
trucks and trailers. It explores the different components for the production and storage of air under pressure as well as the various control valves. The course also focuses on dehumidifiers, air driers, and foundation brake components for both, tractors and trailers as well as ABS and traction control systems. The course also looks at the rules and regulations from DOT concerning air brakes specification and safety for heavy duty trucks.

Prerequisites: ACS 10 and ACS 12

**Electrical Technology**

**ELC 11**

*DC Circuit Analysis*

Resistance: Ohm’s Law, Kirchhoff’s laws, networks with DC current and voltage sources, branch-current analysis, mesh and nodal analysis, superposition. Thevenin’s, Norton’s maximum power theorems, capacitance and inductance. Use of basic test instruments.

Corequisite: MTH 06.

**ELC 15**

*Computer Applications in Technology*

Introductory course in basic computer orientation and implementation of hardware and software applications in technology. Students will use various software packages to create documents, spreadsheets, graphs, databases and presentations with lectures, interactive learning and demonstrations. Laboratory exercises will be required.

Corequisite: MTH 05.

**ELC 18**

*Computer Programming for Engineering Technology*

Introduction to computer programming using a visual programming language. The student is introduced to the concepts of application development, user interface design, program development methodology, structured programming, and object-oriented programming. Projects relevant to electrical and electronic circuits are developed to emphasize areas of problem-solving methods, modeling, data analysis and graphing, and interfacing.

Prerequisite: ELC 15.

Corequisite: MTH 06.

**ELC 26**

*Electronics I*

In this course students are taught the characteristics of amplifiers using op-amps with respect to amplification, dB frequency response, and input and output impedance. Op-amp applications are introduced with emphasis on the uses of these devices in the telecommunications industry. Electro-optical devices, power supplies, and switches are studied.

The frequency response of passive networks and amplifiers is measured. Analysis by computer simulations is stressed.

Prerequisite: ELC 11 or ELC 31.

**ELC 35**

*Electronics II*

Students practice the analysis and application of advanced electronic circuits as applied to the telecommunications industry. Topics include frequency response of filters, op-amps, oscillators, amplitude modulation, noise and LC circuits. Troubleshooting and analysis by computer simulation software is stressed throughout.

Prerequisite: ELC 25.
Digital Systems I

This course presents topics in hardware and systems as used in the electronics and telecommunications industry. Electrical and digital circuits are explored. Binary codes and logic systems are discussed as they apply to electronic and telecommunications equipment. Students will explore hardware to the modular level. Students will simulate and demonstrate digital circuits.

Prerequisite: ELC 13 or ELC 15, or EGR 11
Corequisite: MTH 10 or MTH 13 or MTH 30.
Principles of Energy Management I

An introduction to the principles of energy management in organizations. Energy purchasing and risk management. Energy auditing, project development, monitoring and verification for improvement in various systems. Practice with data management and spreadsheet applications. Organizational aspects of energy accounting, use and management.

Prerequisite: EST 21.
Corequisite: EST 31.

Principles of Energy Management II

Capstone practicum course in which students will conduct and prepare an energy audit of a specific facility (selected in consultation and with approval of the instructor) and create a strategic plan for gaining organizational commitment to energy management goals and a specific energy management implementation. Classes review technical measures and methods, and organizational analysis in the context of student field projects.

Prerequisites: EST 21, EST 31.

Nuclear Medicine Technology

The following courses will be given at the Albert Einstein College of Medicine or at the hospitals affiliated with it.

Nuclear Physics Laboratory

Chronological development of nuclear physics in the 20th century as represented by the experimental work on blackbody radiation, photoelectric effect, matter waves, Compton scattering and pair-production. Comparison of radiation measuring devices including G.M. and scintillation survey meters, gamma cameras, well counters and dosimeters. Quality control and radiation safety.

Prerequisite: PHY 24 and permission of the NMT Program Director, Corequisites: NMT 81-84

Phlebotomy

Introduction to phlebotomy. Topics include: phlebotomy principles, anatomy and physiology of the circulatory system, safety, equipment and techniques. Students completing this course qualify for the certification exam in phlebotomy.

Prerequisite: BIO 24 and permission of the NMT Program Director, or BIO 21 and BIO 22 and permission of the Medical Office Assistant Curriculum Coordinator.

Radio-Pharmaceutical Chemistry
Preparation and use of radio-pharmaceuticals, uptake of radiopharmaceuticals by various organs, time dependent effects.
Prerequisites: BIO 23, CHM 17, NMT 81.

NMT 83 2 rec 2 lab 3 cr
**Radiation Physics and Dosimetry**
Elements of nuclear physics, the conservation laws; alpha, beta, and gamma decay; the neutrino; elements of health physics; the roentgen, REM, REP, and RAD; maximum safe human exposure to radiation; regulations governing exposure.
Corequisite: NMT 81.

NMT 84 2 lect 2 cr
**Radiation Biology**
Comprehensive study of radiation effects on cells including direct and indirect action of ionizing radiation; damage induced by free radicals in DNA: interpretation of survival data; radiation genetics; radiation effects on embryos; delayed effects; radiation safety and health physics.
Corequisite: NMT 81.

NMT 85 1 lect 3 lab 2 cr
**Nuclear Medicine Procedures**
Nuclear medicine procedures related to cardiovascular pulmonary system, endocrine system, central nervous system, gastrointestinal system, genitourinary system, skeletal system, hemalological system and other therapeutic procedures; introduction to radioimmunoassay principles and procedures.
Prerequisite: BIO 24, NMT 83.

NMT 86 2 rec 1 cr
**Didactic Nuclear Medicine**
Rationale for applications of radio pharmaceuticals for in vivo and in vitro procedures; discussion of individual organ systems, RIA principles and procedures; review of relevant medical law and patient care.
Prerequisite: NMT 84.
Corequisite: NMT 85.

NMT 87 500 clin/lab 3 cr
**Clinical Nuclear Medicine I**
Static and dynamic radionuclide procedures on patients; tomographic procedures; interpretation of radionuclide scans and gamma-camera images; nuclear medicine instrumentation; alternative imaging processes.
Corequisite: NMT 84.

NMT 88 1 lect 2 rec 3 cr
**Senior NMT Seminar**
Students meet with Medical Director’s liaison and Clinical Director to discuss research topics in Nuclear Medicine. Term papers and oral reports based on assigned reading material and concepts analyzed during the didactic and laboratory segments of the NMT program.
Prerequisite: NMT 87.
Corequisite: NMT 85, NMT 86, NMT 90.

NMT 89 2 lect 4 lab 160 clin 4 cr
**Introduction to Cardiac Ultrasound**
Topics include physics of ultrasound, ultrasound instrumentation, emergency medical procedures, Doppler and transesophageal echocardiology. Clinical rotation is at Montefiore Medical Center where each student participates in approximately 150 procedures. Students completing this course will receive a certificate from Montefiore Medical Center.
Prerequisite: BIO 24, permission of NMT Program Director.

NMT 90 500 clin/lab 3 cr
**Clinical Nuclear Medicine II**
Static and dynamic radionuclide procedures on patients; tomographic procedures; interpretation of radionuclide scans and gamma-camera images; nuclear medicine instrumentation; alternative imaging processes.
Prerequisite: NMT 87.

**Physics**

PHY 01 4 rec 0 cr
**Introduction to College Physics**
Fundamental laws and principles of classical physics; vectors, Newton’s Laws, conservation principles, laws of thermodynamics. (Required for Engineering Science and Physics majors who have not had high school physics.)
Prerequisite: MTH 06 or equivalent.
Corequisite: RDL 02 if required.

PHY 10 2 lect 1 rec 2 lab 4 cr
**Concepts of Physics**
An elective course that introduces major ideas about the nature of the physical world and methods used in exploring them. Topics include motion and forces; work and energy; nature of light and sound; electricity, magnetism and applications to modern technology; and nature of the atom.
Prerequisite: MTH 05 or CUNY math proficiency.
Corequisites: RDL 02 or ENG 02.

PHY 11 2 lect 1 rec 2 lab 4 cr
**College Physics I**
Introduction to principles and methods of physics. Topics include Newton’s Laws of Motion, mechanics, heat, and sound. (Recommended for Liberal Arts and life science majors, including biology and psychology.)
Prerequisite: Intermediate Algebra or MTH 06.
Corequisite: ENG 02 or RDL 02
Required Core - Life and Physical Sciences
Flexible Core - Scientific World
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**College Physics II**
Elements of electric circuits, electromagnetic theory, light, selected topics in atomic and nuclear physics.
Prerequisite: PHY 11.

**Physics Through Film**
A conceptual introduction to principles of physics as portrayed in popular films. A qualitative and quantitative understanding of elementary physics using simple estimates and dimensional analysis. Concepts studied include kinematics, forces, work and energy, conservation laws, heat and temperature, atoms, molecules and properties of materials.
Prerequisite or Corequisites: ENG 02 or RDL 02 and MTH 05 or CUNY math proficiency

**Physics for Engineering Technology I**
Statics, kinematics, dynamics, work and energy, circular motion, and simple harmonic motion with special applications to problems in technology.
Prerequisite: Intermediate Algebra or MTH 06.
Corequisite: ENG 02 or RDL 02 if required.

**Physics for Engineering Technology II**
Fluid dynamics, thermodynamics, electricity and magnetism, optics, superconductors.
Prerequisite: PHY 21.

**Principles of General Physics**
Basic principles of general physics; survey of mechanics, heat, electricity, magnetism, optics and modern physics. (This course does not fulfill the Physics requirement for curricula requiring a year or more of Physics.)
Prerequisite: MTH 06 or equivalent.

**Physics I**
Statics and dynamics of particles and rigid bodies; force and motion; energy and momentum; rotational motion, elasticity and simple harmonic motion. First semester of a three-semester sequence for students in Engineering or Computer Science (PHY 31, 32, and 33). Also recommended for Science or Mathematics majors in a Liberal Arts and Sciences transfer program.
Prerequisite: High School physics or PHY 01.
Corequisites: MTH 31 and ENG 02 and RDL 02

**Physics II**
Hydrostatics and hydrodynamics; properties of gases; thermodynamics and kinetic theory of matter; wave motion; sound; electrostatics.

**Physics III**
Electromagnetic theory; direct and alternating currents; electromagnetic waves; geometrical and physical optics; modern physics.
Prerequisite: PHY 32.
Corequisite: MTH 33.

**Thermodynamics**
Prerequisites: CHM 11 and PHY 32.
Corequisite: MTH 33.

**Physics of Light and Sound**
A qualitative treatment of wave phenomena and associated properties of light and sound; reflection, refraction, image formation, optics of the eye, interference and diffraction sound, sympathetic vibrations, acoustical properties, laser applications, music. (Required for students in Media Technology.)
Prerequisite: MTH 05 or CUNY math proficiency.

**Modern Physics**
Elementary quantum theory, quantum numbers, atomic shell structures and the periodic table; structure of solids; band theory of metals, insulators, and semiconductors; x-rays and gamma radiation; relativity; nuclear physics.
Prerequisite: PHY 33.
Corequisite: MTH 34.

**Concepts of Physics**
This course introduces major ideas about the nature of the physical world and methods used in exploring them. Topics include motion and forces; work and energy; nature of light and sound; electricity, magnetism and applications to modern technology; and nature of the atom.
Prerequisite: MTH 05 or CUNY Math Proficiency. Corequisite: ENG 02 or RDL 02

**Telecommunications**

**Voice Communications**
Introduction to techniques, principles, and terminology of voice telecommunications. Public and private telecommunication networks are examined. Telecommunication equipment, switching and transmission
technology are demonstrated. Frequency spectrum modulation schemes and multiplexing techniques are explored. Lectures and interactive learning demonstrations. Laboratory exercises required.
Prerequisite/Corequisite: ELC 25.

TEC 15  3 rec 2 lab 4 cr

Telecommunications I
This course is designed to train students in the organization, architecture, setup, maintenance, hardware and software aspects of local area networks. Topics include: introduction to networks; types and characteristics of different network architectures and network topologies; intra and inter-network devices; network operating systems; peer-to-peer and client/server environments; LAN setup and maintenance; network printing; internal web server. A hands-on approach will be taken, with team projects throughout.
Prerequisites: ELC 31, ELC 97.
Corequisite: TEC 11.

Data Communications
Introduction to techniques, principles, and terminology of data communications. Public and private networks are examined. Data communication equipment multiplexing and interactive learning, and demonstrations. Laboratory exercises required.
Prerequisite: ELC 25.
Corequisite: TEC 11.

TEC 21  3 rec 2 lab 4 cr

Telecommunications II
This course will cover the basics of Voice over Internet Protocol (VoIP) systems. Topics include: an overview of TCP/IP networks with a focus on VoIP; Quality of Service (QoS); VoIP system components; VoIP protocols and VoIP protocol analysis; VoIP architecture and VoIP codecs. A hands-on approach will be taken, with team projects throughout.
Prerequisites: TEC 15, ELC 97.
Corequisite: ELC 36.

TEC 25  3 rec 2 lab 4 cr

Local Area Networks
Introduction to the technology of local area networks (LANs). Topologies, transmission media, network interfaces, and the access methods are examined. Shared resources and interconnecting of LANs are explored. Lectures, interactive learning, and demonstrations are employed. Laboratory exercises are required.
Prerequisite: TEC 21.

TEC 31  3 rec 2 lab 4 cr

Telecommunications III
This course covers the organization, architecture, setup, hardware and software aspects of networked video delivery systems. Topics include: video transport; compression; packet transport; multicasting; content ownership and security; transport security; IPTV-IP video to the home; video file transfer; VPN's and home-office video links. A hands-on approach will be taken, with team projects throughout.
Prerequisites: TEC 25.

TEC 35  3 rec 2 lab 4 cr

Advanced Topics in Telecommunications
Survey of current and emerging technologies in telecommunications. Lectures, interactive learning, demonstrations, and site visits. Laboratory exercises required.
Prerequisite: TEC 21.
Corequisite: TEC 31.

TEC 41  3 rec 2 lab 4 cr

Telecommunications IV
A survey of current and emerging technologies in telecommunications will be presented. Lectures, interactive learning, demonstrations, and hands-on work will be employed.
Prerequisites: TEC 35