

Electrical Engineering Technology

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PROGRAMS:

Electrical Engineering Technology/AAS
Telecommunications Engineering Technology/AAS
Telecommunications Engineering Technology/BTech

FACULTY:

Professors: Ayen, Flicker, Goykadosh, Kalechman
Assoc Profs: Kouar, Markowitz, Mynbaev
Asst Profs: Jang, Razani, Wei
Sr CLTs: Ginty, Nguyen
CLTs: Tang, Yuan

Associate in Applied Science in ELECTRICAL ENGINEERING TECHNOLOGY

The Electrical Engineering Technology program is designed to prepare graduates for careers as electronic technicians. The curriculum includes a balanced distribution of lecture and laboratory courses, which provide an introduction to the design and development of basic electronic circuits. Laboratory construction projects range from elementary circuit analysis to microprocessors. The personal computer (PC) is used as a learning tool throughout the curriculum. The department provides their graduates with a deep knowledge of technology coupled with a sound general education.

Major responsibilities of electronic technicians are mostly in maintenance and control of the installed equipment; however, the tendency is to involve them in design, development, and research. The electronic technician usually works as part of an engineering team, which may include electrical engineers, engineering technicians and draftsmen. In a group concerned with engineering design, the electronic technician may determine the positions of electronic components on a panel or chassis, suggest design modifications to facilitate production, perform design calculations for engineers, prepare specifications for materials and components, estimate cost of design alternatives, and help write user and technical manuals for electronic equipment users.

When working in research and development, the electronic technician may construct breadboard layouts of electronic devices, make experimental chassis and cabinets for prototype equipment, set up special environmental and performance tests for new products, design and construct test fixtures and apparatus, plot graphs of test results and write reports, inspect, and calibrate test equipment.

Employers of the graduates of this program include a variety of companies, such as Con Edison, IBM, ITT, Avaya, USPS, NYPD, MTA, JPMorgan Chase, and Verizon.

The electrical engineering technology curriculum is accredited by the Technology Accreditation Commission of the Accreditation Board of Engineering and Technology (TAC/ABET). Graduates of this program have the opportunity to continue their education toward a bachelor of technology in telecommunications engineering technology at New York City College of Technology or in other programs at several other senior colleges.

REQUIRED COURSES IN THE MAJOR		Credits
EET 1102/ET 100	Techniques of Electrical Technology	2
EET 1122/ET 162	Circuit Analysis I	4
EET 1202/ET 205	Electrical Drafting	1
EET 1222/ET 242	Circuit Analysis II	5
EET 1240/ET 212	Electronics	4
EET 1241/ET 252	Electronics Laboratory	1
EET 2120/ET 342	Advanced Circuit Analysis	3
EET 2140/ET 313	Communications Electronics	3
EET 2141/ET 352	Communications Electronic Laboratory	1
EET 2150/ET 322	Electric Machines Theory	3
EET 2162/ET 382	Digital Electronics I	3
EET 2171/ET 351	Projects Laboratory	1
EET 2220/ET 432	Electronic Controls	3
EET 2251/ET 452	Electric Machines Lab	1
EET 2261/ET 482	Digital Electronics II	3
EET 2271/ET 451	Circuits Analysis Lab	1
Subtotal		39
OTHER REQUIRED COURSES		
ENG 1101/EG 101	English Composition I	3
MAT 1375/MA 375 ¹	Mathematical Analysis	4
MAT 1475/MA 475	Calculus I	4
PHYS 1433/SC 433	Physics 1.2	4
PHYS 1434/SC 434	Physics 2.2	4
COMM ²	ENG 1121/EG 121 or ENG 1133/EG133	3
LAP ²	Literature/Aesthetics/Philosophy	3
BS/SS ²	Behavioral Science/Social Science	3
Subtotal		28
TOTAL CREDITS REQUIRED FOR THE DEGREE		67

The College will grant an associate in applied science degree (AAS) with a major in electrical engineering technology upon satisfactory completion of the required 67 credits listed.

¹ Students without the math background for MAT 1375/MA 375 will be required to take MAT 1175/MA 175 and/or MAT 1275/MA 275 prior to taking MAT 1375/MA 375. This will increase the number of credits required for the degree by up to eight (8).

² See page 34 for a detailed explanation of core required courses and categories.

Associate in Applied Science in ELECTRICAL ENGINEERING TECHNOLOGY

Curriculum by Semester

Students will earn an associate in applied science degree (AAS) with a major in electrical engineering technology upon satisfactory completion of the courses listed (67 credits).

FIRST SEMESTER		Credits
EET 1102/ET 100	Techniques of Electrical Technology	2
EET 1122/ET 162	Circuit Analysis I	4
MAT 1375/MA 375 ¹	Mathematical Analysis	4
PHYS 1433/SC 433	Physics 1.2	4
ENG 1101/EG 101	English Composition I	3
Subtotal		17
SECOND SEMESTER		
EET 1202/ET 205	Electrical Drafting	1
EET 1222/ET 242	Circuit Analysis II	5
EET 1240/ET 212	Electronics	4
EET 1241/ET 252	Electronics Laboratory	1
MAT 1475/MA 475	Calculus I	4
PHYS 1434/SC 434	Physics 2.2	4
Subtotal		19
THIRD SEMESTER		
EET 2120/ET 342	Advanced Circuit Analysis	3
EET 2140/ET 313	Communications Electronics	3
EET 2141/ET 352	Communications Electronics Laboratory	1
EET 2150/ET 322	Electrical Machines Theory	3
EET 2162/ET 382	Digital Electronics I	3
EET 2171/ET 351	Projects Laboratory	1
COMM ²	ENG 1121/EG 121 or ENG 1133/EG 133	3
Subtotal		17
FOURTH SEMESTER		
EET 2220/ET 432	Electronic Controls	3
EET 2251/ET 452	Electric Machines Laboratory	1
EET 2261/ET 482	Digital Electronics II	3
EET 2271/ET 451	Circuit Analysis Laboratory	1
BS/SS ²	Behavioral Science/Social Science	3
LAP ²	Literature/Aesthetics/Philosophy	3
Subtotal		14
TOTAL CREDITS REQUIRED FOR THE DEGREE		67
EET 2000/ET 9003	INTERNSHIP	3

¹ Students without the math background for MAT 1375/MA 375 will be required to take MAT 1175/MA 175 and/or MAT 1275/MA 275 prior to taking MAT 1375/MA 375. This will increase the number of credits required for the degree by up to eight (8).

² See page 34 for a detailed explanation of core required courses and categories.

³ Internship is an elective course that can be taken as early as the second semester and will allow students to gain some industrial experience.

Associate in Applied Science in TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

This program prepares students to enter the rapidly expanding field of telecommunications and provides them with a wide range of skills needed for employment, and continuing education in this high tech industry.

Two degree programs are available – an associate in applied science (AAS) in telecommunications engineering technology, and a bachelor of technology (BTech) in telecommunications engineering technology. See pages 9, 32 for information about the BTech program in the catalog.

Students in the associate degree program learn to install, test, maintain and operate a wide spectrum of telecommunication networks for voice, data and video transmission and networking, as well as the technical principles and theories on which these devices and systems are based. The PC is used as an instructional tool throughout the curriculum. The theories of telephony, data communications and transmission are reinforced in up-to-date laboratories built in close collaboration with regional industry.

Graduates may work as communications engineering technicians and continue their education to earn a bachelor's degree. Additional job titles for AAS graduates include PBX technician, fiber optics technician, telecommunications service representative and field engineer, data communications technician, network operations technician, and communications engineering technician. Employers of recent graduates include LIRR, MTA, Citicorp, Board of Education, Verizon, AST, Western Union, SIAC, Avaya, NYPD, JPMorgan Chase and IST.

To be admitted to the telecommunications engineering technology associate degree program, an entering student must be certified in reading and mathematics.

Verizon Next Step Program

The College is one of a consortium of colleges in the Northeast participating in the Verizon Next Step program, in which selected Verizon employees enroll in a customized telecommunications associate degree program sponsored and funded by the company and the Communications Workers of America. Enrollment in this program is limited to Verizon employees who have been selected for the program. The aim of the program is to create a workforce with advanced technical skills coupled with teamwork and team-building skills, an aptitude for critical thinking and problem solving, and for forming good interpersonal relations.

REQUIRED COURSES IN THE MAJOR

REQUIRED COURSES IN THE MAJOR		Credits
EET 1102/ET 100	Techniques of Electrical Technology	2
EET 1122/ET 162	Circuit Analysis I	4
EET 1222/ET 242	Circuit Analysis II	5
EET 1240/ET 212	Electronics	4

EET 1241/ET 252	Electronics Laboratory	1
EET 2140/ET 313	Communications Electronics	3
EET 2141/ET 352	Communications Electronics Laboratory	1
EET 2162/ET 382	Digital Electronics I	3
TCET 1100/TC 100	Intro to Telecommunications	2
TCET 2102/TC 320	Analog and Digital Telephony	4
TCET 2202/TC 420	Data Communications and Systems	4
TCET 2220/TC 410	Transmission Systems	3
TCET 2242/TC 430	Microcomputer Interfacing	3

Subtotal **39**

OTHER REQUIRED COURSES

ENG 1101/EG 101	English Composition I	3
MAT 1375/MA 375 ¹	Mathematical Analysis	4
MAT 1475/MA 475	Calculus I	4
PHYS 1433/SC 433	Physics 1.2	4
PHYS 1434/SC 434	Physics 2.2	4
COMM ²	ENG 1121/EG 121 or ENG 1133/EG 133	3
LAP ²	Literature/Aesthetics/Philosophy	3
BS/SS ²	Behavioral Science/Social Science	3

Subtotal **28**

TOTAL CREDITS REQUIRED FOR THE DEGREE **67**

¹ Students without the math background for MAT 1375/MA 375 will be required to take MAT 1175/MA 175 and/or MAT 1275/MA 275 prior to taking MAT 1375/MA 375. This will increase the number of credits required for the degree by up to eight (8).

² See page 34 for a detailed explanation of core required courses and categories.

Associate in Applied Science in TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

Curriculum by Semester

Students will earn an associate in applied science degree (AAS) with a major in telecommunications engineering technology upon satisfactory completion of the courses listed (67 credits).

FIRST SEMESTER		Credits
EET 1102/ET 100	Techniques of Electrical Technology	2
EET 1122/ET 162	Circuit Analysis I	4
TCET 1100/TC 100	Introduction to Telecommunications	2
MAT 1375/MA 375 ¹	Mathematical Analysis	4
ENG 1101/EG 101	English Composition I	3
Subtotal		15

SECOND SEMESTER

EET 1222/ET 242	Circuit Analysis II	5
EET 1240/ET 212	Electronics	4
EET 1241/ET 252	Electronics Laboratory	1
PHYS 1433/SC 433	Physics 1.2	4
COMM ²	ENG 1121/EG 121 or EG 133	3

Subtotal **17**

THIRD SEMESTER

EET 2140/ET 313	Communications Electronics	3
EET 2141/ET 352	Communications Electronics Laboratory	1
EET 2162/ET 382	Digital Electronics I	3
TCET 2102/TC 320	Analog and Digital Telephony	4
PHYS 1434/SC 434	Physics 2.2	4
MAT 1475/MA 475	Calculus I	4

Subtotal **19**

FOURTH SEMESTER

TCET 2202/TC 420	Data Communications and Systems	4
TCET 2220/TC 410	Transmission Systems	3
TCET 2242/TC 430	Microcomputer Interfacing	3
BS/SS ²	Behavioral Science/Social Science	3
LAP ²	Literature/Aesthetics/Philosophy	3

Subtotal **16**

TOTAL CREDITS REQUIRED FOR THE DEGREE **67**

TCET 2000/TC 9003	Internship	3
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¹ Students without the math background for MAT 1375/MA 375 will be required to take MAT 1175/MA 175 and/or MAT 1275/MA 275 prior to taking MAT 1375/MA 375. This will increase the number of credits required for the degree by up to eight (8).

² See page 34 for a detailed explanation of core required courses and categories.

³ Internship is an elective course that can be taken as early as the second semester and will allow students to gain some industrial experience.

Bachelor of Technology in TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

The curriculum in the baccalaureate program in telecommunications engineering technology builds upon the skills learned in the first two years and adds more advanced study in data communications, coding, computer systems, probability and statistics, satellite transmission, fiber-optic communications, traffic control, economics, programming, network management, regulatory and legal issues and advanced mathematics.

There are several ways a student can enter the bachelor of technology program in telecommunications engineering technology. Students may enter the program as freshmen if they meet the general college criteria for baccalaureate admissions. These students will follow the AAS curriculum for the first 67 credits and earn the AAS degree. Students may transfer in from the City Tech AAS program in telecommunications engineering technology before or after completing the AAS degree. Students transferring from another college must have an AAS degree from an ABET-approved program with a GPA in their major courses of 2.5 or better. Non-ABET degrees will be evaluated course by course. Students with questions are advised to consult the Office of Admissions. Transcripts of entering students will be evaluated to determine the courses they must complete for the bachelor of technology degree. Please consult the department for further information.

Students entering the program without the necessary background in mathematics, science and telecommunications will have to do substantial work in these areas.

BTech degree holders may obtain positions such as technical operation manager, network designer, system technologist, traffic analyst, data communication manager, and telecommunication consultant.

Employers of recent graduates include LIRR, Citicorp, MTA, Board of Education, AST, Western Union, SIAC, Verizon, JPMorgan Chase, IST and NYPD. Graduates may continue towards a master's degree in electrical engineering at City College or other higher institutions of learning.

REQUIRED COURSES IN THE MAJOR		Credits
TCET 3102/TC 500	Analog and Digital Communications I	4
TCET 3120/TC 520	Switching and Automata Theory	3
TCET 3142/TC 570	Computer Systems	4
TCET 3202/TC 620	Analog and Digital Communications II	4
TCET 3222/		
TC 611 and TC 611L	Satellite Transmission	3
TCET 4102/TC 700	Fiber-Optic Communications	3
TCET 4120/TC 750	Legal and Regulatory Issues in Telecommunications	3
TCET 4140/TC 740	Telecommunications Network Management.	3
TCET 4202/TC 800	Advanced Telecommunications	3
TCET 4220/TC 870	Telecommunications Seminar	3
Subtotal		33
OTHER REQUIRED COURSES		
ACC 1162/AC 162	Elements of Accounting	3
CST 2403/CS 403	Intro C Language Programming	3
ENG 1121/EG 121	English Composition II	3
ENG 3700/EG 533	Advanced Technical Writing	3
ENG 2700/EG 171	Advanced Career Writing	3
ECON 1101/EN 101	Macroeconomics	3

MAT 1375/MA 372	Probability and Statistics	3
MAT 1575/MA 575 ¹	Calculus II	4
PHIL 1106/PH 106	Philosophy of Technology	3
LAP ²	Literature/Aesthetics/Philosophy	3
BS/SS ²	Behavioral Science/Social Science	3
Subtotal		31

TOTAL CREDITS REQUIRED FOR THE DEGREE 64

The College will grant a bachelor of technology degree (BTech) with a major in telecommunications engineering technology upon satisfactory completion of the AAS in telecommunications engineering technology or the equivalent and the required 64 credits listed.

¹ Students without the mathematics background for MAT 1575/MA 575 will be required to complete MAT 1175/MA 175, MAT 1275/MA 275, MAT 1375/MA 375 and/or MAT 1475/MA 475, increasing the credits required for graduation.

² See page 34 in the college catalog for a detailed explanation of core required courses and categories.

Bachelor of Technology in TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

Curriculum by Semester

Students will earn a bachelor of technology degree (BTech) with a major in telecommunications engineering technology upon completion of the courses listed (64 credits).

FIRST SEMESTER		Credits
TCET 3102/TC 500	Analog and Digital Communications I	4
TCET 3120/TC 520	Switching and Automata Theory	3
TCET 3142/TC 570	Computer Systems	4
MA 1575/MA 575 ¹	Calculus II	4
ENG 1121/EG 121	English Composition II or	
ENG 3700/EG 533	Advanced Technical Writing	3
Subtotal		18
SECOND SEMESTER		
TCET 3202/TC 620	Analog and Digital Communications II	4
TCET 3222/		
TC 611 and TC 611L	Satellite Transmission	3
ECON 1101/EN 101	Macroeconomics	3
MAT 1372/MA 372	Probability and Statistics	3
ENG 2700/EG 171	Advanced Career Writing	3
Subtotal		16
THIRD SEMESTER		
TCET 4102/TC 700	Fiber-Optic Communications	3
TCET 4120/TC 750	Legal and Regulatory Issues in Telecommunications	3

TCET 4140/TC 740	Telecommunications Network Management	3
CST 1403/CS 403	Introductory C Language Programming	3
PHIL 1106/PH 106	Philosophy of Technology	3

Subtotal **15**

FOURTH SEMESTER

TCET 4202/TC 800	Advanced Telecommunications	3
TCET 4220/TC 870	Telecommunications Seminar	3
ACC 1162/AC 162	Elements of Accounting	3
LAP ³	Literature/Aesthetics/Philosophy	3
BS/SS ³	Behavioral Science/Social Science	3

Subtotal **15**

TOTAL CREDITS REQUIRED FOR THE DEGREE **64**

TCET 4000/TC 9014	INTERNSHIP	3
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¹ Students without the mathematics background for MAT 1575/MA 575 will be required to complete MAT 1175/MA 175, MAT 1275/MA 275, MAT 1375/MA 375 and/or MAT 1475/MA 475, increasing the credits required for graduation.

² Student takes course not taken in AAS

³ See page 34 in the college catalog for a detailed explanation of core required courses and categories.

⁴ Internship is an elective course that can be taken as early as the second semester and will allow students to gain some industrial experience.

COURSES:

EET 1102/ET 100 Techniques of Electrical Technology

1 cl hr, 2 lab hrs, 2 cr

An introduction to the use of computers for analysis of electrical and electronic circuits by using state-of-the-art software for computer simulation of circuits.

Pre- or corequisite: MAT 1175/MA 175

EET 1122/ET 162 Circuit Analysis I

3 cl hrs, 3 lab hrs, 4 cr

Introduction to dc circuits. Topics include series, parallel, and series-parallel circuits, network theorems, equivalent circuits, capacitive and inductive circuits, timing circuits and measuring instruments. Laboratory experiments include breadboarding, measurement techniques and troubleshooting. The writing of laboratory reports is taught and written reports are required.

Pre- or corequisites: EET 1102/ET 100, MAT 1275/MA 275, PHYS 1433/SC 433 or equivalent

EET 1202/ET 205 Electrical Drafting

3 lab hrs, 1 cr

Topics include drawing schematic diagrams of power and electronic circuits, elementary and connection diagrams of control equipment, chassis layout, printed circuits and other specialized types of connection diagrams. Computer-assisted drafting (CAD) is introduced. Transfer of computer-generated circuit designs to PCB layout and generation of files necessary for printed circuit board fabrication are discussed.

Pre- or corequisite: EET 1102/ET 100

EET 1222/ET 242 Circuit Analysis II

4 cl hrs, 2 lab hrs, 5 cr

Analysis of ac circuits with sine-wave sources and R L C circuit components covering phase shift, frequency response, power, and resonance in series and parallel circuits. Three-phase wye and delta circuits are also covered. Hands-on laboratory experiments are included.

Prerequisite: EET 1122/ET 162; pre- or corequisites: MAT 1375/MA 375, ENG 1101/EG 101, PHYS 1434/SC 434

EET 1240/ET 212 Electronics

4 cl hrs, 4 cr

Characteristics and applications of semiconductor elements such as diodes, bipolar junction transistors and field effect transistors are covered.

Applications include dc power supplies, voltage regulators, small signal amplifiers (single and multi-stage), and operational amplifiers.

Pre- or corequisite: EET 1222/ET 242

EET 1241/ET 252 Electronics Laboratory

3 lab hrs, 1 cr

Experiments based on material in EET 1240/ET 212 give the students experience in using the oscilloscope, signal generator and function generator for analyzing and testing electronic circuits.

Pre- or corequisites: EET 1240/ET 212, EET 1222/ET 242

EET 1210/ET 342 Advanced Circuit Analysis

2 cl hrs, 2 lab hrs, 3 cr

Transient response of RL, RC and RLC circuits utilizing both classical and Laplace transform techniques.

Laboratory exercises and computer simulation software included.

Prerequisite: EET 1222/ET 242; corequisite: MAT 1475/MA 475

EET 2140/ET 313 Communications Electronics

3 cl hrs, 3 cr

An intermediate course in theory and applications of modern electronics in communications. Filters, oscillators, transmitters, and receivers as applied to amplitude-modulation and frequency-modulation transmission systems are discussed. Introduction to noise and its effect on communications electronics are given.

Prerequisite: EET 1240/ET 212

EET 2141/ET 352 Communications Electronic Laboratory

3 lab hrs, 1 cr

An intermediate course in developing skills required of technicians in experimenting with electronic circuits, interpreting and analyzing data to verify principles, and writing technical reports. Experiments in application of transistors, diodes, integrated circuits, resonant circuits, radio frequency voltage and power amplifiers, oscillators, amplitude modulation, and demodulation are performed.

Prerequisite: EET 1241/ET 252; pre- or corequisite: EET 2140/ET 313

EET 2150/ET 322 Electric Machines Theory

3 cl hrs, 3 cr

Principles and characteristics of DC and AC machines. Topics include: DC generators and motors, construction characteristics and ratings, alternators, transformers polyphase induction motors, single-phase motors and synchronous motors.

Prerequisites: EET 1222/ET 242, PHYS 1433/SC 433

EET 2162/ET 382 Digital Electronics I

2 cl hrs, 3 lab hrs, 3 cr

Fundamentals of digital electronics using Boolean algebra, truth tables, Karnaugh maps and waveforms to analyze and understand digital logic circuit design. Logic gates (AND, NAND, OR, NOR, EX-OR), binary arithmetic, flip-flops, counters and registers are analyzed in experiments.

Prerequisites: EET 1240/ET 212, EET 1241/ET 252

EET 2171/ET 351 Projects Laboratory

3 lab hrs, 1 cr

A basic course in the use of specialized tools and fabrication techniques as related to electrical and electronic circuit fabrication, with simulation software. Layout and fabrication of printed circuits are covered.

Prerequisites: EET 1202/ET 205, EET 1241/ET 252

EET 2220/ET 432 Electronic Controls

3 cl hrs, 3 cr

The course introduces discrete and continuous control systems. Open-loop and closed-loop systems are analyzed. Laplace transforms and other advanced mathematical techniques are applied to servomechanisms and power control. Instrumentation for feedback systems, and other topics are discussed.

Prerequisites: EET 2120/ET 342, MAT 1475/MA 475

EET 2251/ET 452 Electric Machines Laboratory

3 lab hrs, 1 cr

Experiments are performed to enhance the understanding of the principles of operation of machines studied in EET 2150/ET 322 to develop proficiency in wiring the machines and associated controls, checking circuitry and using power test equipment in report writing.

Prerequisite: EET 2150/ET 322

EET 2261/ET 482**Digital Electronics II**

2 cl hrs, 3 lab hrs, 3 cr

Theory and hands-on experience with microprocessors using assembly language are covered. Emphasis on usage of serial and parallel ports interfacing a digital controller to other devices.

Prerequisite: EET 2162/ET 382; *pre- or corequisite:* EET 2271/ET 451

EET 2271/ET 451**Circuit Analysis Laboratory**

3 lab hrs, 1 cr

Covers analytical and measurement techniques to evaluate a digital project. Each student is assigned an individual project, consisting of designing a circuit, bread-boarding the design and performing various tests and analyses with formal report and presentation.

Prerequisite: EET 2171/ET 351; *pre- or corequisite:* EET 2162/ET 382

EET 2000/ET 900**Internship**

2 cl hrs bi-wkly: 130-field hrs/semester, 3 cr

Ten hours per week of assigned field/study work applying classroom principles and theory to real-world electrical engineering technology problems. Interns assist engineers in building and testing circuits, performing hardware and software diagnostics, testing/measurements, and preventive maintenance as well as generating supporting documentation. Students must maintain a log/journal to be shared in group seminars.

Prerequisites: Completion of all third semester courses with a GPA of 2.8 or better and approval of the department internship director

ETN 1102/ET 363**Principles of Electricity and Electronics**

For non-ET/TC majors

3 cl hrs, 3 lab hrs 4 cr

An introduction to the principles of electricity and electronics, DC circuit theory, problem solving using Ohm's Law in series, parallel and series-parallel resistive, capacitive and inductive circuit elements excited by a sinusoidal waveform. Transistor and solid state linear and digital circuits, and fractional horsepower AC and DC motors are also studied. Laboratory exercises introduce students to various types of electronic equipment.

Prerequisite: MAT 1275/IMA 275 or equivalent

ETN 1202/ET 473**Principles of Computer Maintenance**

For non-ET/TC majors

3 cl hrs, 3 lab hrs, 4 cr

This course concerns the hardware aspects of computers and computer architecture. Processor units, monitors, keyboards and peripherals are studied. Maintenance, repair, and software system upgrade in practical approach are introduced to students. Laboratory experiments and projects support the theory.

Prerequisite: ETN 1102/ET 363 or SC 442

ETN 1302/ET 429**Principles of Electricity, Electronics and Computer Operation**

For non-ET/TC majors

2 cl hrs, 4 lab hrs 4 cr

An introduction to the principles of electricity and electronics, DC and AC circuit theory, capacitive and inductive circuit elements. Transistor and solid state linear and digital circuits, and introduction to computer hardware and operating systems. Laboratory exercises introduce the student to various types of electronic and computer equipment.

Prerequisite: MST 1205/MS 205 or CST 1205/CS 205; *corequisite:* MAT 1375/IMA 375

TCET 1100/TC 100**Introduction to Telecommunications**

2 cl hrs, 2 cr

The basic concepts of telecommunications begin with a survey of communications systems, using the concepts of transmitter, receiver, transmission medium and information. Electrical representation of information and the distinction between analog and digital transmission are discussed. The evolution of the public telephone network is considered with a focus on its topology and switching technologies. Various kinds of information sources are considered, such as voice, data, video, signaling and switching, with a discussion of how each type is transmitted through the network. Concludes with a general discussion of data transmission including an introduction to digital services.

Prerequisite: CUNY certification in reading

TCET 2102/TC 320**Analog and Digital Telephony**

3 cl hrs, 3 lab hrs, 4 cr

This course is an introduction to modern telephone networks and interfaces. Telephone sets, the central office and the Public Switched Telephone Networks are discussed in detail. Private (PBX) and public switches both digital and analog are discussed, with emphasis on features, signaling and technology. Concludes with the transmission of audio signals through different networks.

Laboratory experiments supplement the course and expose students to the fundamentals of telephony.

Prerequisite: TCET 1100/TC 100; *corequisites:* EET 2140/ET 313, EET 2162/ET 382, PHYS 1433/SC 433

TCET 2202/TC 420**Data Communication Systems**

3 cl hrs, 3 lab hrs, 4 cr

Introduction to analog and digital communications systems, synchronous transmission of information and binary transmission. Multiplexing and various binary codes used in communication systems are explored. Distortion, noise and test equipment are discussed. Modems are analyzed. The RS 232 interface, protocols, and line testing (loopback, analog, and digital) are covered. Laboratory exercises emphasize fault isolation and systems troubleshooting techniques. The protocol analyzer is used for monitoring, troubleshooting and emulation.

Prerequisite: TCET 2102/TC 320; *pre- or corequisite:* TCET 2242/TC 430 or EET 2261/ET 482

TCET 2220/TC 410**Transmission Systems**

3 cl hrs, 3 cr

Introduction to the analysis of microwave communications and systems. Transmission line theory, the Smith chart, and mathematical analysis are incorporated. Various transmission media, such as two-wire, twisted telephone wires, coaxial cable, waveguides, fiber, and satellite are studied. Study of microwave components, Tee connectors, attenuators, slotted lines, and cavities are included. Antenna design and radio-wave propagation are also covered (introduced). Concludes with a study of microwave applications and systems.

Prerequisite: EET 2140/ET 313; *pre- or corequisite:* MAT 1475/IMA 475

TCET 2242/TC 430**Microcomputer Interfacing**

2 cl hrs, 3 lab hrs, 3 cr

An introduction to assembly language and programming of microprocessors. The design of memory and microprocessor I/O interfaces. Laboratory experiments provide training in interfacing the microprocessor to D/A and A/D converter. Serial and parallel ports are studied and practical experiments utilizing switches, LED's and speakers are performed.

Prerequisite: EET 2162/ET 382

TCET 3102/TC 500**Analog and Digital Communications I**

3 cl hrs, 3 lab hrs, 4 cr

The course introduces basic concepts in analog and digital communications. Topics covered include spectral analysis of electrical signals, Fourier series, Fourier transform, signal and noise filtering, and amplification. Amplitude, frequency and phase modulation techniques as well as amplitude and pulse-code modulation in Analog to Digital converters are covered. Introduction to traffic engineering is studied in the laboratory.

Prerequisites: EET 2140/ET 313, EET 2141/ET 352, MAT 1475/IMA 475

TCET 3120/TC 520**Switching and Automata Theory**

3 cl hrs, 3 cr

The course covers synchronous state machines. VHDL techniques are used to cover state transition analysis, synthesis and optimization techniques. VHDL concepts are used to develop simulation waveshapes of all of the circuits involved. The course is involved with the study of combinational networks, counters, shift registers and sequential machines.

Prerequisite: TCET 2242/TC 430 or EET 2261/ET 482

TCET 3142/TC 570**Computer Systems**

3 cl hrs, 3 lab hrs, 4 cr

The skills needed to install, configure and troubleshoot a computer network are covered. A wide range of materials, starting with computer hardware, operating systems, wiring, protocols, and installation are discussed. Troubleshooting various networks, utilizing engineering analysis tools is covered. Discovering practical problems in interfacing computer networks in various configurations

are covered in the laboratory.

Prerequisite: AAS Degree in ET, TC, CS, EM or equivalent

TCET 3202/TC 620 Analog and Digital Communications II

3 cl hrs, 3 lab hrs, 4 cr

Theory and practice of transmission and filtering of analog and digital signals are covered. Fundamental parameters of digital communication systems, various modulation techniques such as Pulse Code Modulation (PCM) and Delta Modulation (DM) and their performance in terms of bandwidth efficiency and signal to noise ratio (SNR), line coding and pulse shaping are analyzed. Introduction to information theory and error correcting codes such as block coding and convolutional coding. Emerging technologies. Software simulation and hard-wired experiments dealing with PCM, DM, and line coding are parts of laboratory exercises.

Prerequisites: TCET 3102/TC 500, TCET 3120/TC 520

TCET 3222/TC 611 and 611L Satellite Transmission

2 cl hrs, 3 lab hrs, 3 cr

An overview of the basic concepts and techniques used in satellite communications is introduced. The three major segments of a satellite system: the space segment, the earth segment and the link between these segments are described. A short introduction to satellite launching, followed by a discussion of the methods of determining antenna look angles. The antenna gain and beam-width equations are examined with emphasis on the parabolic antenna. Uplink and downlink budgets are examined. Carrier to noise ratio, bit energy to noise density ratio and gain to noise temperature ratio are studied. Frequency modulation and multiphase modulation methods are investigated.

The laboratory uses several software simulation tools to analyze the different segments of the satellite communication networks. The link budget analysis, launching phase analysis and others are performed to improve understanding of the theoretical concepts. Dish antenna, transmitter/receiver, waveguides and spectrum analyzer are utilized to enhance experiments.

Prerequisites: TCET 2220/TC 410, TCET 3102/TC 500

TCET 4102/TC 700 Fiber-Optic Communications

2 cl hrs, 3 lab hrs, 3 cr

Devoted to all aspects of fiber-optic communication technologies.

Optical fibers, LEDs, laser diodes, photodiodes, passive components, optical amplifiers, and all basic units of a fiber-optic communications system are discussed. Transmission aspects of fiber-optic networks are also studied. The laboratory familiarizes students with basic components, measuring and troubleshooting tools and techniques, for optical communications applications.

Prerequisite: TCET 3202/TC 620

TCET 4120/TC 750 Legal and Regulatory Issues in Telecommunications

3 cl hrs, 3 cr

Legal terminology and legal analysis skills necessary to understand state and federal regulations as they impact on the rapidly expanding telecommunications industry are discussed. Legal issues raised by the deregulation of the telecommunications industry are studied. The role of the courts, legislature and administrative agencies are discussed. Relevant policies that affect current and future telecommunication systems are explored.

Prerequisites: TCET 3142/TC 570, TCET 3202/TC 620

TCET 4140/TC 740 Telecommunications Network Management

3 cl hrs, 3 cr

This course deals with the technical management of a telecommunication network, personnel tasks, staffing patterns suitable to diverse telecommunications firms and users, with an overview of the issues facing the network manager. Included are studies of cost and trade-offs involved in the design and operation of a telecommunications network. Reliability, MTBF, RFP, and MTTR life cycle are analyzed. Traffic patterns and the study of equipment/manpower balance considerations are covered.

Prerequisite: TCET 3142/TC 570; *pre-corequisite:* ECON 1101/EN 101

TCET 4202/TC 800 Advanced Telecommunications

2 cl hrs, 3 lab hrs, 3 cr

Discrete time signals are studied in time and frequency domains using Z transform. The properties of the DFT are studied as well as its applications. Linear convolution and circular convolution are presented. The FFT is covered. Up sampling, down sampling, and up/down sampling are considered in both time and frequency domains as well as for filter requirements. Basic FIR and IIR discrete filters are studied. Software simulation is used to supplement the theory, augmented by Digital Signal Processing and its applications in telecommunications.

Prerequisites: TCET 3222/TC 611, TCET 4102/TC 700

TCET 4220/TC 870 Telecommunications Seminar

3 cl hrs, 3 cr

A senior-level course covering current topics and concerns in the telecommunications field. Students conduct research of the current literature on topics and information that are timely and important to the technology. In addition, guest speakers and video presentations of current issues address the most recent developments in the industry. Students make oral presentations of their research in class. Typical topics: photonic switches and their architecture, video, television, high resolution video, compressed video, ATM and ATM switches, backbones (FDDI, DBDQ, SONET), mobile/wireless communications, B-ISDN, TCP/IP are discussed.

Prerequisites: TCET 4102/TC 700, TCET 4140/TC 740

TCET 2000/TC 900 Internship (for AAS in TC program)

2 cl hrs bi-wkly, 130 field hr semester, 3 cr

Ten hours per week of assigned field/study work applying classroom principles and theory to real-world telecommunications technology problems. Intern work as a technician to assist engineers and network administrators, build LAN networks, install hardware/software, perform online and offline testing, and generate supporting documentation. Students must maintain a log/journal to be shared in group seminars.

Prerequisites: Completion of all third semester courses with a GPA of 2.8 or better and approval of the department internship director

TCET 4000/TC 901 Internship (for B Tech program)

2 cl hrs bi-wkly, 130 field hr semester, 3 cr

Ten hours per week of assigned field/study work applying classroom principles and theory to real-world telecommunications technology problems. Interns work as technologists to assist engineers and network administrators, design and build LAN/WAN networks, install hardware/software, perform online and offline testing, and generate supporting documentation. Each student must maintain a log/journal to be shared in group seminars.

Prerequisites: Completion of all sixth semester courses with a GPA of 2.8 or higher and approval of the department internship director