

Environmental Control Technology

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PROGRAMS:

Environmental Control Technology/AAS
Facilities Management/Btech
Air Conditioning Equipment Technician/Cert
Building/Housing Superintendent Technology/Cert
Facilities Manager/Cert
Heating Equipment Technician/Cert

FACULTY:

Asst Profs: Polchinski, Treglia
Lecturer: Santos
CLT: Sadej

Associate in Applied Science in ENVIRONMENTAL CONTROL TECHNOLOGY

Environmental control technology is the study of the science, equipment and systems that are essential to creating and maintaining a comfortable indoor environment. Sophisticated air conditioning, heating and refrigeration systems are required to maintain the healthful indoor air quality that enables us to live and work in an urban setting, while conserving and utilizing energy resources wisely.

The Environmental Control Technology curriculum contains the theory, design and practical laboratory courses that enable our graduates to secure substantial employment immediately upon graduation and to continue their professional growth. They can continue their education to the baccalaureate level in the Facilities Management degree with no loss of credit, or elect to study for mechanical engineering degrees elsewhere.

Graduates are able to pursue a wide variety of jobs in many different sectors of the economy. Among the many available careers are operating engineers, designer and CADD specialist, sales engineers, estimators, and project managers. Commercial office buildings, large residential complexes, hospitals and health care agencies, museums and schools, consulting engineers, and service contractors all seek graduates from this curriculum.

Employers of our graduates include Trane Air Conditioning, Brooklyn Hospital, Methodist Hospital, Donnelly Mechanical, New York University, Jaros Baum & Bolles, Albert Weiss Air Conditioning, J.T. Falk Consulting Engineers, New York City Transit Authority, and The Accardi Companies.

Other Degree Opportunities

Students who have successfully completed the requirements for the AAS degree are eligible for transfer into the bachelor of technology in facilities management program. See page 128 for a complete description. They may also continue their education toward a baccalaureate degree at other colleges. Transfer credit granted will depend upon each institution's requirements.

Alternate Format

An alternate format AAS is offered in environmental control technology. Please consult the department for eligibility requirements and further information.

REQUIRED COURSES IN THE MAJOR		Credits
ENVC 1110/EC 110	Principles of Air Conditioning I	3
ENVC 1111/EC 111	Air Conditioning Systems Laboratory I	1
ENVC 1120/EC 120	HVAC Systems Graphics	2
ENVC 1210/EC 210	Combustion Processes and Equipment	3
ENVC 1211/EC 211	Heating Systems Laboratory	1
ENVC 1220/EC 220	Hydronic Systems Design	3
ENVC 1250/EC 250	Fire Protection, Plumbing, and Electrical Systems for Buildings	3
ENVC 2311/EC 311	Refrigeration Laboratory I	1
ENVC 2312/EC 312	Principles of Refrigeration	3
ENVC 2321/EC 321	Air Conditioning Systems Laboratory II	1
ENVC 2322/EC 322	Principles of Air Conditioning II	3
ENVC 2340/EC 340	Air Conditioning Systems Design	3
ENVC 2411/EC 411	Refrigeration Laboratory II	1
ENVC 2420/EC 420	Principles of HVAC Systems Controls	3
ENVC 2432/EC 432	Advanced Air Conditioning Systems Design	3
Select one of the following five courses for 3 credits:		
ENVC 2421/EC 421	Air Conditioning Systems Laboratory III	3
ENVC 2436/EC 436	HVAC Systems Cost Estimating	3
ENVC 2442/EC 442	Principles of Environmental Protection	3
ENVC 2452/EC 452	Principles of Facility Energy Management	3
ENVC 2900/EC 900	Internship	3
Subtotal		37
OTHER REQUIRED COURSES		
ENG 1101/EG 101	English Composition I	3
MAT 1275/MA 275 ¹	Introduction to Mathematic Analysis	4
PHYS 1433/SC 433 ¹	Physics 1.2	4
COMM ³	Communications	3
LAP ³	Literature/Aesthetics/Philosophy	3
BS/SS ³	Behavioral Science/Social Science	3
Subtotal		20
ELECTIVE	COMM, BS/SS, MA, SC 2, CH 2, BY2, LAP, AF, PR, FL 2, or MS 101 2	3
Subtotal		3
TOTAL CREDITS REQUIRED FOR THE DEGREE		60

¹ Students without the requisite math background for MAT 1275/MA 275 will be required to take MAT 1175/MA 175 in preparation. This will increase the number of credits required for the degree by four (4).

² These courses, with the exception of PHYS 1434/SC 434, are not transferable into the BTech degree.

³ See page 34 for detailed explanation of core required courses and categories.

Bachelor of Technology in FACILITIES MANAGEMENT

Administered by the departments of Architectural Technology, Construction Management Technology, Environmental Control Technology, Law and Paralegal Studies

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The Facilities Management baccalaureate degree prepares graduates for careers as facility managers in large commercial buildings, hospitals, residential complexes, universities, and other institutions.

The program was designed as the upper level of associate degree programs in architectural, civil, construction and environmental control technologies. It adds the financial, legal, project management, and additional technical courses that meet the demanding needs of the facilities management industry. This associate and baccalaureate degree format gives students an underlying expertise and a “can do” ability that is a hallmark of City Tech graduates. In addition, there are elective courses in facilities management that allow students to further develop their specialty in building engineering, construction management, or space planning.

In addition to this 2+2 program, there are two other tracks to the bachelor of technology degree in facilities management:

- City Tech students can elect a lower-level curriculum that includes several courses from each of the articulated associate degree programs.
- Students who already have an associate degree in a different discipline, from City Tech or other colleges, can enter the baccalaureate program after taking approximately 20 credits of prerequisite courses from one of the articulated associate programs. Liberal arts and science credits may be transferable, and courses from their previous major can enhance their capabilities and enable them to develop their own niche in facilities management.

Employment from entry level to top management can be found throughout New York, with over 900,000 properties and facilities. For those wishing to relocate to other areas, employment is available worldwide and is not dictated by market forces and outsourcing trends.

Lower-Division Course Requirements:

AAS degree in Construction Management Technology (FMC)
AAS degree in Environmental Control Technology (FME)
AAS degree in Architectural Technology (FMA)
AAS degree in Civil Engineering Technology (FMV)
60 credits of lower-division courses (FMB)

Upper-Division Course Requirements

The upper division of the facilities management bachelor of technology curriculum is given below. The statement of requirements varies depending on the associate level degree granted (Architectural Technology, Civil Engineering Technology, Construction Management Technology, Environmental Control Technology, or equivalent degree). Consult the program director.

REQUIRED COURSES IN THE MAJOR

		Credits
FMGT 3510/FM 510	Financial Analysis for Facilities Managers I	3
FMGT 3520/FM 520	Anatomy of a Building	3
FMGT 3610/FM 610	Project Management for Facilities Managers	3
FMGT 3620/FM 620	Building Systems I	3
FMGT 3640/FM 640	Principles of Facilities Management	3
FMGT 4710/FM 710	Financial Analysis for Facilities Managers II	3
FMGT 4720/FM 720	Building Systems II	3
FMGT 4740/FM 740	Personnel Relations	3
FMGT 4900/FM 900 ¹	Internship Project	3
	or	
FMGT 4902/FM 902 ¹	Special Projects in Facilities Management	3
LAW 2603/LS 306	Legal Issues for Facilities Managers	3
	Subtotal	30

CONCENTRATION AREAS

Choose one of the following areas for three courses:

Construction Management

FMGT 4760/FM 760	Construction Planning and Management I	3
FMGT 4860/FM 860	Construction Planning and Management II	3

Select one course from the following three for 3 credits for this concentration:

FMGT 4750/FM 750	Mechanical Systems Operation and Maintenance I	3
FMGT 4780/FM 780	Programming and Introduction to Space Planning	3
ELECTIVE	(Program approval required)	3

Space Planning and Design

FMGT 4780/FM 780	Programming and Introduction to Space Planning	3
FMGT 4880/FM 880	Space Planning	3

Select one course from the following three for 3 credits for this concentration:

FMGT 4750/FM 750	Mechanical Systems Operation and Maintenance I	3
FMGT 4770/FM 770	Urban Housing Management I	3
ELECTIVE	(Program approval required)	3

Facility Engineering

FMGT 4750/FM 750	Mechanical Systems Operation and Maintenance I	3
FMGT 4850/FM 850	Mechanical Systems Operation and Maintenance II	3

Select one course from the following three for 3 credits for this concentration:

FMGT 4760/FM 760	Construction Planning and Management I	3
FMGT 4780/FM 780	Programming and Introduction to Space Planning	3
ELECTIVE	(Program approval required)	3

Urban Housing Management

FMGT 4770/FM 770	Urban Housing Management I	3
FMGT 4870/FM 870	Urban Housing Management II	3

Select one course from the following three for 3 credits for this concentration:

FMGT 4750/FM 750	Mechanical Systems Operation and Maintenance I	3
FMGT 4760/FM 760	Construction Planning and Management I	3
ELECTIVE	(Program approval required)	3

REMAINING CORE DISTRIBUTION AND ELECTIVES²
 Required courses depend on the courses used to satisfy the AAS degree requirements. Students should consult their advisor.

Subtotal **21**

TOTAL CREDITS REQUIRED FOR THE DEGREE **120**

¹ The program faculty will determine if appropriate to take FMGT 4900/FM 900 or FMGT 4902/FM 902. Those students without sufficient experience in the facilities management field will be required to take FMGT 4900/FM 900. All others will take FMGT 4902/FM 902.

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

FMB lower-level course requirements for students electing the 0-4 BT FM option.

REQUIRED FOR DEGREE		Credits
ARCH 1121/AR 121	History of Architectural Technology	2
ARCH 1140/AR 140	Materials in Architecture	2
CMCE 1110/CT 110	Construction Drawings	2
ENVC 1110/EC 110	Principles of Air Conditioning I	3
SUPT 1104/SU 104	Building Management, Sanitation and Codes	3
ARCH 1240/AR 240	Methods of Construction in Architecture	2
ARCH 1290/AR 290	Architectural CADD	2

ENVC 1210/EC 210	Combustion Processes and Equipment	3
ENVC 1250/EC 250	Fire Protection, Plumbing and Electrical Systems for Buildings	3
ENVC 2321/EC 321	Air Conditioning Systems Laboratory II	1
ENVC 2322/EC 322	Principles of Air Conditioning II	3

Select one course from the following two:

ARCH 2370/AR 370	Architectural Environmental Systems	3
CMCE 2419/CT 419	Building Service Systems	2

Subtotal **28/29**

OTHER REQUIRED COURSES

ENG 1101/EG 101	English Composition I	3
MA 1		4
SCI 1		4
SOC 1102/SO 102	Urban Sociology	3
SPE 1330/TS 330	Effective Speaking	3
LAP ¹	Literature/Aesthetics/Philosophy	6
BS/SS ¹	Behavioral Science/Social Science	3
ELECTIVES ¹		5/6

Subtotal **31/32**

TOTAL CREDITS REQUIRED FOR LOWER DIVISION **60**

¹ See page 34 for detailed explanation of core required courses and categories.

² Students without the requisite math background for MA 1 will be required to take lower-level MA in preparation. This will increase the number of credits required for the degree by four (4).

CERTIFICATE PROGRAMS

The Environmental Control Technology Department has four certificate programs: Facilities Manager, Air Conditioning Equipment Technician, Heating Equipment Technician, and Building/Housing Superintendent Technology, which fulfill the needs of individuals who: a) already have a degree in another field but are looking for a career change; b) already are employed in the field and are looking to advance; or c) are looking to attain employment skills. While the certificates are a meaningful credential, individuals without a degree are encouraged to complete a degree program to further enhance their opportunities.

Transfer Opportunities

All the environmental control technology and facilities management courses in the certificate programs can be applied toward degrees in their respective majors. Only the four specific building/housing superintendent technology courses cannot be applied toward a degree.

Evening Program

All courses in the certificate programs curriculum are offered in the College's evening session. Certificate requirements can be completed without taking courses during the day.

Admissions Requirements

Facilities Manager Certificate:

Admission to the Facilities Manager certificate program requires a bachelor's degree from an accredited institution. Individuals without a degree can enter our degree programs.

Admission to the Air Conditioning Equipment Technician, Heating Equipment Technician, and Building/Housing Superintendent programs requires the following qualifications:

- High school diploma or General Equivalency Diploma.
- Students must take the CUNY proficiency tests in writing, reading and mathematics. Transfer students with baccalaureate degrees are exempt from this provision.
- Students must be placed in the appropriate developmental courses.
- Students must be CUNY-certified in reading, writing and mathematics to receive a certificate.

Certificate in FACILITIES MANAGEMENT

Today's facilities contain a variety of telecommunication, building and energy management, life safety and other sophisticated systems, and facilities managers are faced with increasingly difficult options. This certificate meets the needs of individuals who are already employed or are looking to be employed in some aspect of facilities or real estate management. The courses will provide technical and managerial skills that will enable them to meet the needs of this complex environment and to improve their opportunities for career growth.

REQUIRED COURSES IN THE MAJOR**Credits**

Certificate candidates who lack work experience in facilities management will also be required to take ENVC 1110/EC 110 – Principles of Air Conditioning I and ENVC 1250/EC 250 – Fire Protection, Plumbing and Electrical Systems for Buildings, in addition to those listed below.

FMGT 3520/FM 520	Anatomy of a Building	3
FMGT 3610/FM 610	Project Management for Facilities Managers	3
FMGT 3620/FM 620	Building Systems I	3
FMGT 4720/FM 720	Building Systems II	3
LAW 2306/LS 306	Legal Issues for Facilities Managers	3
Subtotal		15

Electives: Students will be required to take three courses from among those listed below. The student's records and experience will be reviewed by an advisor to direct the student to the most beneficial courses in light of the student's prior education and work experience.

FMGT/FM xxxx	Facilities Management Elective 1	3
FMGT/FM xxxx	Facilities Management Elective 2	3
FMGT/FM xxxx	Facilities Management Elective 3	3
Subtotal		?

FM Electives

FMGT 3510/FM 510	Financial Analysis for Facilities Managers I	3
FMGT 3640/FM 640	Principles of Facilities Management	3
FMGT 4710/FM 710	Financial Analysis for Facilities Managers II	3
FMGT 4740/FM 740	Personnel Relations	3
FMGT 4750/FM 750	Mechanical Systems Operation and Maintenance I	3
FMGT 4760/FM 760	Construction Planning and Management I	3
FMGT 4780/FM 780	Programming and Introduction to Space Planning	3
FMGT 4850/FM 850	Mechanical Systems Operation and Maintenance II	3
FMGT 4860/FM 860	Construction Planning and Management II	3
FMGT 4880/FM 880	Space Planning	3

Subtotal**?****TOTAL CREDITS REQUIRED FOR CERTIFICATE****24**

Certificate in AIR CONDITIONING EQUIPMENT TECHNICIAN

This curriculum provides the theoretical, design and practical knowledge that is essential to being able to service, design, and install modern industrial, commercial, and residential refrigeration and air conditioning systems. Students begin the program by learning lower-level fundamentals, and progress to the refrigeration and air conditioning courses.

REQUIRED COURSES IN THE MAJOR**Credits**

ENVC 1110/EC 110	Principles of Air Conditioning I	3
ENVC 1111/EC 111	Air Conditioning Systems Laboratory I	1
ENVC 1120/EC 120	HVAC Systems Graphics	2
ENVC 2311/EC 311	Refrigeration Laboratory I	1
ENVC 2312/EC 312	Principles of Refrigeration	3
ENVC 2321/EC 321	Air Conditioning Systems Laboratory II	1
ENVC 2322/EC 322	Principles of Air Conditioning II	3
ENVC 2340/EC 340	Air Conditioning Systems Design	3
ENVC 2411/EC 411	Refrigeration Laboratory II	1

Select one of the following courses for 3 credits:

ENVC 2421/EC 421	Air Conditioning Systems Laboratory III	3
ENVC 2436/EC 436	HVAC Systems Cost Estimating	3
ENVC 2442/EC 442	Principles of Environmental Protection	3
ENVC 2452/EC 452	Principles of Facility Energy Management	3

TOTAL CREDITS REQUIRED FOR CERTIFICATE**21**

Certificate in HEATING EQUIPMENT TECHNICIAN

Advances in heating equipment, and an increased emphasis on energy conservation and pollution control, have created a need for well-trained, technically qualified service technicians. Students begin the program by learning the underlying principles of heat transfer, and advance to upper-level courses where they learn combustion processes, hydronic systems design, sizing and selection of pumps and domestic hot water systems, and wiring practices, testing, service and adjustment of oil and gas-fired heating systems.

REQUIRED COURSES IN THE MAJOR		Credits
ENVC 1110/EC 110	Principles of Air Conditioning I	3
ENVC 1111/EC 111	Air Conditioning Systems Laboratory I	1
ENVC 1120/EC 120	HVAC Systems Graphics	2
ENVC 1210/EC 210	Combustion Processes and Equipment	3
ENVC 1211/EC 211	Heating Systems Laboratory	1
ENVC 1220/EC 220	Hydronic Systems Design	3
ENVC 1250/EC 250	Fire Protection, Plumbing, and Electrical Systems for Buildings	3
TOTAL CREDITS REQUIRED FOR CERTIFICATE		16

Certificate in BUILDING/HOUSING SUPERINTENDENT TECHNOLOGY

This 30-credit certificate program in building/housing superintendent technology prepares students to operate, maintain and manage multi-family residential buildings. Graduates can have careers as superintendents, assistant superintendents, directors of maintenance, maintenance mechanics, building managers, building services contractors, building custodians and building owners.

The Building/Housing Superintendent curriculum encompasses heating, boilers and combustion of fuels, building maintenance and repair, operation of building mechanical systems, electrical systems, and multi-family building management, sanitation and codes.

Classroom lectures and demonstrations give a solid theoretical foundation. Intensive practical training is presented in modern and well-equipped air conditioning, combustion and tool skills laboratories.

Graduates and undergraduates from other institutions can transfer to City Tech's Superintendent Technology program. The College grants credit for general education courses and for technical courses that are similar in content to building/housing superintendent technology.

REQUIRED COURSES IN THE MAJOR		Credits
SUPT 1103/SU 103	Building/Housing Superintendent Carpentry Laboratory	1
SUPT 1104/SU 104	Multi-Dwelling Management, Sanitation and Codes	3
SUPT 1206/SU 206	Building/Housing Superintendent Plumbing Laboratory	1
SUPT 1261/SU 261	Building Maintenance and Repair Laboratory	2
ENVC 1110/EC 110	Principles of Air Conditioning I	3
ENVC 1111/EC 111	Air Conditioning Systems Laboratory I	1
ENVC 1120/EC 120	HVAC Systems Graphics	2
ENVC 1210/EC 210	Combustion Processes and Equipment	3
ENVC 1211/EC 211	Heating Systems Laboratory	1
ENVC 1250/EC 250	Fire Protection, Plumbing, and Electrical Systems for Buildings	3
Subtotal		20
OTHER REQUIRED COURSES		
ENG 1101/EG 101	English Composition I	3
MAT 1175/MA 175	Fundamentals of Mathematics	4
BS/SS ¹	Behavioral Science/Social Science	3
Subtotal		10
TOTAL CREDITS REQUIRED FOR CERTIFICATE		30

¹ See page 34 for detailed explanation of core required courses and categories.

COURSES:

ENVC 1110/EC 110 Principles of Air Conditioning I

3 cl hrs, 3 cr

An introductory lecture course which teaches the basic principles, equations and analytical approaches used in the design of air conditioning systems. Students learn the physical principles of work, power, energy, pressure, specific volume, density, heat, and enthalpy. They learn fundamental properties of steam and air, the pressure-temperature relationships of gases, basic principles of hot water and steam heating systems, and procedures for calculating heat losses from buildings.

Prerequisite: None

ENVC 1111/EC 111 Air Conditioning Systems Laboratory I

3 lab hrs, 1 cr

An introductory laboratory course in which students become familiar with piping, tubing, ductwork, soldering, brazing, swaging, threading, and

flaring. Different types of gauges, manometers, and measuring and testing instruments will be used to measure air velocity, pressures, and densities of substances. Elements of electricity, basic electrical control circuits and electrical test instruments will be introduced.

Prerequisite: None

ENVC 1120/EC 120 HVAC Systems Graphics

1 cl hr, 2 lab hrs, 2 cr

A drafting course designed to train students to read and represent graphically in the heating, ventilating and air conditioning field. They learn to letter, draw linework, use drafting instruments and standard HVAC representations, draw orthographic and isometric projections of HVAC equipment, and work with architectural, structural and lighting plans to lay out HVAC systems.

Prerequisite: None

ENVC 1210/EC 210 Combustion Processes and Equipment

3 cl hrs, 3 cr

A lecture course which teaches the design and operation of combustion equipment and boilers. Students learn the properties and handling of fuels, the chemistry of combustion, flame safety controls, boiler design and rating, gas and oil burners, boiler maintenance and safety, design of breeching and stacks, and the control of air pollution caused by combustion.

Prerequisite: ENVC 1110/EC 110

ENVC 1211/EC 211 Heating Systems Laboratory

3 lab hrs, 1 cr

A laboratory course in which students work on oil burners, gas burners, steam and hydronic boilers, draft and combustion efficiency testing, boiler and burner safety and operating controls, reading control wiring diagrams, and wiring electrical control components. Individual reports are required for each laboratory exercise.

Prerequisite: ENVC 1111/EC 111;
corequisite: ENVC 1210/EC 210

ENVC 1220/EC 220 Hydronic Systems Design

2 cl hrs, 2 lab hrs, 3 cr

A theory, design and drafting course that teaches the procedures used in designing, analyzing and laying out hydronic systems. Students learn how to calculate the heating load of a building and piping friction losses, and the design criteria for boilers, convectors, valves, pumps, and compression tanks. Students do design projects including the drafting and designing of a complete hydronic system.

Prerequisites: ENVC 1110/EC 110, ENVC 1111/EC 111, ENVC 1120/EC 120

ENVC 1250/EC 250 Fire Protection, Plumbing and Electrical Systems for Buildings

3 cl hrs, 3 cr

A lecture course that surveys selected features and code requirements of building fire protection, plumbing and electrical systems. Students learn the basic principles of building fire safety with regard to building construction and means of egress, fire and smoke detection systems, sprinkler and standpipe systems, and building fire safety personnel. The plumbing section of the course provides the

student with information on plumbing system design, and how to determine the capacity and size of water supply and sanitary piping. Lighting design and selection, wiring, and codes are covered in the electrical systems portion of the course.

Prerequisites: ENVC 1110/EC 110, ENVC 1120/EC 120; *pre- or corequisite:* ENVC 1211/EC 211

ENVC 2311/EC 311 Refrigeration Laboratory I

3 lab hrs, 1 cr

A laboratory course in which students receive experience in installing, operating and maintaining refrigeration equipment. They learn methods of joining piping and tubing; compressor assembly and disassembly; use of analog and digital temperature and pressure instrumentation; and procedures for recovery, evacuation and charging of refrigeration systems under EPA guidelines. The final project requires students to work as team members to assemble, wire and install a complete refrigeration system. Individual reports are required for each laboratory exercise.

Pre- or corequisite: ENVC 2312/EC 312

ENVC 2312/EC 312 Principles of Refrigeration

3 cl hrs, 3 cr

A lecture course that covers refrigeration theory, applications, equipment and systems. Students learn the properties of various refrigerants, temperature-pressure relationships of saturated vapors, compression refrigeration and heat pump cycles, operating principles of compressors, characteristics of evaporators and condensers, refrigerant flow control devices, applications of pressure-enthalpy diagrams of refrigerants, cooling tower theory and operation, selection and matching of refrigeration system components, and the operation and uses of absorption refrigeration systems.

Prerequisite: ENVC 1110/EC 110

ENVC 2321/EC 321 Air Conditioning Systems Laboratory II

3 lab hrs, 1 cr

A laboratory course that teaches methods to evaluate the performance of air handling and air conditioning systems. Students learn how to use a sling psychrometer, balometer, pitot tube and draft

gauge, Anor Velometer, anemometers, computer data loggers, and sound level meters. They are introduced to operating, testing and calibrating procedures for HVAC system pneumatic controls. Students will work with different types of air conditioning equipment, from residential and small commercial split and packaged air conditioning and heat pump systems, to a larger chilled water system which uses a cooling tower and chilled water distribution to separate air handlers. Students write individual laboratory reports on the performance testing of ducts, diffusers, controls, and the air conditioning systems.

Prerequisites: ENVC 1110/EC 110, ENVC 1111/EC 111; *pre- or corequisite:* ENVC 2322/EC 322

ENVC 2322/EC 322 Principles of Air Conditioning II

3 cl hrs, 3 cr

A lecture course that teaches psychrometrics and cooling load calculation methodologies. Students learn to use psychrometric charts to determine the properties of air at various conditions, and the sensible and latent energy changes required to maintain specified comfort levels in occupied spaces. They also learn to calculate cooling loads using both computerized modeling software and manual methods in accordance with accepted industry practices.

Prerequisite: ENVC 1110/EC 110

ENVC 2340/EC 340 Air Conditioning Systems Design

2 cl hrs, 2 lab hrs, 3 cr

A computerized drafting and design course that teaches the procedures used in designing, analyzing and laying out air handling systems. Students learn to perform the calculations and analyses necessary to size ducts and accessories, determine pressure drops, lay out mechanical equipment rooms, specify fans, and select diffusers and registers. They utilize AutoCad Computer-Aided Design and Drafting software to complete their drawing and design projects.

Prerequisites: ENVC 1110/EC 110, ENVC 1120/EC 120; *pre- or corequisite:* ENVC 2322/EC 322

ENVC 2411/EC 411 Refrigeration Laboratory II

3 lab hrs, 1 cr

A laboratory course in which students continue their experience in installing, operating and maintaining refrigeration equipment. They learn how to install refrigeration electrical controls and motors, procedures for testing and troubleshooting electrical systems, and how to operate chilled water systems. Individual reports are required for each laboratory exercise.

Prerequisites: ENVC 2311/EC 311, ENVC 2312/EC 312

ENVC 2420/EC 420 Principles of HVAC Systems Controls

3 cl hrs, 3 cr

A lecture course that introduces the principles of HVAC control systems design. Students are introduced to the theory of control and learn the methods of control of air conditioning, heating, and refrigeration systems. They study HVAC control instrumentation, control devices, pneumatic control systems, and electric and electronic control systems.

Prerequisite: ENVC 2322/EC 322

ENVC 2421/EC 421 Air Conditioning Systems Laboratory III

2 cl hrs, 2 lab hrs, 3 cr

A laboratory course in which students perform evaluations of chilled water air conditioning systems, cooling tower water treatments, and indoor air quality. They learn the operation of boilers with dual fuel burners, and hydronic heating systems. Also included are computerized HVAC Direct Digital Control systems, and acoustic and vibration analysis of mechanical equipment. Individual laboratory reports are required.

Prerequisites: ENVC 2321/EC 321, ENVC 2322/EC 322

ENVC 2432/EC 432 Advanced Air Conditioning Systems Design

2 cl hrs, 2 lab hrs, 3 cr

An advanced theory and design course in which students specify and design a complete heating, air conditioning and ventilation system. Students calculate heating and cooling loads, write specifications, utilize building and energy codes, determine ventilation requirements, and specify mechanical systems and integrate them with the building

construction. AutoCad and computerized load calculation software are utilized.

Prerequisites: ENVC 1220/EC 220, ENVC 2322/EC 322, ENVC 2340/EC 340, MAT 1275/IMA 275

ENVC 2436/EC 436 HVAC Systems Cost Estimating

3 cl hrs, 3 cr

A lecture course that teaches how to estimate the costs of HVAC systems. Students learn the different types of estimates, estimating forms and methods, and company overhead, mark-up, and budget prices. They also learn to estimate the costs of mechanical heating and cooling equipment, fans and blowers, cooling towers, pumps, tanks, piping, ductwork, air distribution devices, insulation, HVAC system controls, and electrical power wiring. Students will be required to complete a cost estimate for an entire air conditioning system project.

Prerequisites: ENVC 1210/EC 210, ENVC 1220/EC 220, ENVC 2340/EC 340, MAT 1275/IMA 275; *corequisites:* ENVC 2420/EC 420, ENVC 2432/EC 432

ENVC 2442/EC 442 Principles of Environmental Protection

3 cl hrs, 3 cr

A lecture course that covers the sources and control of air pollution caused by oil burners and incinerators, indoor air quality, and noise control in HVAC systems. Students learn how residual oil burners are operated, controlled and maintained to minimize air pollution. They also learn how indoor air quality is maintained by HVAC systems and how an indoor air quality investigation is planned and performed. Basic acoustic terminology is also covered, along with sound level measurement procedures and noise control codes. Students complete term projects.

Prerequisites: ENVC 1210/EC 210, ENVC 1211/EC 211, ENVC 2321/EC 321

ENVC 2452/EC 452 Principles of Facility Energy Management

3 cl hrs, 3 cr

A lecture course in which students are taught the management tools and procedures which will enable them to track and control energy consumption in a large facility. The energy use characteristics of many types of facilities will be covered

and analyzed. The course also provides students with the ability to perform an energy audit and to successfully implement a facility energy conservation program. Students will be required to assemble an energy conservation plan for a building and write a report as their final project.

Prerequisites: ENVC 1210/EC 210, ENVC 1250/EC 250, ENVC 2322/EC 322, ENVC 2340/EC 340

FMGT 3510/FM 510 Financial Analysis for Facilities Managers I

3 cl hrs, 3 cr

This course will teach students how to analyze and report on a facility's financial performance. Topics include revenue, operating and capital budgets, and the use of tax incentives for financing facilities development. Present value techniques for analyzing a facility's long-term financing options and for evaluating capital improvement projects will also be covered. The use of computers to perform financial analyses is required.

Prerequisite: MAT 1275/IMA 275

FMGT 3520/FM 520 Anatomy of a Building

3 cl hrs, 3 cr

This course will provide students with a systems perspective of facilities. Students will view buildings as a synthesis of interrelated and dependent systems, and observe these systems at various stages throughout their rated life to see the effects of aging, wear and maintenance on their performance. Students will also examine the characteristics that are typical of different types and ages of buildings.

Prerequisite: ENVC 1250/EC 250 or CMCE 2419/CT 419 or ARCH 2370/IAR 370 or equivalent

FMGT 3610/FM 610 Project Management for Facilities Managers

3 cl hrs, 3 cr

An introduction to the procedures for project management. How to maintain control of time and cost, allocate labor and other personnel effectively, and apply these principles to actual situations. How computers are used to effectively manage projects is emphasized.

Prerequisite: FMGT 3510/FM 510

FMGT 3620/FM 620 Building Systems I

3 cl hrs, 3 cr

This course will teach students the fundamentals of utility services, costs, incoming power distribution systems, electrical maintenance and lighting systems. Topics covered will include rate classifications, service protection, uninterruptible and emergency power supplies, co-generation systems, electrical distribution equipment, and alternatives to existing utilities and vendors.

Prerequisite: FMGT 3520/FM 520

FMGT 3640/FM 640 Principles of Facilities Management

3 cl hrs, 3 cr

Through case studies, students will learn the diverse skills that facilities managers must have to successfully fulfill their responsibilities in a variety of settings; commercial, institutional, health care, residential, governmental. This course will also prepare them to develop plans for the repair or replacement of a major building system, understand the impact of government regulations on the operation of a facility, and keep abreast of the technical changes affecting the facilities management industry.

Prerequisites: FMGT 3510/FM 510, FMGT 3520/FM 520

FMGT 4710/FM 710 Financial Analysis for Facilities Managers II

3 cl hrs, 3 cr

Students learn how to analyze expenses, identify controllable items, make comparisons to benchmark standards, establish achievable targets, and develop and manage a cost control program. Examples of proven cost saving techniques will be used and the net effect upon the short and long term profitability and value of a facility will be determined. Topics covered will include energy costs, telecommunications costs, insurance premiums, labor costs and taxes.

Prerequisite: FMGT 3510/FM 510

FMGT 4720/FM 720 Building Systems II

3 cl hrs, 3 cr

Students will become familiar with facility management and building management computer systems, voice and data telecommunications systems, networking systems, and the supporting infrastructure for all of these systems. They will also be

taught the fundamentals of disaster planning, emergency management, environmental strategies, and the issues which need to be addressed in planning for common and extraordinary occurrences that affect buildings.

Prerequisite: FMGT 3520/FM 520

FMGT 4740/FM 740 Personnel Relations

3 cl hrs, 3 cr

The management principles and practices involved in maintaining productive relationships with personnel will be emphasized. Students will understand the leadership role of the facilities manager, learn how to work effectively within the structure of organizations, and develop the techniques that are used to make successful presentations to staff and higher levels of management. Topics covered will also include conflict resolution techniques, personnel management and training, work rules, OSHA and other labor laws, and the collective bargaining process.

Prerequisite: FMGT 3510/FM 510

FMGT 4750/FM 750 Mechanical Systems Operation and Maintenance I

3 cl hrs, 3 cr

Heating, domestic hot water and other ancillary systems in residential, commercial and institutional buildings. Study of computerized and manual techniques for managing, operating and maintaining these systems. Topics covered will include preventive maintenance, work orders, staff scheduling, diagnostic techniques, types of burners and boilers, heat distribution systems, direct and indirect fired domestic hot water systems, and vertical transportation systems.

Prerequisite: FMGT 3520/FM 520

FMGT 4760/FM 760 Construction Planning and Management I

3 cl hrs, 3 cr

Introduction to the basic principles of construction management. The relationship of the owner, designer and contractor in the construction process is discussed in detail. The main parts of a building contract are studied. This course emphasizes the role of the engineer, the on-site inspector and the superintendent. The fundamentals of the Critical Path Method and computer

programs used in construction will be covered.

Prerequisite: FMGT 3610/FM 610

**FMGT 4770/FM 770
Urban Housing
Management I**

3 cl hrs, 3 cr

This course shows students how the relationships between tenants, owners, managers, banks, lenders, regulatory agencies, and community groups affect urban housing management. Topics covered will include financial management, how to meet the immediate housing needs of tenants, how to provide a secure and habitable community, how facility managers can provide leadership, and the different types of property and ownership. Term projects are required.

Prerequisites: FMGT 3510/FM 510, FMGT 3520/FM 520

**FMGT 4780/FM 780
Programming and
Introduction to
Space Planning**

2 cl hrs, 2 lab hrs, 3 cr

Lecture and design course presenting procedures for programming a facility renovation, expansion or relocation. Introduction to space planning. Topics covered include procedures for determining if a facility renovation is necessary, roles and responsibilities of project management and management review teams, preparation of preliminary floor plans, establishment of space standards and basic design elements, workstations, space requirements questionnaires, blocking plans and stacking plans. Term projects are required.

Prerequisites: FMGT 3610/FM 610, FMGT 3620/FM 620

**FMGT 4850/FM 850
Mechanical Systems
Operation and
Maintenance II**

3 cl hrs, 3 cr

Air conditioning, refrigeration and ventilation systems in residential, commercial and institutional facilities. Use of computerized and manual techniques for managing, operating and maintaining these systems. Topics covered will include preventive maintenance, compression and absorption refrigeration systems, air handling systems, cooling towers, and high-pressure boilers.

Prerequisite: FMGT 4750/FM 750

**FMGT 4860/FM 860
Construction Planning
and Management II**

3 cl hrs, 3 cr

The main parts of a building contract and the details of the relationships between the owner, designer and contractor in the construction process will be discussed. Bidding documents, financing, bonds, insurance and inspection as they relate to the construction industry will be covered.

Prerequisite: FMGT 4760/FM 760

**FMGT 4870/FM 870
Urban Housing
Management II**

3 cl hrs, 3 cr

A course in multi-family housing management that addresses the particular needs and concerns of urban housing regarding capital planning, resource allocation, operations and maintenance and security. Students learn how to comply with government agency regulations, complete reporting forms, follow procedures for filings and hearings, and manage the maintenance of multi-family housing mechanical, electrical and plumbing systems. Management techniques for avoiding and resolving conflicts with tenants by providing timely service, maintenance and repairs will also be covered. Term project reports are required.

Prerequisite: FMGT 4770/FM 770

**FMGT 4880/FM 880
Space Planning**

2 cl hrs, 2 lab hrs, 3 cr

Lecture and design course presenting procedures for space planning for a facility renovation, expansion or relocation. Topics covered include scheduling and budgeting, schematic design, design development and preparation of construction documents.

Prerequisites: FMGT 4780/FM 780 or ARCH 1111/AR 111, ARCH 3561/AR 561

**FMGT 4900/FM 900
Internship Project**

3 cl hrs, 3 cr

120 hours of work experience in a facilities management organization or any related industry organization approved by the advisor. Each student will keep a log/journal to be shared in group seminars. Supervision will be by faculty and by a supervisor at the internship site. The program faculty will determine

if students will be required to take FM 900 or FM 902. Those without sufficient experience in the facilities management field will take FM 900. All others will take FM 902.

Prerequisites: FMGT 2610/FM 610, FMGT 3710/FM 710, FMGT 3720/FM 720

**FMGT 4902/FM 902
Special Projects in
Facilities Management**

3 cl hrs, 3 cr

Projects, supervised by a faculty advisor, that are chosen for their special interest to students and their relevance to facilities management. Examples of individual projects are: developing maintenance, energy conservation, or emergency management plans for a facility; studying the effect of variable air volume systems on indoor air quality; and determining the effect of utility deregulation on the costs of operating buildings. An example of a group project would be two to four students from different disciplines preparing an assessment and capital improvement plan for a facility. The program faculty will determine if students will be required to take FM 900 or FM 902. Those without sufficient experience in the facilities management field will take FM 900. All others will take FM 902.

Prerequisites: FMGT 2610/FM 610, FMGT 3710/FM 710, FMGT 3720/FM 720

**SUPT 1103/SU 103
Building/Housing
Superintendent
Carpentry Laboratory**

3 lab hrs, 1 cr

This course introduces students to basic carpentry techniques, both new construction and repairs, typically employed in maintaining multi-dwelling buildings. Students become familiar with basic carpentry tools and their usage, e.g., tools for fastening, cutting, drilling holes, layout and gauging, and clamping; wood construction materials and their appropriate usage; wall and ceiling construction and repair, e.g., drywall, wood and lathe walls; installation of interior and exterior doors and lock sets; and finished carpentry.

Prerequisite: None

**SUPT 1104/SU 104
Multi-Dwelling
Management, Sanitation
and Codes**

3 cl hrs, 3 cr

A lecture course that surveys the City of New York Housing Maintenance Code, the New York State Multiple Dwelling Law, and other codes, laws and regulatory agencies that affect the role and functions of building superintendents. Employee management, contracting, purchasing and record keeping are also covered. The instructor demonstrates the operation and repair of key multi-dwelling building components and equipment.

Pre- or corequisite: ENG 092R/DR 092 or ESOL 031W/EL 031 or their equivalents

**SUPT 1206/SU 206
Building/Housing
Superintendent
Plumbing Laboratory**

3 lab hrs, 1 cr

This course introduces students to components of the plumbing systems of buildings. The installation and repair of water closets, tubs, faucets, mixing valves, and drain cleaning are included in the course.

Prerequisite: ENVC 1111/EC 111

**SUPT 1261/SU 261
Building Maintenance
and Repair Laboratory**

1 cl hr, 2 lab hrs, 2 cr

This course introduces students to the procedures used to maintain and repair both interior and exterior components of buildings. The maintenance and repair of electrical systems, lighting systems, fire protection systems, room air conditioners, valves, door systems and locks, windows, exterior walls and roofs are included in the course.

Prerequisite: ENVC 1111/EC 111