

Environmental Science, Safety and Health

Environmental Science, Safety and Health

Associate Degree

Health and Safety Training for Hazardous

Waste Operations Certificate

Water/Wastewater Technology Certificate

Occupational Health and Safety Certificate

Sustainable Building Certificate

Environmental, Science, Safety and Health technicians work in a wide variety of entry-level positions for environmental engineering consulting firms, environmental laboratories, wastewater and water treatment facilities, lead and asbestos abatement contractors, manufacturing facilities, governmental agencies, and other organizations requiring individuals to work in environmental or safety related positions. The demand for technicians capable of performing tasks such as sample collection, monitoring, data management, and instrumentation calibration, operation, and maintenance continues to increase. According to recent surveys and job placement rates, the job market for environmental and safety technicians in central Ohio is very strong.

Columbus State's associate degree program in Environmental Science, Safety and Health has a diverse curriculum, which includes many basic science courses, as well as courses offered by other engineering technologies. This curriculum provides students with a strong foundation of technical skills necessary for careers in the environmental industry. An internship program also offers students hands-on experience in a real work setting.

In addition to providing environmental technicians with entry-level training, the degree provides opportunities for individuals seeking career changes, continuing education, and skills enhancement.

The Water/Wastewater Technology Certificate is designed to serve the educational needs of employees that work in water and/or wastewater treatment, such as those who work for municipalities or industry. This certificate will also provide a strong educational foundation for those students who have an interest in entering an occupation in water or wastewater treatment. Individuals who complete the coursework in this program will be much better prepared to take the state water or wastewater treatment operator exams. Most courses in this certificate will also apply towards the Associate of Applied Science degree in either Environmental Science, Safety and

Health or Civil Engineering Technology.

The Occupational Health and Safety Certificate is designed to provide basic supervisory and regulatory skills to those who have, or may wish to have, a job responsible for the health and safety of the employees in the workplace.

The Sustainable Building Certificate is designed to provide information on sustainable design and construction to students of the Construction Sciences Department, and to provide a training opportunity for current professionals such as architects, building managers, construction managers, and others.

For additional information on the Health and Safety Training for Hazardous Waste Operations Certificate, or other OSHA training opportunities, see the Environmental Science, Safety and Health Advisor.

Upon completion of the associate degree in Environmental Science, Safety and Health, the graduate will be able to:

- Collect air, water, waste, and soil samples for routine monitoring as required by regulatory agencies and for operational control of remediation or treatment systems.
- Conduct field investigations using environmental instrumentation.
- Assist in the operation and maintenance of systems used to control pollution, remediate contaminated materials, or treat water as required by environmental laws.
- Perform duties related to the management, treatment, storage, disposal, and emergency response to spills of hazardous materials and toxic substances in accordance with the EPA, OSHA and DOT.
- Collect and compile data necessary for an environmental site assessment.
- Utilize basic concepts of geology, hydrology, chemistry, and biology in the investigation of the occurrence, transport, and remediation of environmental contaminants.
- Demonstrate a knowledge of solid and hazardous waste management practices, including being able to evaluate hazardous waste data to provide information for compliance with environmental standards.
- Describe components of risk assessment and toxic substances exposure analysis. Identify duties requiring knowledge of safety regulations in the workplace and at construction sites.

Demonstrate a working knowledge of the regulatory aspects of industrial hygiene.

Environmental Science, Safety and Health

Associate Degree

| COURSE | | CR |
|---------------------------------|---|-----------|
| Quarter 1 | | |
| ENGL 101 | Beginning Composition | 3 |
| ENVR 101 | Intro to Environmental Science, Safety and Health | 4 |
| ENVR 158 | Environmental Site Assessment | 3 |
| MATH 148 | College Algebra | 5 |
| BIO 111 | Introductory Biology I | 5 |
| TOTAL CREDIT HOURS | | 20 |

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|---------------------------------|--|-----------|
| Quarter 2 | | |
| ENGL 102 | Essay and Research | 3 |
| ENVR 110 | Industrial/Municipal Pollution Control | 3 |
| CIT 101 | PC Applications I | 3 |
| ENVR 130 | Environmental Laws and Regulations | 5 |
| GEOL 101 | Earth Systems I (<i>or</i>) | |
| GEOL 121 | Physical Geology | 5 |
| TOTAL CREDIT HOURS | | 19 |

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|---------------------------------|--------------------------------------|-----------|
| Quarter 3 | | |
| CHEM 111 | Elementary Chemistry I | 5 |
| ENVR 111 | Hazardous Materials Management | 3 |
| ENVR 120 | Environmental Aspects of Soils | 5 |
| ENVR 224 | Environmental Hydrology | 3 |
| TOTAL CREDIT HOURS | | 16 |

Summer Quarter (between 1st and 2nd year)

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|---------------------------------|---|----------|
| ENVR 252 | Health and Safety Training for Hazardous Waste Operations. | 3 |
| TOTAL CREDIT HOURS | | 3 |

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|---------------------------------|--|-----------|
| Quarter 4 | | |
| ENVR 170 | General Industry Safety and Health | 4 |
| MATH 135 | Elementary Statistics | 5 |
| ENVR 250 | Environmental Sampling | 5 |
| COMM 204 | Technical Writing | 3 |
| TOTAL CREDIT HOURS | | 17 |

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|---------------------------------|--|-----------|
| Quarter 5 | | |
| ENVR 240 | Environmental Analytical Methods | 2 |
| COMM 110 | Conference and Group Discussion | 3 |
| SSCI 104 | Human Economic Geography | 5 |
| ENVR 222 | Water Treatment Techniques (<i>or</i>) | |
| ENVR 223 | Wastewater Treatment Techniques | 3 |
| ENVR 255 | Air Pollution and Monitoring | 3 |
| TOTAL CREDIT HOURS | | 16 |

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|--|--|------------|
| Quarter 6 | | |
| ENVR 253 | Environmental Systems Analysis | 3 |
| ENVR 254 | Subsurface Restoration Techniques | 5 |
| HUM 152 | American Civilization II (recommended) (<i>or</i>) | |
| HUM XXX | Humanities 111,112,113, 151, or 224 | 5 |
| XXX XXX | Technical Elective | 3 |
| XXX XXX | Technical Elective | 3 |
| TOTAL CREDIT HOURS | | 19 |
| TOTAL DEGREE CREDIT HOURS | | 110 |

Technical electives must be selected from the following list of courses:

SPECIALIZATION TRACKS

ENVR Specialization

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|----------|-------------------------------|---|
| ENVR 220 | Environmental Chemistry | 5 |
|----------|-------------------------------|---|

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| ENVR 256 | Hazardous Materials Refresher Training | 1 |
| ENVR 282 | Sustainable Building Strategies | 3 |
| ENVR 283 | Ecological Residential Construction | 3 |
| ENVR 291 | Field Experience | 3 |
| ENVR 299 | Special Topics Environmental Science, Safety and Health | 1-5 |

Safety and Health Specialization

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|----------|---|---|
| ENVR 275 | Industrial Hygiene | 4 |
| ENVR 160 | OSHA 10-Hr Construction Safety and Health | 1 |
| ENVR 265 | OSHA 30-Hr Construction Safety and Health | 4 |

Water and Wastewater Specialization

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|----------|------------------------------|---|
| CIVL 221 | Elementary Hydraulics | 3 |
| CIVL 223 | Public Utility Systems | 3 |

Field/Support Services Specialization

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|----------|--|---|
| SURV 141 | Basic Surveying (<i>or</i>) | |
| SURV 140 | Surveying and GPS | 4 |
| ARCH 110 | Construction Drafting: Manual I | 2 |
| ARCH 112 | Construction Drafting: CAD I | 2 |
| GEOG 207 | Introduction to Geographic Information Systems | 5 |

Health and Safety Training for Hazardous Waste Operations Certificate

| COURSE | | CR |
|---|---|----------|
| Quarter 1 | | |
| ENVR 252 | Health and Safety Training for Hazardous Waste Operations | 3 |
| TOTAL CERTIFICATE CREDIT HOURS | | 3 |

Water/Wastewater Technology Certificate

| COURSE | | CR |
|---------------------------------|--|-----------|
| Quarter 1 | | |
| CHEM 100 | Introduction to Chemistry | 4 |
| ENGL 101 | Beginning Composition | 3 |
| ENVR 101 | Introduction to Environmental Science, Safety and Health ... | 4 |
| MATH 102 | Beginning Algebra I | 4 |
| TOTAL CREDIT HOURS | | 15 |

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|---------------------------------|---|----------------|
| Quarter 2 | | |
| CIVL 221 | Elementary Hydraulics | 3 |
| ENVR 110 | Industrial/Municipal Pollution Control | 3 |
| CIT 101 | P.C. Applications I | 3 |
| ENVR 252 | Health and Safety Training for Hazardous Waste Operations (<i>or</i>) | 3 |
| ENVR 170 | General Industry Safety and Health | 4 |
| TOTAL CREDIT HOURS | | 12 - 13 |

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|---|---------------------------------------|----------------|
| Quarter 3 | | |
| CIVL 223 | Public Utility Systems | 3 |
| ENVR 222 | Water Treatment Techniques | 3 |
| ENVR 223 | Wastewater Treatment Techniques | 3 |
| ENVR 224 | Environmental Hydrology | 3 |
| ENVR 253 | Environmental Systems Analysis | 3 |
| TOTAL CREDIT HOURS | | 15 |
| TOTAL CERTIFICATE CREDIT HOURS | | 42 - 43 |

Occupational Health and Safety Certificate

| COURSE | | CR |
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|--------|--|----|

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|---------------------------|---|
| Quarter 1 | |
| ENVR 101 | Introduction to Environmental Science, Safety and Health ...4 |
| ENVR 111 | Hazardous Materials Management3 |
| TOTAL CREDIT HOURS | 7 |

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|---------------------------|---|
| Quarter 2 | |
| ENVR 160 | OSHA 10-Hr Construction Safety and Health.....1 |
| ENVR 170 | General Industry Safety and Health.....4 |
| TOTAL CREDIT HOURS | 5 |

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|---------------------------------------|--|
| Quarter 3 | |
| ENVR 252 | Health and Safety Training for Hazardous Waste Operations 3 |
| ENVR 275 | Industrial Hygiene.....4 |
| TOTAL CREDIT HOURS | 7 |
| TOTAL CERTIFICATE CREDIT HOURS | 19 |

Sustainable Building Certificate

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|---------------------------|--|
| COURSE | CR |
| Autumn Quarter | |
| ENVR 282 | Sustainable Building Strategies3 |
| TOTAL CREDIT HOURS | 3 |

| | |
|---------------------------|--------------------------------|
| Winter Quarter | |
| CMGT 282 | Sustainable Construction.....3 |
| TOTAL CREDIT HOURS | 3 |

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|---------------------------|--------------------------------------|
| Spring Quarter | |
| ARCH 282 | Sustainable Design Strategies3 |
| TOTAL CREDIT HOURS | 3 |

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|---------------------------------------|---------------------------------------|
| Summer Quarter | |
| ARCH 283 | Sustainable Energy Performance3 |
| TOTAL CREDIT HOURS | 3 |
| TOTAL CERTIFICATE CREDIT HOURS | 12 |

Environmental Science, Safety and Health (ENVR)

ENVR 101 Introduction to Environmental Science, Safety and Health (A, W, DL, SP) 4 credits

This course is an introduction to the environmental technology field, including an overview of environmental laws and regulations, toxicology, ecology, air pollution, water pollution, water treatment, hazardous materials, solid and hazardous waste, waste site investigation and remediation, and occupational safety and health.

Lecture: 4 hours – Lab: 0 hours

ENVR 110 Industrial/Municipal Pollution Control (W) 3 credits

This course is an overview of the management, treatment and disposal practices utilized for pollution control. It addresses the nature of pollution and provides an introduction to air pollution control devices, wastewater treatment techniques, solid and hazardous waste management, treatment and disposal, recycling and pollution prevention.

Lecture: 2 hours – Lab: 2 hours Lab fee: \$18.00

ENVR 111 Hazardous Materials Management (SP) 3 credits

This class presents an overview of the management practices for hazardous materials and hazardous waste, including principles of science and technology, occupational health and safety concerns and regulatory compliance. An emphasis will be placed on DOT, OSHA and RCRA requirements.

Lecture: 2 hours – Lab: 2 hours Lab fee: \$20.00

ENVR 120 Environmental Aspects of Soils (A, SP, SU) 5 credits

This course offers a multi-disciplinary overview of soil science. Topics include soil formation and development, classification systems, soil mechanics, soil chemistry and contamination, soil hydrology, agricultural aspects of soil, soil erosion, soil microbiology and soil sampling techniques. Soil characteristics will be explored by means of laboratory examination and elementary testing techniques.

Lecture: 4 hours – Lab: 2 hours Lab fee: \$15.00

ENVR 130 Environmental Laws and Regulations (W) 5 credits

ENVR 130 presents a study of American political institutions and a brief history of the American environmental movements and the resulting environmental regulations, as well as a study of local, state, and federal codes and regulations as they apply to the handling, treatment, storage, and disposal of hazardous materials and wastes. Emphasis on NEPA, the Clean Water and Air Acts, the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).

Lecture: 4 hours – Lab: 2 hours Lab fee: \$15.00

ENVR 158 Environmental Site Assessment (A, SP) 3 credits

This course explores environmental site assessments, including Phase I ESAs for real estate transactions. Environmental regulations and standard practices will be applied in the analysis of a site-specific project. Additional property assessment issues addressed in this class include Environmental Impact Statements, wetlands, asbestos, lead, mold and radon.

Lecture: 2 hours – Lab: 2 hours Lab fee: \$12.00

ENVR 160 OSHA 10-Hour Construction Safety and Health (W, SP) 1 credits

This course covers the approved Occupational Safety and Health Administration (OSHA) curriculum for the 10-hour Outreach Training Program for Construction Industry Safety and Health. Topics include introduction to OSHA, electrical safety, fall protection, personal protective and lifesaving equipment, materials handling, storage, use and disposal, equipment safety, excavation, stairways and ladder safety and other applicable OSHA standards. Course completion cards will be issued to individuals successfully completing the class.

Lecture: 1 hour Lab fee: \$10.00

ENVR 167 OSHA 10-Hour General Industry Safety and Health (On Demand) 1 credit

This course covers the approved OSHA curriculum for the 10-hour Outreach Training Program for General Industry Safety and Health. Topics include introduction to OSHA, walking and working surfaces, exit routes, emergency action plans, fire prevention plans, fire protection, fall protection, electrical safety, and other applicable safety topics as recommended by OSHA. Course completion cards

will be issued to individuals successfully completing the class. Not open to students with credit for ENVR 170.

Lecture: 1 hour Lab fee: \$10.00

ENVR 170 General Industry Safety and Health (A) 4 credits

This course covers the approved Occupational Safety and Health Administration (OSHA) curriculum for the 30-hour Outreach Training Program. Topics include an introduction to OSHA, hazardous materials, walking and working surfaces, fire protection, personal protective equipment, confined space, lockout/tagout, machine guarding, welding and brazing safety, electrical safety, industrial hygiene and other applicable OSHA standards. Course completion cards will be issued to individuals successfully completing the class.

Lecture: 4 hours Lab fee: \$10.00

ENVR 220 Environmental Chemistry (On Demand) 5 credits

Effective solutions to environmental problems require an understanding of the chemical processes that occur in the environment. This course provides a basic knowledge of environmental chemistry including water, soil and atmospheric chemistry. The chemistry of the transport and fate of pollutants in the environment, hazardous material chemistry and toxicology are covered. Related laboratory exercises will be performed including utilizing analytical techniques, instrumentation and quality assurance.

Lecture: 4 hours – Lab: 3 hours

Prerequisite: CHEM 111 Lab fee: \$18.00

ENVR 222 Water Treatment Techniques (SU) 3 credits

This course is designed to permit the student to attempt the State of Ohio Class One Water Operator's exam. The course will emphasize water quality methods of water treatment and laboratory processes. Practical experience will be emphasized.

Lecture: 2 hours – Lab: 2 hours

Prerequisites: High school chemistry or any CHEM course, MATH 102 or a higher math course, or permission of instructor

Lab fee: \$20.00

ENVR 223 Wastewater Treatment Techniques (W) 3 credits

This course is designed to provide the training to permit the student to attempt the State of Ohio Class One Wastewater Operator exam. The course will emphasize types of treatment, equipment, hygiene and public health aspects, sewer systems, and laboratory processes. Practical experiences will be emphasized.

Lecture: 2 hours – Lab: 2 hours

Prerequisite: High school chemistry or any CHEM course, MATH 102 or a higher math course, or by permission of instructor

Lab fee: \$20.00

ENVR 224 Environmental Hydrology (SP) 3 credits

Course studies the occurrence, movement, and behavior of water in the hydrologic cycle. Also presents an introduction to the concepts of controlling the movement of surface water and ground water, and the ways in which these resources can be exploited and/or contaminated.

Lecture: 2 hours – Lab: 2 hours

Prerequisite: MATH 102 Lab fee: \$15.00

ENVR 240 Environmental Analytical Methods (W) 2 credits

This course provides an overview of the qualitative and quantitative

analysis of environmental, waste and building material samples. An overview of laboratory methods will be provided. The emphasis will be on the application of certain analytical methods commonly used in the environmental industry.

Lecture: 1 hour - Lab: 3 hours

Prerequisites: CHEM 100 or CHEM 111 Lab fee: \$20.00

ENVR 250 Environmental Sampling (A) 5 credits

ENVR 250 covers the techniques and methods used in sampling of environmental media, especially for field investigations. Emphasized is the sampling of air, surface water, ground water, soil and hazardous materials. Topics include the regulatory framework, project coordination, drilling techniques, monitoring well installation, field instrument calibration, decontamination, and supplemental investigative techniques.

Lecture: 4 hours – Lab: 3 hours Lab fee: \$20.00

ENVR 252 Health and Safety Training for Hazardous Waste Operations (40-Hour OSHA Training) (W, SP, DL, SU) 3 credits

Satisfies 29 CFR Part 1910.120(e) under OSHA. A health and safety training course for individuals who may be involved in the investigation, remediation and operation of hazardous waste sites. Topics include hazardous materials chemistry, toxicology, air monitoring instrumentation, air purifying respirators, self-contained breathing apparatus, supplied air respirator systems, protective clothing, decontamination, simulated hazardous materials response incidents, and appropriate problem sets. Students enrolled in the distance version of this course will be required to come to campus for an orientation meeting, completion of hands-on laboratory exercises, and for the final exam.

Lecture: 2 hours – Lab: 3 hours Lab fee: \$100.00

ENVR 253 Environmental Systems Analysis (SP) 3 credits

This course introduces engineered environmental systems and practical applications of their operation and maintenance. Topics include flow diagrams, schematics, plumbing and piping, pumps, blowers, electrical systems, instrumentation, flow measurements, process control, troubleshooting and safety for engineered systems.

Lecture: 2 hours – Lab: 2 hours

Prerequisite: ENVR 110 Lab fee: \$18.00

ENVR 254 Subsurface Restoration Techniques (SP) 5 credits

This course will address subsurface remediation techniques and treatment technologies used at hazardous waste sites. Course topics include the regulatory framework for subsurface restoration, clean-up goals, basic contaminant chemistry and transport, supplemental subsurface investigative techniques, soil and groundwater remediation techniques, and water and air treatment technologies.

Lecture: 4 hours – Lab: 3 hours

Prerequisite: ENVR 250 Lab fee: \$20.00

ENVR 255 Air Pollution and Monitoring (W) 3 credits

This course covers the fundamentals of air pollution, such as sources, important atmospheric aspects and the effects of air pollutants. It also focuses on EPA methods for stack and ambient sampling of various air contaminants. Other topics include continuous emission monitoring, air pollution control options, and applicable permitting and reporting requirements.

Lecture: 2 hours – Lab: 2 hours

Prerequisite: CHEM 111 Lab fee: \$23.00

ENVR 256 Hazardous Materials Refresher Training (W, SU, DL)

1 credit

This course provides refresher training for site workers and emergency operators who have completed the 24 or 40-hour courses and complies with the 29 CFR 1910.120 refresher training requirements. Emphasis is placed on practical exercises and review of relevant changes in OSHA requirements. Successful completion of the course is based on classroom participation and completion of a written assignment. Students enrolled in the distance version of this course will be required to come to campus to complete the final quiz. This is a repeatable course.

Lecture: 1 hour – Lab: 0 hours Lab fee: \$50.00

ENVR 265 OSHA 30-Hour Construction Safety and Health

(W, SP)

4 credits

This course covers the approved Occupational Safety and Health Administration (OSHA) curriculum for the 30-hour Outreach Training Program for the Construction Industry Safety and Health. Topics include an introduction to OSHA, safety and fall protection, health hazards, material handling, equipment safety, concrete and masonry construction, welding and cutting, excavation, stairways and ladder safety and other applicable OSHA standards. Course completion cards will be issued to individuals successfully completing the class.

Lecture: 4 hours Lab fee: \$10.00

ENVR 275 Industrial Hygiene (SP)

4 credits

This course is an overview of the science of industrial hygiene and describes the process of investigating and examining workplace hazards and how those hazards are abated. The laboratory will emphasize the use of instrumentation and important calculations. Topics include introduction to industrial hygiene, principles of toxicology, occupational safety and health standards, occupational skin and noise disorders, indoor air quality, ergonomics, engineering and administrative controls, and personal protective equipment.

Lecture: 3 hours – Lab: 2 hours

Prerequisite: CHEM 111 or permission of instructor

Lab fee: \$10.00

ENVR 282 Sustainable Building Strategies (SP)

3 credits

This course is an introduction to the field of environmentally-friendly construction. Sustainable architecture and building site principles will be presented, including strategies for energy-efficient heating and cooling, “green” building materials and methods, alternative energy sources, water efficiency and waste management. Topics include the need for sustainability, energy efficient design, construction and controls, site selection, passive solar heating and cooling, “green” building materials and methods, alternative energy sources and water efficiency and waste management.

Lecture: 3 hours Lab fee: \$10.00

ENVR 283 Ecological Residential Construction (On Demand)

3 credits

This course addresses the important aspects of building green homes. The topics include environmentally friendly design, the use of alternative materials, and the utilization of sustainable systems.

Lecture: 2 hours – Lab: 2 hours Lab fee: \$10.00

ENVR 291 Field Experience (SU or On Demand) 3 credits

ENVR 291 offers an off-campus work experience in the environmental services industry that augments formal education received in the technology with actual work conditions and job experience. “N” credit will not be allowed for this course.

Lecture: 0 hours – Lab: 36 hours Lab fee: \$15.00

ENVR 299 Special Topics on Environmental Science, Safety and Health (On Demand) 1–5 credits

ENVR 299 explores special topics from the environmental industry designed to meet specific needs.

Lecture and/or Lab Hours: Vary

ENVIRONMENTAL SCIENCE, SAFETY AND HEALTH

Chairperson, Dick Bickerstaff, B.A., *Youngstown State University, M.A., The Ohio State University*

Coordinator, Professor Jeffrey K. Bates, B.A., *State University of New York at Buffalo, M.S., Bowling Green State University, Ph.D., The Ohio State University*

Advisory Committee

Jeffrey L Bertacchi.....City of Columbus
William Carter.....The University of Findlay
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Andrew Wehr, CSP.....Cardinal Health