CIVIL ENGINEERING TECHNOLOGY

Sylvania Campus
Science Technology Building (ST), Room 200
971-722-4159
pcc.edu/programs/civil-engineering/

CAREER AND PROGRAM DESCRIPTION

Civil engineering technicians are problem-solvers, working as part of a team involved in the planning, design, construction, operation, and management of many types of projects. These may include buildings, bridges, dams, highways, rapid transit facilities, airport and coastal improvements, land development projects, residential and commercial complexes, utilities, and environmental protection facilities such as water and wastewater treatment plants, air pollution control systems, solid and hazardous waste disposal systems, and storm water control facilities. These skilled professionals work on a variety of assignments including: design calculations, computer-aided drafting, environmental sampling, engineering and boundary surveying, laboratory testing, specification writing, technical sales, scheduling, estimating, and construction management, among others. Employers of CET’s include consulting engineering firms, government agencies, utilities, construction companies, manufacturers, and materials testing laboratories.

The PCC Civil Engineering Technology program is designed to develop marketable skills in a broad range of technical areas, as well as in problem analysis and solution, spoken and written communication, computer software use, and computer-aided drawing. While providing a curriculum strong in mathematics and engineering topics, our teaching format also emphasizes student involvement, teamwork, and extensive student-instructor interaction.

DEGREES AND CERTIFICATES OFFERED

ASSOCIATE OF APPLIED SCIENCE DEGREE
Civil Engineering Technology
Civil Engineering Technology: Green Technology and Sustainability Option

TWO-YEAR CERTIFICATE
Civil Engineering Technology

ADMISSION PREREQUISITES

Academic Prerequisites

• CET is a limited-entry program. Prospective students must meet with an engineering technology advisor prior to registering for any CMET courses
• Civil Engineering Technology AAS:
  - WR 115 or IRW 115 or equivalent placement.
  - MTH 58 or MTH 60 or higher, or equivalent placement.
• Civil Engineering Technology: Green Technology and Sustainability AAS requirements
  - WR 121 or equivalent placement.
  - MTH 58 or MTH 60 or higher, or equivalent placement.
• Civil Engineering Technology Certificate requirements:
  - WR 115 or IRW 115 or equivalent placement.
  - MTH 58 or MTH 60 or equivalent placement.

• High school courses in chemistry and physics are helpful, but not required. Skill in keyboarding is highly recommended. A specific calculator is required.
• For students not meeting these requirements, advising is available to assist in preparing for entrance into the program and to earn credits which will apply toward the certificate or degree once accepted into the program.

Other Prerequisites

• Full-time students: CET is a limited enrollment program for students seeking a certificate or degree. Qualified applicants are accepted in the order in which the application process is completed. Program starts in fall and winter terms. See a program advisor for other term starts.
• Job-upgrade students: Non-program students seeking to upgrade job skills are welcome to enroll in individual courses. Students must meet individual course prerequisites and complete an advising interview with a CET faculty advisor prior to enrollment. Admission is granted on a space-available basis after the needs of the full-time students have been met.
• Continuing education: Students of this program may transfer to various out-of-state institutions to pursue a Bachelor of Science degree in civil or construction engineering technology or to Oregon State University for a degree in construction engineering management. Faculty advisors will provide assistance in the selection of additional course work appropriate to each student’s goals.

PROGRAM REQUIREMENTS

Academic Requirements

• None

Other Requirements

• None

Non-Academic Prerequisites

• Full-time students: CET is a limited enrollment program for students seeking a certificate or degree. Qualified applicants are accepted in the order in which the application process is completed. Program starts in fall and winter terms. See a program advisor for other term starts.
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Non-Academic Requirements

• None

ASSOCIATE OF APPLIED SCIENCE DEGREE
Civil Engineering Technology (p. 1)
Civil Engineering Technology: Green Technology and Sustainability Option (p. 2)

CIVIL ENGINEERING TECHNOLOGY AAS DEGREE

Minimum 97 credits. Students must also meet Associate Degree Comprehensive Requirements and Associate of Applied Science Requirements. Students must complete a total of sixteen credits of General Education. Some courses specified within the program may be used as General Education. Math/computation competency is met through the courses in the program of study indicated with a §
symbol. Students should consult with program advisors for course planning.

COURSE OF STUDY

The coursework listed below is required. The following is an example of a term-by-term breakdown.

First Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMET 110</td>
<td>Statics or Statics</td>
<td>4</td>
</tr>
<tr>
<td>or ENGR 211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMET 111</td>
<td>Portland Design: Brews, Bridges and Bikes</td>
<td>3</td>
</tr>
<tr>
<td>CMET 112</td>
<td>Technical Algebra/Trigonometry ¹</td>
<td>4</td>
</tr>
<tr>
<td>or MTH 95</td>
<td>or Intermediate Algebra</td>
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</tr>
<tr>
<td>ENGR 102</td>
<td>Engineering Graphics</td>
<td>3</td>
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<tr>
<td>General Education</td>
<td></td>
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Second Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CMET 121</td>
<td>Strength of Materials or Strength of Materials</td>
<td>4</td>
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<tr>
<td>or ENGR 213</td>
<td></td>
<td></td>
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<tr>
<td>CMET 122</td>
<td>Global Energy Physics</td>
<td>4</td>
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<tr>
<td>or PHY 201 and</td>
<td></td>
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<tr>
<td>PHY 202</td>
<td>or General Physics and General Physics</td>
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<td>or PHY 211 and</td>
<td>or General Physics (Calculus) and</td>
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</tr>
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<td>PHY 212</td>
<td>or General Physics (Calculus)</td>
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</tr>
<tr>
<td>CMET 123</td>
<td>Technical Algebra with Analytic Geometry ² or Elementary Functions</td>
<td>4</td>
</tr>
<tr>
<td>or MTH 112</td>
<td></td>
<td></td>
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<tr>
<td>CMET 241</td>
<td>Structural Steel Drafting</td>
<td>3</td>
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<td>Third Term</td>
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<table>
<thead>
<tr>
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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Inorganic Chemistry Principles</td>
<td>5</td>
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<tr>
<td>CMET 131</td>
<td>Applied Calculus</td>
<td>8</td>
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<tr>
<td>or MTH 251 and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTH 252</td>
<td>or Calculus I and Calculus II</td>
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<tr>
<td>CMET 213</td>
<td>Fluid Mechanics §</td>
<td>3</td>
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Fourth Term

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<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>CMET 221</td>
<td>Environmental Systems</td>
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<tr>
<td>CMET 233</td>
<td>CET Applied Computer Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>CMET 255</td>
<td>Civil and Mechanical Professional Skills Development I</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 226</td>
<td>Plane Surveying</td>
<td>4</td>
</tr>
<tr>
<td>GEO 265</td>
<td>Introduction to GIS (Geographical Information Systems)</td>
<td>4</td>
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</table>

| Total Credits | 14 |

Fifth Term

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CMET 211</td>
<td>Environmental Quality</td>
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</tr>
<tr>
<td>CMET 223</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>CMET 228</td>
<td>Construction Materials</td>
<td>3</td>
</tr>
<tr>
<td>GEO 266</td>
<td>GIS Analysis</td>
<td>4</td>
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<tr>
<td>General Education</td>
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</tbody>
</table>

| Total Credits | 18 |

Sixth Term

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>COMM 215</td>
<td>Small Group Communication: Process and</td>
<td>4</td>
</tr>
<tr>
<td>or COMM 100</td>
<td>Theory or Introduction to Communication or Public Speaking</td>
<td></td>
</tr>
<tr>
<td>or COMM 111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMET 214</td>
<td>Surveying II</td>
<td>3</td>
</tr>
<tr>
<td>CMET 236</td>
<td>Structural Design</td>
<td>3</td>
</tr>
</tbody>
</table>

| Total Credits | 97 |

General Education | 4 |

Credits | 14 |

Total Credits | 97 |

* Could be be used as General Education

§ Course cannot be substituted with another course.

¹ Or any course for which MTH 95 is a prerequisite.

² Or any course for which MTH 112 is a prerequisite.

GREEN TECHNOLOGY AND SUSTAINABILITY AAS DEGREE

Minimum 100 credits. Students must also meet Associate Degree Comprehensive Requirements and Associate of Applied Science Requirements. Students must complete a total of sixteen credits of General Education. Some courses specified within the program may be used as General Education. Math/computation competency is met through the courses in the program of study indicated with a § symbol. Students should consult with program advisors for course planning.

Green Technology and Sustainability Degree Courses

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<td>Technical Algebra/Trigonometry ¹</td>
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<tr>
<td>or MTH 95</td>
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<tr>
<td>CMET 233</td>
<td>CET Applied Computer Aided Design</td>
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<td>CMET 255</td>
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<td>Introduction to GIS (Geographical Information Systems)</td>
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CIVIL ENGINEERING TECHNOLOGY

GEO 266  GIS Analysis  4
SOC 228  Introduction to Environmental Sociology *  4
General Education  8

Total Credits  100

* Could be used as General Education

§ Course cannot be substituted with another course.  
1 Or any course for which MTH 95 is a prerequisite.
2 Or any course for which MTH 112 is a prerequisite.

CIVIL ENGINEERING TECHNOLOGY TWO-YEAR CERTIFICATE

Minimum 69 credits. Students must also meet certificate requirements.

COURSE OF STUDY

The coursework listed below is required. The following is an example of a term-by-term breakdown.

First Term
CMET 110  Statics  4
or ENGR 211  or Statics
CMET 111  Portland Design: Brews, Bridges and Bikes  3
CMET 112  Technical Algebra/Trigonometry  
or MTH 95
or Intermediate Algebra
ENGR 102  Engineering Graphics  3
WR 121  English Composition  
or WR 122
or Technical and Professional Writing

Credits  18

Second Term
CMET 121  Strength of Materials  4
or ENGR 213  or Strength of Materials
CMET 122  Global Energy Physics  4
or PHY 201  or General Physics and General Physics
and PHY 202
or PHY 211  or General Physics (Calculus) and
and PHY 212
CMET 123  Technical Algebra with Analytic
or MTH 112
or Elementary Functions
CMET 241  Structural Steel Drafting  3

Credits  15

Third Term
CH 101  Inorganic Chemistry Principles  5
CMET 131  Applied Calculus  8
or MTH 251  or Calculus I and Calculus II
and MTH 252
CMET 213  Fluid Mechanics  
§
CMET Human Relations Electives 
§

Credits  20

Fourth Term
CMET 221  Environmental Systems  3
CMET 233  CET Applied Computer Aided Design  3
CMET 255  Civil and Mechanical Professional Skills  2
Development I
ENGR 226  Plane Surveying  4

Credits  16

Total Credits  69

§ Course contains Related Instruction and cannot be substituted with another course. Related Instruction details can be viewed here.

1 Or any course for which MTH 95 is a prerequisite.
2 Or any course for which MTH 112 is a prerequisite.

CMET HUMAN RELATIONS ELECTIVES

Code  Title  Credits
CG 191  Exploring Identity and Diversity for College Success  4
PSY 101  Psychology and Human Relations  4
PSY 201A  Introduction to Psychology - Part 1  4
PSY 202A  Introduction to Psychology - Part 2  4
PSY 214  Introduction to Personality  4
PSY 215  Human Development  4
PSY 216  Social Psychology  4
PSY 222  Family & Intimate Relationships  4
PSY 231  Human Sexuality  4
PSY 232  Human Sexuality  4
PSY 236  Psychology of Adult Development and Aging  4
PSY 239  Introduction to Abnormal Psychology  4
PSY 240  Personal Awareness and Growth  4
SOC 204  Sociology in Everyday Life  4
SOC 206  Social Problems  4
SOC 213  Diversity in the United States  4
SOC 218  Sociology of Gender  4
SOC 232  Death and Dying: Culture and Issues  4
WS 101  Women's Studies  4

CMET 110. Statics. 4 Credits.
Covers fundamental concepts of mechanics relating to forces acting on rigid bodies in both two dimensions and three dimensions. Includes drawing complete free-body diagrams to solve engineering problems. Addresses external forces, moments of a couple, reactions, internal forces and moments. Covers friction for dry surfaces, moments of inertia and centroids. Corequisite: CMET 111. Prerequisites: MTH 60 and placement in WR 115. Audit available.

CMET 111. Portland Design: Brews, Bridges and Bikes. 3 Credits.
Enthusiastic appreciation for design and engineering through the prism of three design topics that Portland is known for: coffee, bridges and bikes. Focuses on ‘back of the envelope’ engineering, problem solving, making and building, and professional skills and teamwork. Covers trigonometry and scientific calculator operations. Introduces the engineering technician profession and engineering ethics. Includes time in the MakerSpace, CMET labs and field trips. Audit available.

CMET 112. Technical Algebra/Trigonometry. 4 Credits.
Includes algebra and trigonometry used in CMET 110 and 111, emphasizing simultaneous linear equations, quadratic equations and applied problems. Prerequisites: MTH 60 and placement in WR 115. Department approval required. Audit available.

CMET 121. Strength of Materials. 4 Credits.
Covers the relationship between stress and strain on deformable solids. Applies analysis to members subjected to axial, bending, and torsional loads. Covers combined stresses and properties of structural materials. Prerequisites: CMET 110, CMET 112, and (ENGR 102 or ENGR 105). Prerequisite/Concurrent: CMET 122. Audit available.

CMET 122. Global Energy Physics. 4 Credits.
Introduces physical properties of matter and energy, including properties of solids, liquids and gases. Presents applications of the basic equations of fluid mechanics, heat transfer, and the First Law of Thermodynamics, as well as application of these concepts to the human population’s energy supply and demand. Prerequisite/concurrent: CMET 121, CMET 123. Audit available.
CMET 123. Technical Algebra with Analytic Geometry. 4 Credits.
Covers algebra and geometry of special interest to engineering technicians, including solving higher order equations, determinants, matrix operations, logarithms and trigonometric identities. Introduces plane analytical geometry in preparation for calculus, emphasizing development of skills and confidence to solve advanced pre-calculus problems. Prerequisite: CMET 112 or MTH 111. Audit available.

CMET 131. Applied Calculus. 8 Credits.
Introduces differential and integral calculus, with applications to engineering problems, including kinematics, moments of inertia and deflections of beams. Specific calculator required, see advisor. Prerequisites: CMET 121, 122, 123. Audit available.

CMET 133. Materials Technology. 3 Credits.
Covers selection of materials for engineering technology applications. Explores structures and properties of metals, ceramics, and polymers starting with fundamental atomic arrangements. Covers microstructural control through thermal and mechanical processing and effects of service environment. Prerequisites: CMET 121, CMET 123, CH 101, and (WR 115 or IRW 115). Audit available.

CMET 211. Environmental Quality. 4 Credits.
Introduces physical, chemical and biological parameters relating to the quality of water. Presents sampling systems, data analysis techniques and computational methods, including mathematical models. Recommended: CMET 131. Prerequisites: CMET 123, CH 104, and (WR 115 or IRW 115). Prerequisite or concurrent: WR 121. Audit available.

CMET 212. Thermodynamics I. 4 Credits.
Covers principles of classical thermodynamics. Develops understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. Covers first and second laws of thermodynamics, perfect gas law, properties of real gases, and the general energy equation for closed and open systems. Prerequisites: CMET 131, CMET 122 and CH 101. Audit available.

CMET 213. Fluid Mechanics. 3 Credits.
Covers properties of fluids, laws of fluid mechanics and energy relationships for incompressible fluids. Studies flow in closed conduits, including pressure loss, flow measurement, pipe sizing and pump selection. Recommended: CMET 131. Prerequisites: CMET 110, CMET 122, CMET 123. Audit available.

CMET 214. Surveying II. 3 Credits.
Presents techniques for preliminary location and construction surveys. Includes elements of horizontal and vertical location for roadways, including circular and parabolic curves. Covers use of advanced capabilities of electronic total stations, include data logging. Prerequisite: ENGR 226. Audit available.

CMET 215. Environmental Systems. 3 Credits.
Explores ground water, air, hazardous waste, and water pollution problems. Presents data analysis techniques and computational methods. Examines technological solutions of these problems, including water, wastewater, and air pollution treatment, as well as alternatives. Prerequisites: CMET 123, (WR 115 or IRW 115). Audit available.

CMET 221. Thermodynamics II. 4 Credits.
Covers application of principles of thermodynamics in the analysis of vapor and gas power cycles, refrigeration and heat pump machinery, and air distribution systems. Combustion reactions, ideal gas mixtures, and properties of moist air (psychrometrics) are also studied. Prerequisite: CMET 212. Audit available.

CMET 222. Project Management. 3 Credits.
Administration of engineering projects. Covers owner-design professional-constructor relationships, law and contracts, specifications writing and interpretation, cost estimating, engineering economy, and planning and scheduling (CPM and time-scaled arrow diagrams). Recommended: COMM 100 or COMM 111. Prerequisites: CMET 123. Prerequisite or concurrent: WR 121. Audit available.

CMET 226. Dynamics. 3 Credits.
Covers kinematics and kinetics principles relating to the motion of particles and rigid bodies. Examines force, mass, acceleration and velocity relationships. Includes practical linear and curvilinear motion problem solving. Covers work-energy and impulse-momentum methods. Prerequisite: CMET 110 and CMET 131. Audit available.

CMET 227. Applied Electricity Fundamentals. 2 Credits.
Introduces fundamentals of electricity as applied to mechanical systems. Principle topics covered: basic electrical theory, electric motors, controls, and energy consumption considerations. Prerequisite: CMET 112. Audit available.

CMET 228. Construction Materials. 3 Credits.
Covers production, processing, and testing of aggregate, asphalt, concrete, soil and other materials in highway and commercial/industrial building projects. Includes quality assurance concepts, measurements and calculations, terminology and random sampling. Focuses on testing procedures common to construction in the northwest. Recommended: CMET 131. Prerequisites: CMET 121, 122, 153. Prerequisite/concurrent: WR 121. Audit available.

CMET 233. CET Applied Computer Aided Design. 3 Credits.
Presents advanced topics in civil engineering-oriented computer aided design and drafting meeting industry standards. Prerequisite: CMET 241. Prerequisite or concurrent: CMET 214. Audit available.

CMET 235. Machine Design. 3 Credits.
Examines fundamentals of machine design, including analysis and design of mechanical components. Covers shafts, fasteners, belt and chain drives, brakes, gears, springs and bearings. Includes predicting static and fatigue failures for various loadings and materials. Prerequisite: CMET 121, 226. Audit available.

CMET 236. Structural Design. 3 Credits.
Introduces design of steel, wood, and reinforced concrete structures with emphasis on steel buildings. Covers beam and column design along with bolted and welded connections. Recommended: CMET 131. Prerequisites: CMET 121, 122, 123, and (WR 115 or IRW 115). Audit available.

CMET 237. MET Applied Computer Aided Design. 3 Credits.
Presents topics in solid modeling for mechanical/manufacturing engineering computer aided design and drawing, meeting industry standards. Prerequisite: ENGR 102. Audit available.

CMET 241. Structural Steel Drafting. 3 Credits.
Introduces structural detail drafting of engineering design drawings and shop fabrication drawings for steel construction. Covers steel grades and shapes; and design, fabrication, and erection drawings for steel structures. Prerequisites: ENGR 102, CMET 121. Audit available.

CMET 254. Civil/Mechanical Engineering Technology Seminar. 1 Credit.
Covers job searching and resume building skills for civil and mechanical engineering technicians. Includes resumes, interviewing, communication skills, and professionalism in the workplace. Prerequisites: CMET 133, WR 121. Audit available.

CMET 280A. Cooperative Ed: Civil/Mechanical Engineering Technology. 1-5 Credit.
An opportunity to develop engineering technology skills in a department-approved work setting. Department permission required. Audit available.