Sustainable Energy Engineering
Master of Science

Responding to climate change, rising energy costs, and security issues facing society, the School of Engineering and Mines offers Master of Science and Master of Engineering degrees in Sustainable Energy Engineering. These degree programs continue UND’s tradition as a world leader in energy-related research and education. The Sustainable Energy Engineering program educates graduate students in the growing field of sustainable energy engineering which includes the absorption and conversion of wind energy; geothermal energy conversion; renewable fuels and chemicals; hydrogen production, storage, distribution, and utilization; energy efficiency; the environmentally acceptable use of coal; the absorption and conversion of solar energy and other technologies. Coursework is designed to help students develop a broad background in the technical, economic, and societal factors needed to develop sustainable energy. Research projects provide focused, experiential learning in areas of sustainable energy engineering. Projects are often conducted through our interdisciplinary Sustainable Energy Research, Infrastructure and Supporting Education (ND SUNRISE) research initiative, the Petroleum Research, Education and Entrepreneurship Center of Excellence (PREEC) or in collaboration with the Energy and Environmental Research Center.

This program is designed to equip students for careers associated with sustainable energy technologies as well as to conduct research and development activities or to pursue advanced studies associated with technologies that will provide sustainable sources of energy in the future. Coursework will be designed to help students develop a broad background in the technical, economic, and societal factors needed to develop sustainable energy. Graduates from this program are expected to find employment in the emerging renewable energy economic sector as well as in the coal-fired utilities industry and supporting engineering companies. The M.S. degree is the most common option in the Sustainable Energy Engineering program and financial aid is provided to the vast majority of students working towards this degree.

The objective of the Sustainable Energy Engineering Master of Science program is to equip students for careers conducting research and development activities in sustainable energy fields, or pursuing advanced studies in technologies that will provide sustainable sources of energy in the future. This preparation will be customized to meet specific areas of interest to the students and for which the faculty is qualified to manage and instruct.

**Goal 1:** Graduates will have mastered selected topics in Sustainable Energy Engineering and related areas to achieve their specific goals and objectives.

**Goal 2:** Graduates will be proficient researchers, having the skills required to formulate, assess, and document a hypothesis.

**Goal 3:** Graduates will be well prepared for a career in industry, government, or doctoral studies in sustainable energy engineering.

**Admission Requirements**
The applicant must meet the School of Graduate Studies’ current minimum general admission requirements as published in the graduate catalog.
1. B.S. degree in chemical, mechanical or environmental engineering or related field. Students holding a B.S. degree in a science or an unrelated engineering field may be admitted to Qualified Status with an obligation to acquire background undergraduate engineering knowledge. The exact requirements will be determined on a case-by-case basis.
2. An overall undergraduate GPA of at least 2.75, or 3.00 for the last two years. (An overall GPA of at least 3.3 for the combined BS ChE / MS SEE or combined BS ME / MS SEE degree is required.)
3. Graduate Record Examination General Test for those with undergraduate degrees from non-ABET accredited programs.
4. Satisfy the School of Graduate Studies’ English Language Proficiency requirements as published in the graduate catalog.

**Degree Requirements**
1. A minimum of 30 semester credits, including the credits granted for the thesis and the research leading to the thesis.
2. At least one-half of the credits must be at or above the 500-level.
3. A maximum of nine semester credits may be transferred from another institution.
4. Required Courses:

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHE 562</td>
<td>Seminar in Chemical Engineering (one credit per semester)</td>
<td>2</td>
</tr>
<tr>
<td>CHE 591</td>
<td>Research</td>
<td>3</td>
</tr>
<tr>
<td>CHE 998</td>
<td>Thesis</td>
<td>4</td>
</tr>
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<td></td>
<td>At least 21 credits of coursework from sustainable energy engineering and related fields</td>
<td>21</td>
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Deadlines apply. See our website for more details.

Last Updated: 7/9/2014

Email: questions@gradschool.und.edu
which may include a minor or cognate

<table>
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<th>Total Credits</th>
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<td>30</td>
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5. A thesis documenting research on a topic related to sustainable engineering.

**Non-Thesis Option**

1. A minimum of 32 semester credits, including credits granted for the independent study project.
2. At least one-half of the credits must be at or above the 500-level.
3. A maximum of nine semester credits may be transferred from another institution.
4. Required Courses:

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<thead>
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</thead>
<tbody>
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<tr>
<td>CHE 591</td>
<td>Research</td>
<td>4</td>
</tr>
<tr>
<td>CHE 997</td>
<td>Independent Study</td>
<td>2</td>
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<td></td>
<td>At least 24 credits of coursework from sustainable energy engineering and related fields</td>
<td>24</td>
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<tr>
<td></td>
<td>Total Credits</td>
<td>32</td>
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5. Preparation of a written independent study report approved by the faculty advisor
6. Passing of a comprehensive final examination.

**Faculty and Areas of Expertise**

- **Forrest Ames, Ph.D., P.E.,** External Gas Path Heat Transfer, Film Cooling, and Aerodynamics, Influence of Flow Field Turbulence, Turbulence Modeling, Gas Turbine Component Cooling
- **Steve Benson,** Renewable and fossil fuel properties, Clean and efficient gasification and combustion systems, Fireside behavior of ash and slag, Carbon products, Carbon dioxide separation, capture, and sequestration, Materials analysis – electron microscopy and x-ray microanalysis
- **Frank Bowman,** Atmospheric aerosols, organic aerosol partitioning, mathematical modeling of multicomponent aerosols, air quality modeling, educational technology, assessment of student learning, educational air pollution models
- **Matthew Cavalli, Ph.D.,** Solid Mechanics, Materials, Manufacturing
- **William D. Gosnold, Ph.D.,** Heat flow, Tectonics, Global Change, Isostasy, Structural Geology
- **Nanak Grewal, Ph.D.,** Heat Transfer in Fluidized Beds
- **Yun Ji,** Renewable and sustainable energy, chemicals and biofuels from biomass, enzymatic hydrolysis, integrated energy and environmental projects, process simulation
- **Edward Kolodka,** Polymer reaction engineering, synthesis, rheological, and mechanical properties of novel polymers, biopolymers, development of improved adhesives for wood laminates.
- **Gautham Krishnamoorthy,** Computational fluid dynamics, simulations of combustion reaction flows, carbon capture technologies, radiative heat transfer.
- **Michael Mann,** Performance issues in advanced energy systems firing coal and biomass, emission control, renewable energy systems, and the development of energy strategies based on thermodynamics and economics.
- **Jaakko Putkonen, Ph.D.,** Geomorphology, Surface Processes, Quaternary Geology
- **Hossein Salehfar, Ph.D.,** Power Systems, Power Electronics, Intelligent Systems (Neural Networks & Fuzzy Logic), and Electromagnetics
- **Wayne Seames,** Mitigation of the environmental impact of heavy metals, trace element partitioning from combustion and incineration, alternative fuels development, new products and improved processing of agriculture, biochemical unit operations, environmental impacts from wood and concrete contamination.
- **Brian Tande,** Phase behavior and rheology of polymeric and nanodisperse systems, block copolymer morphology, neutron scattering of polymers, novel materials for hydrogen storage, biopolymers and biocomposites.
- **Robert Wills,** Non-thermal drying of solids by chemical dehydration, vegetative oil extraction and product enhancement.
- **Marcellin Zahui, Ph.D.,** Control Systems, Acoustic, Active Noise and Vibration Control

**Contact Information**

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