

# RENEWABLE ENERGY (RENG)

## **RENG 101. Basic Elec Renewable Energy. (4 Credits)**

Explore the fundamentals of DC and AC electrical circuits applied to renewable energy systems. Engage in hands-on laboratory exercises that reinforce theoretical concepts and prepare you for advanced renewable energy coursework. Gain practical knowledge of power conditioning components, including charge controllers, inverters, and diversion loads, essential for designing and maintaining energy systems. This course provides a strong foundation for understanding and applying electrical principles in diverse renewable energy applications. Pre or Corequisite: MATH 102, 123 or 141. 4 credits (3 lecture hours and 2 lab hours), fall semester.

## **RENG 102. Renewable Energy Resources. (3 Credits)**

Explore renewable energy with a scientific focus on alternative energy sources, their technologies, and applications. Survey the evolving energy landscape by examining past, present, and future energy needs, including conventional energy sources, bioenergy, wind, geothermal, solar, and nuclear power. Gain practical insights to enhance energy conservation and efficiency practices, promoting sustainable energy solutions. Knowledge of intermediate algebra is highly recommended for this course. This course satisfies the Liberal Arts and Sciences requirement and the SUNY General Education Requirement for Natural Science. 3 credits (3 lecture hours), fall and spring semester.

## **RENG 103. Renewable Energy Seminar. (1 Credit)**

Explore and discuss challenges and opportunities shaping the renewable energy industry and current sustainability efforts. Learn about jobs opportunities and career paths in the renewable energy field. 1 credit (1 lecture hour per week), fall semester.

## **RENG 150. Analysis Techniques for Renewable Energy. (3 Credits)**

Strengthen your ability to interpret data and solve problems within the context of renewable energy systems, laying the groundwork for advanced studies and practical applications in the field. Build essential data analysis skills using a variety of analytical tools, enabling you to apply concepts to real-world renewable energy examples. This course equips you with the mathematical and analytical expertise needed to succeed in the dynamic and evolving renewable energy industry. Pre or Corequisites: MATH 102, 123 or 141 and RENG 102. 3 credits (3 lecture hours), fall or spring semester.

## **RENG 221. Introduction to Wind Systems. (3 Credits)**

Prepare for a career in the wind energy sector with a strong foundation in both theoretical concepts and practical applications critical to the field. Explore the fundamentals of wind energy, including the effects of turbulence, frequency distributions, and tower height on wind resources. Gain hands-on experience with the installation, maintenance, and troubleshooting of wind systems. This course aligns with the Job Task Analysis for the NABCEP Small Wind Associate examination and provides essential skills for aspiring industrial wind technicians. This course has an additional lab fee. Prerequisites: RENG 101 or DTEC 125 or RESC 125 minimum grade of C. Corequisite: PHYS 107. 3 credits (2 hours lecture, 2 hours laboratory), spring semester.

## **RENG 225. Tower Climbing and Rescue. (2 Credits)**

Develop industry-relevant tower climbing, rescue, and rigging skills through hands-on experience on our indoor and outdoor tower climbing facilities. Understand tower climbing standards and industry terminology, competent climber expectations and duties, and fall protection equipment inspections. Build confidence in working safely at heights and performing team tasks in stressful conditions. This course is physically demanding and requires the willingness to be at heights; students must be able to lift 50 pounds and climb a ladder. This course has an additional lab fee. 2 credits (1 lecture hour, 3 lab hours), fall and spring semester.

## **RENG 231. Solar Photovoltaic Installation. (3 Credits)**

Prepare for a career in the solar energy industry with a strong foundation in both theoretical concepts and practical applications. Explore the fundamentals of solar energy, including the effects of seasonality, aspect, and latitude on solar resources. Engage with system components and design principles for solar photovoltaic electricity generation in both grid-tied and off-grid systems. This course aligns with the Job Task Analysis for the NABCEP Solar PV Associate examination, providing a strong foundation for certification and careers in solar energy. This course has an additional laboratory fee. Prerequisites: RENG 101 or DTEC 125 or AGEN 125, and MATH 102, 123 or 141 minimum grade of C. 3 credits (2 hours lecture, 2 hours laboratory), fall semester.

## **RENG 240. Introduction to Heat Pumps. (3 Credits)**

Gain hands-on experience and foundational knowledge to excel in installation, operation, and maintenance of geothermal and air-source heat pump systems. This course prepares you for the EPA 608 refrigerant certification exam, offered at the completion of the course, providing a valuable credential for a career in the growing field of clean heating and cooling. This course has an additional lab fee. Corequisite: RESC 260 - Heating and Energy Systems 3 credit hours (2 hours of lecture and 3 hours of laboratory), spring semester.

## **RENG 245. Electrical Systems. (3 Credits)**

Gain essential skills for understanding the control, monitoring and troubleshooting of electrical and electronic systems relevant to wind and solar energy. Explore power electronics, power converters, control basics, monitoring technologies such as Supervisory Control and Data Acquisition (SCADA), electrical substations, switchgear and protection. Build skills for structured approaches for fault detection and troubleshooting using modern tools, drawing and schematics. Prerequisite: RENG 101. 3 credits (2 lecture hours, 2 lab hours).

## **RENG 306. Alternative Fuel Vehicles. (2 Credits)**

Explore current and emerging technologies in the automotive industry focused on alternative power sources. Investigate vehicles such as hybrids, full electric (EVs), biofuel-powered, and fuel cell systems, gaining insight into their design and functionality. Learn the automotive technologies and challenges involved in creating fully sustainable vehicles. Prior knowledge of automotive technology and internal combustion theory is helpful but not necessary. 2 credits (1 lecture hour and 3 laboratory hours), spring semester.

## **RENG 310. Biomass Energy Resources. (3 Credits)**

Explore the production of bioenergy feedstocks from agriculture, forestry, and aquaculture, along with the recovery of biomass from agricultural, forestry, municipal, and industrial waste streams. Engage in hands-on laboratory activities to understand bioenergy production systems and conversion processes. Learn the fundamentals of bioenergy conversion pathways, including chemical, biological, and thermal methods, to transform biomass into valuable energy sources and materials. This course has an additional lab fee. Prerequisites: BIOL or CHEM or ENRM 302 or ENRM 332 and MATH 102, 123 or 141, or permission by the instructor. 3 credits (2 lecture hours, 2 lab hours), fall semester.

**RENG 311. Biofuels. (3 Credits)**

Develop a technical understanding of biomass-derived fuels through theoretical lessons and hands-on field and laboratory activities. Acquire practical skills for both small-scale and commercial biofuels production and utilization. Explore key areas such as feedstock procurement, logistics, processing, fuel conversion, quality testing, and the end use of biofuels. Prerequisites: RENG 310 and CHEM, as advised. 3 credits (2 hours of lecture and 3 hours of laboratory), fall semester.

**RENG 321. Intro to Micro Hydro Systems. (3 Credits)**

Explore the fundamentals of hydroelectricity, including the effects of head, flow, and fluid dynamics on usable water resources. Gain hands-on experience with the installation, maintenance, and troubleshooting of micro hydroelectric systems (<10 kW). Focus on sizing penstocks, mapping hydro resources, and addressing environmental considerations for small hydro systems. Prerequisites: AGEN 151 and PHYS 107, minimum grade of C. 3 credits (2 hours lecture, 2 hours laboratory), fall semester.

**RENG 331. Solar Thermal Systems. (3 Credits)**

Explore the fundamentals of hydroelectricity, including the effects of head, flow, and fluid dynamics on usable water resources. Gain hands-on experience with the installation, maintenance, and troubleshooting of micro hydroelectric systems (<10 kW). Focus on sizing penstocks, mapping hydro resources, and addressing environmental considerations for small hydro systems. Prerequisites: RESC 221, RENG 240, or RESC 260 minimum grade of C. 3 credits (2 hours lecture, 2 hours laboratory), spring semester.

**RENG 332. Passive Solar Energy Systems. (3 Credits)**

Explore the principles of passive solar energy systems, focusing on their relationship to the sun, site, climate, and materials. Learn how these systems harness natural processes to provide sustainable energy with minimal maintenance and no thermal pollution. Study the theory, design, and application of passive solar systems for natural heating and cooling. Through system design techniques, analyze performance, energy efficiency, and comfort conditions. This course emphasizes evaluation methods to assess the effectiveness of various passive solar solutions, preparing you for practical applications in sustainable building and energy management. Pre or corequisite: MATH 102 and CAD 181 or permission of the instructor. 3 credits (3 lecture hours), fall or spring semester.

**RENG 335. Solar Photovoltaic System Design. (3 Credits)**

Develop fundamental solar photovoltaic system design skills with emphasis on siting solar PV systems, National Electrical Code Article 690, roof analysis, wind loading, weight loading, array withdrawal forces, sliding forces, 1-line electrical diagrams, system grounding, off-grid systems, optimizing system efficiency, and troubleshooting. Gain an understanding of paperwork necessary for grant funding and New York State local ordinances. Prerequisites: MATH 102, MATH 123, or MATH 141 and RENG 231. 3 credits (2 hours of lecture and 3 hours of laboratory), fall semester.

**RENG 340. Renewable Energy Heat & Cool. (3 Credits)**

Design renewable and clean space heating and cooling systems, including biomass heating, solar thermal, and heat pump technologies, integrated with conventional systems. Learn to estimate heating and cooling loads, size and specify equipment, and design layouts for ducted forced-air and hydronic systems. Explore heat emitter sizing, system controls, and monitoring. Prerequisite: RENG 240. 3 credits (3 hours lecture), spring semester.

**RENG 350. Energy Economics & Financing. (3 Credits)**

Explore the principles of energy economics, including supply and demand, energy security, price regulation, and environmental externalities. Learn financing strategies for energy efficiency and renewable energy, such as power purchase agreements and leases. Study key aspects of renewable energy project motivation and development, gaining the skills to create project budgets and conduct financial evaluations. This course provides a comprehensive foundation in the economic and financial considerations critical to renewable energy projects. Prerequisite: MATH 102, MATH 123, or MATH 141, or permission of the instructor. 3 credits (3 lecture hours), fall or spring semester.

**RENG 355. Renewable Energy Law & Policy. (3 Credits)**

Examine the goals, impacts, benefits, and challenges of federal and state energy laws and policies. Analyze current energy industry examples to understand strategies for implementing renewable energy systems and technologies. Research a specific energy policy or law, evaluating its implications, benefits, and challenges. This course provides a practical understanding of how energy policies shape the adoption and development of renewable energy solutions. Prerequisite: Junior standing or permission of the instructor. 3 credits (3 lecture hours), fall or spring semester.

**RENG 420. Wind Energy Development & Analytics. (3 Credits)**

Develop wind project design and development skills for siting wind systems, analyzing Weibull and Rayleigh wind distribution functions, and evaluating wind shear, turbulence, and tip-speed ratios. Learn to optimize turbine-inverter interactions for maximum energy production, design rotors and electrical systems, and apply National Electrical Code standards. Develop skills in system troubleshooting and complete the paperwork required for grant funding and compliance with New York State ordinances. This course provides a foundation in wind system design and operation. Prerequisites: MATH 123 or 141, and RENG 221. 3 credits (2 hours of lecture and 3 hours of laboratory), spring semester.

**RENG 435. Solar Development Engineering. (3 Credits)**

Explore advanced topics in solar photovoltaic systems, reflecting the evolving scope and scale of the industry. Study commercial and industrial systems, high-voltage DC systems, transformers, utility interconnections, and storage-based microgrids. Gain practical experience with project-based learning that integrates the National Electrical Code, AutoCAD, and online design tools. This course is designed to meet the demands of the renewable energy job market, preparing you for cutting-edge roles in solar energy design and project development. Prerequisite: RENG 335, minimum grade of C. 3 credits (3 lecture hours) weekly, spring semester.

**RENG 450. Advanced Grid Technologies. (3 Credits)**

Explore components, systems, economics, and design of advanced electricity grids with a focus on renewable energy technologies. Study key topics such as smart grids, energy storage, grid communication and control systems, microgrid design, electricity markets, and renewable energy forecasting. Designed to adapt to evolving technologies, this advanced course provides an opportunity to refine your understanding of modern grid systems and prepares you for innovations in the energy sector. Prerequisite: RENG 335. 3 credits (3 lecture hours), fall semester.

**RENG 460. Systems Integration. (3 Credits)**

Design and propose a renewable energy system in this capstone course, showcasing your expertise in system design and development to meet a client's goals. Conduct an energy audit, recommend energy efficiency and conservation strategies, assess renewable resources, and create a system tailored to the client's objectives. Ensure compliance with local ordinances, prepare incentive applications, complete utility interconnection agreements, and perform a detailed financial analysis. Utilize quantitative analysis, technical writing, and presentation skills to deliver a comprehensive written and oral project proposal to the client. Prerequisite: Minimum of two 400-level RENGL courses. 3 credits (3 lecture hours), fall semester.

**RENG 480. Renewable Energy Internship Pr. (1 Credit)**

Gain the skills and knowledge to navigate the internship and job search processes, advancing your career in renewable energy. Develop and refine job application materials, internship proposals, and reporting documents. Learn about internship expectations to ensure professionalism, comply with program guidelines, and align with the goals of students, faculty advisors, and employers. Students must complete RENGL 480 prior to enrolling in RENGL 490 - Renewable Energy Internship. Prerequisite: Junior standing in Renewable Energy BTech. 1 credit (1 lecture hours), fall semester.

**RENG 490. Renewable Energy Internship. (15 Credits)**

Gain hands-on experience in renewable energy or energy efficiency through a 120- to 600-hour internship (40 hours per credit). Apply theoretical and technical knowledge in a professional setting. Before starting, create a proposal outlining internship goals and employer and academic expectations with guidance from your advisor in RENGL 480. Secure a signed contract between the employer, student, and advisor. During the internship, submit interim progress reports, and upon completion, deliver a comprehensive written report and a professional presentation to highlight your achievements and learning outcomes. Prerequisite: RENGL 480, enrollment in the Renewable Energy BTech program, and permission from the instructor. 3-15 credits, fall, spring or summer semester.