Blue Marble University

B.S./D.Sc. 5 year Fast Track Combination Program, featuring a Bachelor Degree in Chemical Engineering and a Doctoral Degree in Chemical Engineering.

(5 Year Program You Can Complete Entirely Online)

This program introduces the student to basic chemical engineering concepts and then proceeds into the doctoral program where the student will learn advanced applications of chemical engineering

Chemical engineers apply the principles of chemistry, biology, and physics to solve problems. These problems involve the production or use of chemicals, fuel, drugs, food, and many other products. They design processes and equipment for large-scale safe and sustainable manufacturing, plan and test methods of manufacturing products and treating byproducts, and supervise production. A chemical engineer is involved in the design, development, construction and operation of industrial processes and factories for the production of a diverse range of products, as well as in commodity and specialty chemicals. Relevant industries include oil and gas, pharmaceuticals, energy, water treatment, food and drink, plastics and toiletries. Modern chemical engineering is also concerned with pioneering valuable new materials and techniques, such as nanotechnology, fuel cells and biomedical processes and engineering. As a chemical engineer, you may work in research, teaching, development, manufacturing, technical support, marketing, sales, project engineering, or enter into engineering management.

We have an exciting program, and it is not as difficult as you think!! At the doctoral level, you will take core courses covering mathematical modeling, thermodynamics, fluid mechanics, and chemical reaction engineering, then you will move on to more specialized subjects such as materials science, process control, environmental science, and petroleum engineering, Dissertation topics are always open to the student to select what he/she would like to research (with faculty guidance and approval).

We operate on a trimester schedule, which means that our academic year is divided into 3 segments of 4 months each. In each 4 month period, students take three courses. For some terms, or as determined by the University, students may be assigned courses in sequence, lasting about 1 month each. In that event, for any approximate one month period, a student will be studying one course.

Please Note: This is a 5 year program only. We do not offer a Bachelor Degree to students who only complete the first two years.

Years 1 and 2 are Used for the Bachelor Degree Part of the Program
(See our note at the end relating to Seat Time)

Year 1	Year 2
Term 1	Term 1
Mathematics: This course is a review of real numbers, functions of one variable, sequences, limits, continuity and differentiation; continuity and differentiability of functions of several variables	**Thermodynamics:** This course reviews the main principles and laws of thermodynamics, heat and mass transfer, and fluid dynamics. It introduces the use of entropy and free energy, energy conversions and energy systems, combined heat and power, tri-generation systems (power, heating, cooling), hybrid systems and energy conversion efficiencies. It offers an understanding of the role of chemical thermodynamics in the development and design of energy systems.
Chemistry I: This course is a survey of general, inorganic, and organic chemistry	**Fluid Mechanics**: This course studies continuity, momentum, and energy equations, laminar and turbulent flow in pipes, rheology, flow in porous media, filtration, and fluidization.
English Writing: This course is designed to polish you writing skills and may include functions of literature searches and technical writing.	**Reaction Engineering:** This course examines treatment of chemical reaction engineering including effects of non-ideal flow and fluid mixing on reactor
Digital Portfolio 1: This course begins the formulation of the student's online professional identity and the creation of the Online Portfolio outline for summarizing the student's education, accomplishments, research, and other interests.	
Term 2	Term 2
Programming Language: This course introduces the students to the algorithmic method that drives the information age. Students will learn aspects of the C++ programming languages and be exposed to the MATLAB programming language	**Unit Operations**: The aim of this course is to deepen the knowledge of the unit operations with a focus on distillation, absorption, adsorption and drying processes.

Year 1	Year 2
Chemistry II: This course is a survey of analytical and physical chemistry and instrumentation	**Heat Transfer**: This course reviews conductive, convective, and radiative energy transfer using control volume and differential analysis and prediction of transport properties. Special focus is on heat exchangers.
Digital Portfolio 2: The student's Online Portfolio will be examined and updated	**Independent Study Project**: The student with faculty guidance will practice technical writing concerning a subject of interest. The project may creating a review of a specific topic related to chemical engineering
Term 3	Term 3
Introduction to Chemical Engineering: This course explores the systems of units; laws of conservation of momentum, mass, and energy; material balances and chemical reactions, gas laws, phase phenomena, energy balances for systems with and without chemical reactions. It describes chemical engineering processes, and the analytical and numerical solutions of resulting equations.	**Mass Transfer**: This course is an introduction to principles and applications of mass transfer, with focus on the design of equilibrium stage and continuous contacting separation processes.
Physics: This course is a survey of mechanics, electricity, and magnetism.	**Instrumentation and Process Control**: This course explores methods of chemical process control, dynamic response of chemical processing equipment and systems, modes of control and controller characteristics, and the use of mathematical and experimental models. It considers cost estimation, materials and fabrication in the optimum design of chemical processing systems and equipment.
Digital Portfolio 3: Independent study project. The student will conduct a literature search or conduct a simple laboratory study for publication to the Digital Portfolio	**Plant Design**: This course analyzes the structure of chemical process systems. It considers chemical process analysis, thermodynamic and kinetic of process operations and configuration, process synthesis, networks of heat exchangers, separation schemes, simulation of chemical process systems, and chemical engineering process optimization

Note: Satisfactory Completion of the first two years of this program qualifies the student for continuing into the 3 year doctoral program in Chemical Engineering, and that 3 year program is detailed again here:

In the following table, all the courses for a particular year are shown sequentially in the column for that year.

Year 3	Year 4	Year 5
Term 1	Term 1	Term 1
Advanced Thermodynamics: This course explores properties of pure substances, first and second laws of thermodynamics, entropy and energy analysis with applications to energy conversion devices and thermodynamic cycles, single- and multi-phase systems, irreversibility in thermodynamics	**Advanced Plant Design:** In this course principles of technical and economic evaluation are applied to a chemical engineering problem.	**Research Methodology and Writing:** Includes introduction to blogging and preparation of Online Portfolio to highlight the student's education, accomplishments, and interests.
Advanced Mathematics for Chemical Engineers: This course explores the use of the basic laws of conservation of momentum, mass and energy to formulate partial differential equations describing chemical engineering processes. Analytical and numerical solution of partial differential equation, matrices, and vector analysis.	**Energy Systems Processes**: This course explains the concepts and process of energy conversion. It presents power systems structure, components and operation. It deals with the applications of power transmission lines and transformers, energy system representation, load flow, power system protection, symmetrical components, faults and stability. This course examines energy supply, conventional fuel reserves (coal, oil, natural gas), alternative sources (nuclear, solar, geothermal, etc.)	**Topics for Thesis:** A thesis topic will be determined and outlined.

Year 3	Year 4	Year 5
Experimental Design, Statistical Process and Quality Control: This course explores how to design an experimental study, carry out an appropriate statistical analysis of the data, and properly interpret and communicate the analyses. At the end of the course a review of quality control in industrial settings is given.	**Introduction to Materials Science**: This course reviews the structure, processing, properties, and applications of metals, ceramics, polymers, and composite materials.	**Dissertation Preparation I**: The student will spend the rest of the time engaged in generating an independent work.
Term 2	Term 2	Term 2
Advanced Reaction Engineering: This course explores the advanced treatment of chemical reaction engineering including effects of non-ideal flow and fluid mixing on reactor design. Multi-phase reaction systems of non-heterogeneous catalysis and catalytic kinetics.	**Wastewater Treatments:** This course provides an introduction to wastewater treatment operation and maintenance and to the facilities used to treat wastewater. It also provides in-depth coverage of preliminary wastewater treatment facility operation and maintenance.	**Dissertation Preparation II**
Advanced Fluid Mechanics: This course surveys the principal concepts and methods of fluid dynamics. Topics include mass conservation, momentum, and energy equations for continua, the Navier-Stokes equation for viscous flows, similarity and dimensional analysis, lubrication theory, boundary layers and separation, circulation and vorticity theorems, potential flow, an introduction to turbulence, lift and drag, surface tension and surface tension driven flows.	**Introduction to Petroleum Engineering**: This course studies the reserves of coal, oil, and natural gas. It deals with petroleum processing and refining; coal, oil shale, and tar sand; gasification and liquefaction of coal. It explores methods used to evaluate the natural and synthetic properties of oil and gas.	

Year 3	Year 4	Year 5
Advanced Process Control: Advanced topics in control, including feed forward control, cascade control, and frequency response analysis. Control of processes using microprocessors and digital computers is introduced. Specification of control systems and on-line process instrumentation is stressed. A survey is made of the most recent methods for analysis of the dynamic behavior and control of process systems.	**Polymer Engineering**: This course examines polymer chemistry, polymerization kinetics, polymer rheology, and material characteristics. It considers design and analysis of polymer reactors, extruders, molding machines, and other forming operations, and discusses modern industrial and commercial processes for production and fabrication of polymer materials.	
Term 3	Term 3	Term 3
Modeling of Chemical Processes: This course is a review of mathematical modeling of chemical processes, application of numerical techniques to the solution of equations, use of a programming language to write programs for calling numerical subroutines, numerical solutions of problems resulting in partial differential equations.	**Introduction to Biochemical Engineering**: This course analyzes immobilized enzyme technology, microbial biomass production, and transport phenomena in microbial systems, biological reactor design, process instrumentation and control, applications in separation and purification processes.	**Dissertation Presentation and Completion of Online Portfolio**
Advanced Heat and Mass Transfer: This course covers problems of heat and mass transfer in greater depth and complexity than is done in previous courses and incorporates many subjects that are not included or are treated lightly in those courses; analysis is given greater emphasis than the use of correlations.	**Biomedical Engineering:** The course covers basic concepts of biomedical engineering and their connection with the spectrum of human activity. It serves as an introduction to the fundamental science and engineering on which biomedical engineering is based	

Year 3	Year 4	Year 5
Advanced Reactor Design: The overall objective of the course is to introduce students to the concepts of reactor design and reaction engineering covering more advanced topics. Chemical reaction engineering involves the exploitation of chemical reactions on a commercial scale. This is what specifically sets chemical engineering apart as a distinct branch of the engineering profession	Environmental engineering: This course reviews the control technologies used for management of air, water, and wastewater pollutants. It examines the characteristics of air and water quality, their physical, chemical, and bacteriological parameters, and control, including filtration, sedimentation, coagulation, absorption, chemical treatment, and aeration.	

Doctoral Program Total: 72 TRIMESTER CREDITS
(Equivalent to the USA Minimum Requirement for a Doctoral Degree)

Credits: In the 3 year portion of the doctoral program, each of the above courses (with the exception of Dissertation Presentation and Completion of Online Portfolio which is 6 credits) consists of 3 trimester credits each.The program comprises 72 trimester credits, and consequently is equivalent to the minimum 60 semester credits for a USA regionally accredited college or university. Upon completion, and for a nominal fee, graduates will be able to obtain a Certificate of Equivalency from a foreign education credentials evaluation service approved by the USA Department of Education for employment purposes in the USA.

Note Concerning Undergraduate Degree and "Seat Time"

As we have stated before, we drop "seat time" from each and every one of our programs. All of our students must demonstrate "Proficiency" with regard to the subject matter of their studies. Consequently, our programs are shorter.

"Seat time", which is the foundation of "accreditation" in the USA, is the old fashioned, outdated requirement that a student spend a required amount of time and/or take required general studies courses in order to receive a Bachelors Degree. We follow the USA Department of Education in its "National Education Technology Plan 2010" wherein it recognized that "seat time" has got to go. At Page 12 of the report: *"One of the most basic assumptions in our education system [accreditation] is time-based or "seat-time" measures of educational attainment.... [colleges and universities should be organized] around competence rather than seat time and others that enable more flexible scheduling that fits students' individual needs* ***rather than traditional academic periods and lockstep curriculum pacing."***