

Blue Marble University
40 Hillsborough Street
Roseau, 00152
Commonwealth of Dominica
<http://bluemarbleuniversity.com>

Program Title: Bachelor of Science (B.S. Engineering Technologies)
120 Credits Bachelor Degree

Bachelor of Science (B.S.) in Engineering Technologies 120 Standard U.S. Credits
Term 1: 15 Credits
English Writing- Writing a College Research Report with References. 3 Credits.
Internet Research: Business and Technical- How to conduct internet research for technical information and product/software apps. 3 Credits.
English Literature- Selected readings and study of English literature. 3 Credits.
Communications 1- Introduction to Website Building. The course covers communicating via web presence, the importance of a scholarly digital fingerprint available for the world to see. The elements of web page design and kinds of content, including a review of CMS (content management systems) including Wordpress. 3 Credits.
Communications 2 Lab- With staff guidance and supervision, the student will design and launch a personal website on the Wordpress platform to display their interests, hobbies, educational history and accomplishments. Video uploading, use of images also covered. 3 Credits.
Term 2: 15 Credits
College Mathematics- College math including probability and statistics, analytical geometry, and basic algebra. The course also touches upon infinitesimal calculus and applied mathematics. 3 Credits.
Financial Accounting- Accounting for non-accountants includes analysis of Financial Statements. Banking and Credit Card Issues, credit reporting and collections. 3 Credits.
Art Appreciation- Foundational course in analyzing the emotional and visual impact of art. 3 Credits.
History of Art- The course covers the history of art from the Egyptian Period to modern Pop Art. The course includes some text material, to be supplemented by the students internet research to expand topics in greater detail. 3 Credits.
Religion- Study of the Quran and comparison to Bible texts. 3 Credits.
Term 3: 15 Credits

World History- The course covers the high points of World History with emphasis on the world wars. Excerpts from Will Durant, “The History of Civilization” are studied. **3 Credits.**

Introduction to Science Careers- This course introduces the student to various science careers using various sources as well as a study of college and university course lists to assist the student in selecting a Major. After selection of a major, the student curriculum will be developed accordingly. **3 Credits.**

Business Law- Contracts, Negligence, Agency, UCC, and other business law topics. **3 Credits.**

Cultures- Main world cultures are studied, with emphasis on the lasting contributions to civilization made by various cultures, as described in the eleven volume treatise: Will Durant, “The History of Civilization” **3 Credits.**

Biology Field Studies- This course introduces the student to biology field studies in microbiology, insect classification and mounting, and conducting simple experiments with a microscope. The collection and review of field data is emphasized. A bacterial investigation is included. The purpose of the course is to understand scientific data collection as well as hands on field experience. **3 Credits.**

Term 4: 15 Credits

Research Methodology and Writing- The Scientific Method is studied along with scientific report writing and referencing. **3 Credits.**

Home Chemistry Experiments [or Home Biology Experiments]- Instructor guided experiments that students complete at home with special illustrated text. Nominal cost for purchase of supplies and equipment required. **3 Credits.**

Diversity in Weddings and Marriage Customs Worldwide- A comparative study of U.S. and International weddings and marriage customs. **3 Credits.**

Foreign Language - Choice of language studies offered. **3 Credits.**

Computer Skills- A course teaching basic computer skills in word processing, image handling, spreadsheets, slide presentations, video production and other relevant topics. **3 Credits.**

End of General Education Courses: 60 Credits

Term 5: 15 Credits Begin Major Program of Studies

College Trigonometry. This advanced math course covers Angles, Trigonometric Functions, Trigonometric Identities and Equations, and Graphing Trigonometric Functions. Graphing Sine and Cosine is emphasized. **3 Credits.**

Chemistry Lab. Introduction to chemistry experimentation, including lab safety and safety equipment, what to do in emergencies, types and use of a variety of glassware, how to use a bunsen burner, pH measurements, and accurate weighing of compounds. Actual chemistry experiments are undertaken using a variety of household chemicals as well as chemicals purchased at local supply houses. Analysis of magnetic earth samples are made. **3 Credits.**

Calculus I. This course covers a variety of essential calculus skills, including: derivatives and anti-derivatives of polynomials, trig functions, exponentials, and logarithms; how to find the extreme values of a function limits, including L'Hopital's rule; definite and indefinite integrals; techniques of integration; multiple integrals. **3 Credits.**

Calculus II. Multiple Variables. The course presents the Chain Rule with multiple variables; partial derivatives; extreme values with multiple variables; vectors; vector analysis and vector calculus; the gradient, divergence, and curl; the main coordinate systems: Cartesian, 2D polar, spherical, and cylindrical; center of mass, and moment of inertia. **3 Credits.**

Immunochemistry I. This course covers the Double-Immunodiffusion Assay, also called the **Ouchterlony Assay**. The test is useful in detecting ANY protein, particularly antigens present in human biological fluids, using antibody against that specific protein to diffuse in a gel to form precipitin bands. Students will learn the assay technique, including reading semi-quantitative and quantitative results with a gel reader application. Students are required to purchase a laboratory demonstration kit, conduct and video record the specified experiments, keep a laboratory journal, and write up a research report summarizing results. **3 Credits.**

Term 6: 15 Credits

Immunochemistry II and Lab. This course, primarily a lab course, covers the detection of proteins in bodily fluids using the very sensitive Ouchterlony double-Immunodiffusion technique learned in Immunochemistry I. Saliva will serve as the sample bodily fluid, and the detection of albumin and other related proteins will be attempted. Various parameters of the testing procedure will be changed and studied, including different gel formulations, use of formalin, and different plates and gel thicknesses. Students will be required to obtain various laboratory reagents and basic lab equipment to use for the specified experiments under the supervision of Instructor, with Lab Reports required. **3 Credits.**

Differential Equations. In depth study of Differential Equations, including Separation of variables, First-order equations, Linear first-order equations, The Wronskian, Power series solutions, Second order equations, and other topics. **3 Credits.**

Thermodynamics. The Laws of thermodynamics are covered along with their mathematical expression and representation. **3 Credits.**

Wide-Application Engineering Instrumentation. The purpose of this course is to develop a working knowledge in instrumentation and equipment including: medical and biological imaging, physical principles and signal processing techniques used in thermographic, ultrasonic, and radiographic imaging, including image reconstruction from projections such as CT scanning, MRI, and millimeter wave determination of temperature profiles. "How to" instruction in NMR, Laser Optics, UV spectrometry, IR spectrometry, Mass spectroscopy, Gas chromatography, and HPLC. Such instrumentation has wide application in general chemistry, organic chemistry, qualitative and quantitative analysis, and is commonly used in laboratories involved in chemical production, pharmaceutical production, food chemistry, cosmetic chemistry, environmental monitoring, and quality control. **3 Credits.**

Matlab/Simulink Engineering and Modeling. This course introduces the engineering student to the Matlab and Simulink graphical programming environment for modeling, simulating and analyzing dynamic systems. Students will practice modeling using the various block libraries to create simulations. Registration at Mathworks and downloading of "Matlab and Simulink Student Suite" required. **3 Credits.**

Term 7: 15 Credits

Introduction to Chemical Engineering Topics. Using video tutorials, this course illustrates various chemical engineering processes such as: Centrifugal Pumps, Continuously Stirred Tank Reactors, Diaphragm Pump, Gas Dispersion/Flooding Tank Reactors, Distillation Basics, Continuous Distillation, Operating Line Graph, Varying Reflux Ratio, and many more. **3 Credits.**

Process Engineering-Mass Balances. This course delves into Mass and Energy Balance, using a combination of text, video instruction, with simulations emphasized. Among the modules covered are: Mass Balances on a Distillation Column; Mass Balances in Evaporative Crystallization; Mass Balances in Absorption and Stripping Units. **3 Credits.**

Cybersecurity Topics. You will learn cybersecurity concepts, issues, and tools that are critical in solving problems in the computing security domain. Essential techniques in protecting systems and network infrastructures, analyzing and monitoring potential threats and attacks, devising and implementing security solutions for organizations large or small, are presented. **3 Credits.**

Electrical Engineering. Students study the concept of a “charge”, the fields around it when it sits there, the fields that are created when the charges move. Insulators, conductors, semi-conductors, voltage, current, circuits, and other topics are all covered in meaningful depth. Students learn basic theory, tools, and troubleshooting electrical problems. **3 Credits.**

Electronics. The course covers fundamental electronic parts associated with electronic circuits including resistors, capacitors, inductors, diodes and transistors. Emphasis is placed on the study of devices used in day-to-day consumer electronic products to include semiconductor components diodes, transistors, and thyristors. Finally the course presents the most common electronic circuits, such as analogue, differential and operation amplifiers, suppliers and references, filters, math converters, pulsers, and logical gates. **3 Credits.**

Term 8: 15 Credits

Electronics Lab- This is a lab course in which the student will complete actual hands-on electronic projects using the Arduino Uno microprocessor. In addition, virtual simulations, such as the Falstad electronic circuit simulator, and the PhET Interactive Simulations project at the University of Colorado will be studied to learn relationships between Current, Capacitance, Resistance, and Inductance. Purchase of Arduino lab kit required. **3 Credits.**

Pharmaceutical Chemistry Lab I- Extraction of Botanical Compounds. The first purified plant extract, aspirin, is compared to the current formulations of herbal supplements, why herbal remedies do not work very well, the important differences between supplements containing dried plant leaves and roots vs supplements containing purified active ingredients, what do we mean by "100% purity". Active ingredients of plants and plant derivatives, what to look for in obtaining botanicals, what they do, dosages, and indications. **3 Credits. Grade**

Pharmaceutical Chemistry Lab II: Purification of Extracts. The isolation, characterization, and purification of plant extracts. The student examines the latest equipment, such as HPLC (High Performance Liquid Chromatography), spectrographic analysis and equipment. Cheaper separation techniques you can use. The further purification of extracts via crystallisation. The use of the new membrane filtration techniques to remove water and increase the concentration of extracts in solution. **3 Credits. Grade**

Quality Control Designs and Reporting. QC Analysts prepare and test samples from all phases of a manufacturing or other handling process, with the goal of determining if the substance meets the standards or requirements of the project. They prepare technical documents that report the results of their lab work. Course also covers Corrective and preventive action (CAPA). Root Cause Analysis. CAPA Inputs: NCMR's, Complaints, Internal/External Audits. Validation from CAPA sources: Man, Machine, Material, Method, Environment. A study of the CAPA process. The practicalities of technical report writing to summarize a problem, to make fact based suggestions, to file reports respecting production. How to write report and reviews of SOP (standard operating procedures). **3 Credits.**

Technical Reports. The practicalities of technical report writing to summarize a problem, to make fact based suggestions, to file reports respecting production. How to write reports in the pharmaceutical industry, including GMP data reviews, analytical data reviews, and reviews of SOP (standard operating procedures). The course presents the handling of data and compliance. **3 Credits.**

Total Number of Credits: 120

Notes:

Credits: 1 Blue Marble University Credit = 1 USA Semester Credit. Although registered in the Commonwealth of Dominica, we follow the **USA Code of Federal Regulations** requiring “one hour of classroom or direct faculty instruction [or 60 minutes of preparation in a correspondence course] and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit”, which translates to 15 hours of notational learning plus 30 hours of study. **Each Term is 15 weeks.** Blue Marble University operates all year round with no breaks. Each term is 15 weeks, comparable to a standard US semester of 15 weeks. Consequently, each student can complete the equivalent of three 15-week terms per year.
