

**GREAT PLAINS TECHNOLOGY CENTER
COURSE OF STUDY**

Career Cluster: Science, Technology, Engineering and Mathematics (SC)
Career Pathway: Science and Mathematics (SC002)
Program: Advanced PLTW Biomedical Science and Medicine (SC0026007)
Program Hours: Secondary Students: 1560 Hours

<u>Instructors:</u>	Name	Office	E-Mail
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Credits: Secondary Students: 3 high school credits per year - *OK Promise Credit

Prerequisites: Enrollment in the Biomedical Science and Medicine Program is with the home school recommendation. Biology I or concurrently enrolled

Program Description:

Students in this program will study biomedical science through the exciting Project Lead the Way curriculum that will provide students hand on projects and experiences. Topics will include bio-informatics, human medicine, and an in depth study of the human body. Students will also study advanced math courses that may include Adv. Algebra II, Adv. Trigonometry/Pre-Calculus and an AP math course as well as advanced science courses that may include Anatomy and Physiology, Microbiology, Adv. Chemistry and AP Biology. Students who complete this program will have been exposed to a diverse curriculum that will better equip them to choose a major at the college/university level. Students will also have the strong math and science foundation needed to be prepared to enter a college/university program in a science related field. Students will be able to test for college credit through AP courses and successfully transition to post-secondary.

Program Goals:

This program challenges students to use mathematical, scientific and technological principals in solving real-world problems.

Upon achieving the goals of this Program, students will:

- work as a contributing member of a team
- lead a team
- use appropriate written and/or visual mediums to communicate with a wide variety of audiences
- practice public speaking
- listen to the needs and ideas of others
- understand the potential impact their ideas and products may have on society
- think creatively
- problem solve
- manage time, resources and projects
- research

- go beyond the classroom for answers
- collect and analyze data
- prepare for two-and four-year college programs

Career Opportunity Examples:

- A career in biochemistry
- A career in biomedical engineering
- A career in dentistry
- A career in forensics
- A career in microbiology
- A career in immunology
- A career in pharmacology
- A career in physiology
- A career in radiological sciences

Program Objectives:

After successful completion of this Program, the student will be able to:

- Understand how the skills they are learning in the classroom can be applied in everyday life.
- Increase cooperative learning and higher-order thinking skills.
- Develop strategies to direct their own learning.
- Make connections to problems in context and see the value in what they learn.
- Synthesize and construct knowledge to grapple with the complexities of problems.

DESCRIPTION OF COURSES

Biomedical Science and Medicine is available to sophomores, juniors, and seniors. Students will complete a total of four PLTW courses and up to five academic math or science courses.

<u>Course #</u>	<u>Course Name</u>	<u>HST</u>	<u>HSL</u>	<u>Total</u>
ST00003	Principles of Biomedical Sciences (8706*) – PLTW Course	72	48	120
<p>This course provides an introduction to the biomedical sciences through exciting “hands-on” projects and problems. Student work involves the study of human medicine, research processes and an introduction to bioinformatics. Students investigate the human body systems and various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. A theme through the course is to determine the factors that led to the death of a fictional person. After determining the factors responsible for the death, the students investigate lifestyle choices and medical treatments that might have prolonged the person’s life. Key biological concepts including: homeostasis, metabolism, inheritance of traits, feedback systems, and defense against disease are embedded in the curriculum. Engineering principles including: the design process, feedback loops, fluid dynamics, and the relationship of structure to function are incorporated in the curriculum where appropriate. The course is designed to provide an overview of all the courses in the Biomedical Sciences program and to lay the scientific foundation necessary for student success in the subsequent courses.</p>				

ST00001 Human Body Systems (8707*) – PLTW Course 72 48 120

The human body is a complex system requiring care and maintenance. This course will engage students in the study of basic human physiology, especially in relationship to human health. Students will use a variety of monitors to examine body systems (respiratory, circulatory, and nervous) at rest and under stress, and observe the interactions between the various body systems. Students will use Logger Pro software to design and build systems to monitor body functions.

ST00004 Medical Interventions (8708*) – PLTW Course 72 48 120

Medical practice includes interventions to support humans in treating disease and maintaining health. Student projects will investigate various medical interventions that extend and improve quality of life, including gene therapy, pharmacology, surgery, prosthetics, rehabilitation, and supportive care. Students will study the design and development of various medical interventions including vascular stents, cochlear implants, and prosthetic limbs. They will review the history of organ transplants and gene therapy, and read current scientific literature to be aware of cutting edge developments. Using 3-D imaging software and current scientific research students will design and build a model of a therapeutic protein.

ST00005 Biomedical Innovation (8719*) – PLTW Course 72 48 120

This capstone course gives student teams the opportunity to work with a mentor, identify a science research topic, conduct research, write a scientific paper, and defend team conclusions and recommendations to a panel of outside reviewers. Each team will have one or more mentors from the scientific and/or medical community guiding their scientific research. This course may be combined with the capstone course from the pre-engineering pathway, allowing students from both pathways to work together to engineer a product that could impact healthcare.

HL00597 Anatomy – Academic Science Elective 36 24 60

Anatomy is the study of the structure and shape of the body and their relationships to one another. This course includes both gross anatomy (anatomy of the large body structures), as well as microscopic anatomy (anatomy of body structures too small to be seen with the naked eye).

HL00598 Physiology – Academic Science Elective 36 24 60

Human physiology, a branch of general physiology, is concerned with how the human body works. This course will approach the study through an organ-system approach. Organ-systems are collections of cells, tissues, and organs which have dedicated functions in the body.

ST00028 AP Biology 72 48 120

CareerTech AP Biology is designed to be the equivalent of a first year Biology post-secondary course. The range and depth of knowledge of the content area, types of labs, and time expenditure is elevated and extensive. Students will develop a conceptual framework for biology and an appreciation of science as a process. The course follows Collegeboard's outline and covers eight major themes. They are: Science as a Process, Evolution, Energy Transfer, Continuity and Change, Relationship of Structure to Function, Regulation, Interdependence in Nature, Science, Technology, and Society. Labs play an integral part of this course and there are twelve lab topics that will be covered. They will provide the student with an opportunity to learn a variety of skills and facts, principles, and concepts of biology. Lab investigations will encourage higher-order thinking, generating ideas, and formulating hypotheses. All students are expected to take the AP Exam upon completion of this course.

ST00016 Adv. Chemistry (5051) – Academic Science Elective 72 48 120

Adv. Chemistry is designed to prepare students for the complex thinking that will be expected in future science courses. This course will focus on the development of the student as a scientist through the study of chemistry. Being a scientist requires a broad set of tools, including theory, problem solving, written and oral communication, interpreting data and laboratory skills. Areas covered are: Matter, atoms & periodic table, molecules & compounds, chemical reactions & stoichiometry, aqueous solutions & reactions, gases, energy & chemical reactions, atomic & molecular structure. Prerequisite: Concurrent enrollment in Algebra II

ST00007 AP Chemistry (5055) – Academic Science Elective 72 48 120

Chemistry is the study of the properties of materials and the changes that materials undergo. A student will see how chemical principles operate in all aspects of our lives, from everyday activities to far-reaching matters like the development of drugs to cure cancer. Students will learn through laboratory and lecture methods using group and individual activities, cooperative learning, presentations, and technology to enhance the learning environment. Students will learn how to design and conduct experiments using a variety of laboratory techniques and technology to investigate a chemical concept. They will apply stoichiometric concepts to chemical reactions and analyze how atomic structure relates to periodicity. The student will analyze how atomic structures relate to chemical bonding and apply chemical concepts to reactions in aqueous solutions. They will learn about gas laws as well as study electrochemistry. Prerequisite: Adv. Chemistry

ST00206 AP Physics I – Academic Science Course 72 48 120

AP Physics 1 course, together with the AP Physics 2 course, replaces the AP Physics B course as of fall 2014. Through inquiry-based learning, AP Physics 1 students will develop critical thinking and reasoning skills, allowing them to cultivate their understanding of physics and science practices. The AP Physics 1 Exam, which debuts in May 2015, will assess students' achievement of the AP Physics 1 learning objectives.

ST00223 Adv. Trigonometry – Academic Math Course 36 24 60

This semester course is designed to be in preparation for AP Calculus and/or AP Physics. The course includes a study of six basic functions of trigonometry, Topics include right triangle relationships, unit circle, sine, cosine, and tangent functions and their applications, inverse trigonometric functions, identities, and trigonometric form of solutions of right and oblique triangles, trigonometric identities, conics, and complex numbers. The student will analyze and graph mathematical functions. Students will use graphing calculators in activities that are appropriate to the topics being studied.

ST00224 Adv. Calculus – Academic Math Course 36 24 60

This semester course is designed to be in preparation for AP Calculus and/or AP Physics. The course includes topics in Algebra ranging from polynomial, rational, and exponential functions to conic sections. The course gives a review study of straight lines, conic sections, algebraic curves, transcendental curves, a completed study of straight lines, simplification of equations, and polar coordinates. Students will then begin calculus concepts such as limits, derivatives, and integrals. The student will analyze and graph mathematical functions. Students will use graphing calculators in activities that are appropriate to the topics being studied.

ST00006 Adv. Algebra II – Academic Math Course 72 48 120

This course will enhance and expand the mathematical foundations of Algebra I and Geometry. The course will stress the fundamental extension of previous mathematics and the preparation for future

higher-level mathematics courses. It will involve operations with real and complex numbers as well as matrices. The problem solving processes will use functions and relations. Within the course applications of math, and while satisfying predictions based on a set of data, the use of data analysis, and statistics will be justified. Students who master CareerTech Algebra II will gain experience with quadratic functions, conic sections, logarithmic and exponential functions, linear functions, solution methods for systems of linear functions, and matrix operations.

ST00061 AP Calculus AB – Academic Math Elective 72 48 120

This is a college course taught to high school students that intend to move on to post-secondary. It offers extreme rigor in a specialized field of study. It will enable the student to be successful on the Advanced Placement AP Calculus AB exam and/or in college calculus. An emphasis will be placed on real world applications as they relate to the various engineering fields as well as development of problem-solving skills. Prerequisite: Trigonometry/Pre-Calculus

ST00062 AP Calculus BC – Academic Math Course 72 48 120

The AP Calculus BC covers the same differential and integral calculus topics that are included in Calculus AB, plus additional topics in differential and integral calculus, and polynomial approximations and series. This is material that would be included in a two-semester calculus sequence at the college level. Graphing calculator use is an integral part of the course. Students cannot take both the Calculus AB and Calculus BC exams during the same year.

ST00213 PLTW Environmental Sustainability (Oklahoma’s Promise/ OHLAP) 72 48 120

Oklahoma’s Promise/ OHLAP. Students investigate and design solutions in response to real-world challenges related to clean and abundant drinking water, food supply, and renewable energy. (This course is currently not available.)

Program Total:

Theory Hours – Dependant on courses taken

Lab Hours – Dependant on courses taken

Total Hours Year One – 360

Total Hours Year Two – 360

Total Hours Year Three – 360

Evaluation Policy:

Performance Grades (45% of final grade)

- Performance or skill tests
- Homework
- Written Assignments

Academic Grade (55% of final grade)

- Test grades will be based on a 100-point scale.
- Test grades include written and/or skills tests.

- A test will be given for each unit of instruction.
- Tests are to be taken as a unit is completed.
- Tests must be completed within allotted time.

Final Grade (9 Weeks Period)

9-weeks grade will be calculated by averaging grades in each category and summing each category according to their assigned weight. Progress reports will be sent to home schools at six and twelve-week intervals each semester as required or requested. Grades are accessible on-line at <http://sonisweb.greatplains.edu/studsect.cfm>

Grading Scale:

The grading scale as adopted by the Board of Education is as follows:

- A = 90 – 100
- B = 80 – 89
- C = 70 – 79
- D = 60 – 69
- F = Below 60
- W = Withdrawn
- I = Incomplete
- N = No Grade (Refer to Student Handbook)

Make-Up Work Policy:

All Make-Up Work Is The Responsibility Of The Student. Make-up work will be handled as specified in the Student Handbook. Please be sure to read and understand all student policies, especially make-up of assignments, tests and employability due to absences. Students should always arrange for any make-up work with the instructor as per the Student Handbook. Students should keep track of his or her progress and grades.

Attendance Policy:

For specific information related to attendance and tardiness refer to the Student Handbook. Students should keep a written record of their absences and tardiness.

Course Requirements and Expectations:

The general course requirements and expectations include:

- Training methods will consist of lecture, individualized instruction and practical application.
- All students must adhere to policies and procedures in the GPTC student handbook.
- Health Occupations Students of America (HOSA) is the student organization for Biomedical Science and Medicine. This student organization offers an outstanding opportunity to develop leadership and social skills. Students are highly encouraged to participate.
- Upon satisfactory completion of Biomedical Science courses (excluding academic courses), students will receive a Competency Profile. A skill rating will be given for more specific tasks.

Student Behavior Includes:

- Be Prompt: Enter the classroom quickly and quietly ready to start the lesson for each day. Students who provide their own transportation must arrive by the following times: 8:15 for AM students and 11:50 for PM students.
- Be Prepared: Ensure that you have all materials needed for each day.

- Be Respectful: Disrespect for others and authority will not be tolerated.
- Be Responsible: Take responsibility for all of your actions academically as well as socially.

NOTE: For additional information or questions regarding the GPTC School policies and procedures, please refer to the Student Handbook and/or the Instructor.

Accountability Measures and Assessments:

- Principles of Biomedical Science, Human Body Systems, and Medical Intervention End of Course Tests administered through Project Lead The Way (PLTW)
- Oklahoma Priority Academic Student Skills (2003). Oklahoma State Department of Education - PASS www.sde.state.ok.us
- Principles and Standards for School Mathematics (4th Ed) (2005). National Council of Teachers of Mathematics, Reston, VA
- National Science Standards (5th Ed) (1998). National Research Council, Washington, D.C., National Academy of Sciences
- Students are expected to take AP Exams upon completion of AP courses.
- All AP Courses undergo an AP Course Audit through College Board.

Industry Alignments:

Curriculum content has been developed by Project Lead the Way and cross-walked with the following standards:

- National Academy of Sciences
- National Council of Teachers and Mathematics
- International Technology Education Association
- National English Language Arts

CIP & SOC:

- CIP: 15.0401 – Biomedical Technology/Technician
- SOC: 17-3029 – Engineering Technicians, Except Drafter, All Other

OCAS program codes:

- 9852 - Biomedical Science and Medicine Program (first year)
- 9870 - Biomedical Science and Medicine Program (second year)

OCAS course codes:

- 8854 – PLTW Environmental Sustainability
- 8706 – PLTW Principles of Biomedical Sciences
- 8707 – PLTW Human Body Systems
- 8708 – PLTW Medical Interventions
- 8719 – PLTW Biomedical Innovations
- 5213 – AP Physics I
- 4750 – Adv. Trigonometry
- 4611 – Adv. Pre-Calculus
- 4615 – AP Calculus AB
- 5333 – Anatomy
- 5220 – Physiology
- 5051 – AP Chemistry
- 5035 – AP Biology

Instructional Materials and Supplies:

Students are not required to purchase textbooks or supplemental materials.

eLearning Curricula:

Applied Educational Systems, Inc. "HealthCenter21 Easily Saves Time for Health Science Instructors." *HealthCenter21: Health Science Curriculum*,
www.aeseducation.com/healthcenter21.

Textbooks:

Campbell, Neil, et al. Campbell Biology. 9th ed. 0321739752. San Francisco: Pearson, 2011.

Marieb, Elane. Essentials of Human Anatomy & Physiology. 9th ed. 798-0-13-600165-2. San Francisco: Pearson Education, 2009.

Martini, Fredric H. Fundamentals of Anatomy and Physiology. 7th ed. 0-13-195644-2. Upper Saddle River: Pearson Education, 2006.

Zumdahl, Steven S. Chemistry: AP Edition. 9th ed. 978-1133611103. Independence: Brooks/Cole Cengage Learning, 2013.