SAN LEANDRO UNIFIED SCHOOL DISTRICT
COURSE PROPOSAL: Course of Study
SECTION A. COVER PAGE

1. **Course Title:** Principles of Biomedical Health	7. **Action** X New Course ▢ Course Revision ▢ Title Change Only
2. Date Submitted: 12/12/16	8. **Grade Level**(s) ▢ 6 ▢9 ▢11 ▢ 7 X 10 ▢12 ▢ 8 Grade 10 recommended
3. Transcript Title/Abbreviation(s)	**9. Prerequisites** (Please list.) ▢ Required ▢ Recommended
4. Transcript Course Code/Course Number :	**10. Seeking Program Distinction?** ▢ YES (Check one below.) ▢NO ▢Honors ▢ AP ▢Other
5. Subject Area Biomedical Health Pathway Elective (Science)	11. **Is this a CTE course?** ▢ YES ▢ NO **If YES, complete Section C**
6. **Department** Science	12. **Previously approved by UC?** ▢ YES ▢ NO ▢ NA for 6th-8th Year approved Year removed
13. UC ELIGIBILITY **Already eligible?** ▢ NA for 6th-8th **yes "d"** **a**▢ **b**▢ **c**▢ **d**▢ **e**▢ **f**▢ **g**▢ **Proposing eligibility?**▢ NA for 6th-8th **XYES** ▢**NO** **a**▢ **b**▢ **c**▢ **d**X **e**▢ **f**▢ **g** X Please mark one for approved eligibility or proposed eligibility.	14. **Unit Value/Course Credit/Length of Course** ▢ 0.5 (semester or half-year X 1.0 (one year equivalent) ▢ 2.0 (two-year equivalent) ▢ Other
15. School Contact and Course Developer Name: Juanita Abundiz, Gaia Pine Phone: Email: jabundiz@slusd.us gpine@slusd.us Position:	

16. Approval Signatures:	Approval Date:
Department Chair	12/14/2016
Principal:	12/15/16

DISTRICT OFFICE USE ONLY
Date approved by Board Curriculum Committee
1/31/17

Date approved by Board

SECTION B. COURSE CONTENT

17. Course Description

This year long course, modeled after Project Lead The Way's "Principles of Biomedical Sciences" provides an introduction to biomedical science through exciting hands-on projects and problems. This is a course in the Biomedical Health Pathway. Through a process of project based learning, work based learning and self-exploration, students will learn a new way of thinking about science and the healthcare industry. The course is designed to actively engage students in hands-on learning integrating 21st century skills (communication, creativity, critical thinking and collaboration). Students investigate concepts of biology and medicine as they explore health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They will determine the factors that led to the death of a fictional woman as they sequentially piece together evidence found in her medical history and her autopsy report. Students will investigate lifestyle choices and medical treatments that might have prolonged the woman's life and demonstrate how the development of disease is related to changes in human body systems. Projects and activities are more structured in the beginning of the course and become more open ended through a gradual release of responsibility over time.

18. Course Goals and/or Major Student Outcomes

- Students will gain an introductory understanding of human anatomy & physiology, medicine, and research processes and allow students to design experiments to solve problems.
- Students will apply key biological concepts, including maintenance of homeostasis in the body, metabolism, inheritance of traits, and defense against disease.
- Students will practice problem solving, collaboration, documentation, communication, and other professional skills through a variety of written, visual and oral projects.
- Students will raise their awareness of ethical issues related to biomedical science.

19. Course Objectives (standards)

List of CCSS and NGSS Standards by lesson

20. Course Outline
(based on Project Lead The Way)

Unit 1: The Mystery

The goal of Unit 1 is to provide the foundation and develop the theme for the course. Students are engaged by reading about a woman, Anna Garcia, who is found dead in her home. Students investigate the scene, gather evidence, and then move to the lab to analyze their findings. Through their examination of key evidence, students learn notebook organization, observation and documentation skills, and the fundamentals of experimental design. Students are introduced to the structure of DNA and investigate how basic molecular biology techniques can be used to connect suspects with a crime scene. Students also discuss the bioethics of scientific research and explore the bounds of HIPAA legislation. In each unit of the course, students obtain additional medical history information for Anna as well as details from her autopsy report as they explore the various illnesses she encountered throughout her life. Students will maintain a medical file for Anna Garcia, compile their ideas and findings over the duration of the course, and ultimately determine her cause of death in the final unit.

Lesson 1.1.....Investigating the Scene
Lesson 1.2.....DNA Analysis
Lesson 1.3.....The Findings

Unit 2: Diabetes

The goal of Unit 2 is for students to walk through Anna Garcia's diagnosis of diabetes by completing simulated laboratory tests. Given results of the tests, students can deduce the basic biology of both Type 1 and Type 2 diabetes. Students investigate the connection between insulin and glucose and discuss how feedback systems in the body regulate the function of key hormones. Students investigate the biochemical makeup of food and complete experiments to demonstrate the relationship between energy and food. As students explore diabetes, they are introduced to basic chemistry, the structure and function of macromolecules, and the relationship of these molecules to metabolic function. The causes, symptoms, treatments, and side effects of diabetes are studied as well as the lifestyle implications associated with this disease. Students examine complications related to diabetes and finally brainstorm and develop an innovation to help with the management or treatment of the disease.

Lesson 2.1.....What is Diabetes?
Lesson 2.2.....The Science of Food
Lesson 2.3.....Life with Diabetes

Unit 3: Sickle Cell Disease

The goal of Unit 3 is for students to learn basic concepts of genetics and inheritance as they explore Anna Garcia's struggle with sickle cell disease.

Students examine sickled red blood cells under a microscope and learn what life is like with the disease by reading and writing patient diary entries. They simulate the process of protein synthesis, examine the assembly of the protein hemoglobin, and demonstrate how sickle cell disease results from a mutation that alters a protein product. Students examine the structure of chromosomes and show how traits are passed through generations on the chromosomes in our cells.

Lesson 3.1.....The Disease
Lesson 3.2.....It's in the Genes
Lesson 3.3.....Chromosomes
Lesson 3.4.....Inheritance

Unit 4: Heart Disease

The goal of Unit 4 is for students to examine the normal function of the human heart and investigate malfunctions in the cardiovascular system that can lead to heart disease. Students complete a dissection to tour heart anatomy and study heart function using probes and data acquisition software. They collect and analyze heart data, including heart rate, blood pressure, and EKG readings and analyze cardiac test results of Anna Garcia. Students explore the role cholesterol plays in the body. Students further their knowledge of molecular biology as they run gel electrophoresis and complete RFLP analysis to diagnose familial hypercholesterolemia. Students design models to simulate the function of a pump and design visuals to show interventions for blocked coronary vessels.

Lesson 4.1.....Heart Structure
Lesson 4.2.....The Heart at Work
Lesson 4.3.....Heart Dysfunction
Lesson 4.4.....Heart Intervention

Unit 5: Infectious Disease

The goal of Unit 5 is to introduce students to microbiology and infection. Students follow the spread of a simulated epidemic in order to conduct a thorough examination of the agents of disease. Students use clues from their investigation of Anna Garcia's medical history to deduce that she was suffering from a bacterial infection. Through a series of laboratory investigations, students learn the fundamentals of aseptic technique, complete visual identification of bacterial morphology, use the Gram stain to examine bacterial cell structure, and analyze the results of metabolic tests to pinpoint the particular bacterium at the heart of the illness. Students explain the functioning of the human immune system in a visual project and explore how this system is designed to protect against invaders.

Lesson 5.1.....Virus
Lesson 5.2.....Bacteria
Lesson 5.3.....Public Health Campaign

Unit 6: Post Mortem

This unit is the culminating unit of the course. Students will put together all they have learned throughout the course to determine Anna Garcia's cause of death. Throughout

the course they have been compiling an Anna Garcia file with any information they have learned about her and her case. In this final unit, students will investigate the structure and function of key human body systems and relate all of the ways Anna's various illnesses affected each body system, potentially resulting in her premature death. In the final activity of the course, students will receive one final autopsy report and put together all they know to determine Anna's cause of death. They will think about the interventions or innovations that may have saved Anna that day and reflect on the power of prevention in keeping the body well and safe from harm.

Lesson 6.1..... Analyzing Anna
Lesson 6.2..... Medical interventions, preventions and innovations

21. Instructional Materials:

Project Lead The Way lab book and PLTW recommended materials.

22. Instructional Methods and/or Strategies (Key Assignments)

PLTW uses project- and problem-based instructional design centered on hands-on, real-world activities, projects, and problems that help students understand how the knowledge and skills they develop in the classroom may be applied in everyday life. The approach scaffolds student learning through structured activities and projects that empower students to become independent in the classroom and help them build skill sets to apply to an open-ended design problem. This approach provides students with unique opportunities to work collaboratively, identify problems, apply what they know, persevere through challenges, find unique solutions, and lead their own learning.

Differentiation will be offered in support of English Language learners and students with IEPs, and other diverse learners .

23. Assessment Methods and/or Tools

The PLTW program provides an integration of both formative and summative assessments that allow teachers to monitor student progress and modify instruction as needed. Through a balanced assessment approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools – such as performance rubrics, reflective questioning, and End-of-Course (EoC) assessments to deepen and expand their knowledge and skills.

24. Grading Policy

Grading will follow the San Leandro Unified School District's policy.

SECTION C

25. Context for Course

The California Career Pathways Trust grant supports schools to develop career relevant curriculum and provide articulated pathways to postsecondary education. San Leandro Unified School District is a recipient of the Career Pathway Trust Grant and is developing a Biomedical Health Pathway. This course is adopted from Project Lead the Way (PLTW). PLTW is an organization focused on empowering students and transforming the teaching experience. Since 1997, they have grown from a high school engineering program to offering comprehensive K-12 pathways in computer science, engineering, and biomedical science. This course works with the same equipment and tools used by lab professionals. PLTW students are empowered to explore and find solutions to some of today's most pressing medical challenges. Through scaffolded activities that connect learning to life, students step into the roles of biomedical science professionals and investigate topics including human medicine, physiology, genetics, microbiology, and public health. Students work together in teams to find unique solutions and learn transferable skills such as critical thinking and communication.