PROVIDENCE
A SANTA BARBARA CHRISTIAN SCHOOL

Providence Engineering Academy

Application for 2016-2017

The Providence Engineering Academy is an exciting new program that launched in the 2015-2016 school year. We recognize that many of our students have a strong interest in mathematics, science, and technology, and this initiative gives such students opportunities to develop those interests in a structured way. The coursework is led by Mr. Rodney Meadth, who holds a Bachelor of Engineering in Aerospace degree from RMIT University in Melbourne, Australia. Mr. Meadth has been teaching mathematics, science, engineering, and technology classes to high schoolers in a Christian school context since 2006.

Interested students must read through the entire application, and submit responses to the questions on the final page. They will then be interviewed by a panel of Providence staff members. Commitment to this program should not be taken lightly; the coursework will be intentionally challenging, with the view to adequately preparing students to undertake further studies in related fields. The ideal applicant will have demonstrated aptitude in their mathematics and science classes, will be willing to work as part of a team to accomplish projects, and will have the desire to be challenged in their leadership skills and academic ability.

The vision and mission statements summarize the central goals and philosophy of the program.

Vision Statement

The Providence Engineering Academy seeks to inspire and equip students to find creative solutions to the world's problems through mathematics, science, and engineering, as imitators of a creative God.

Mission Statement

The Providence Engineering Academy offers a rigorous, four-year course of studies to high schoolers in various fields of mathematics, science, and engineering, complementing the school's established liberal arts environment. Upon successful completion, students will be well equipped to continue on into any of a wide variety of math/science-based programs, ultimately glorifying God as capable leaders in their field.

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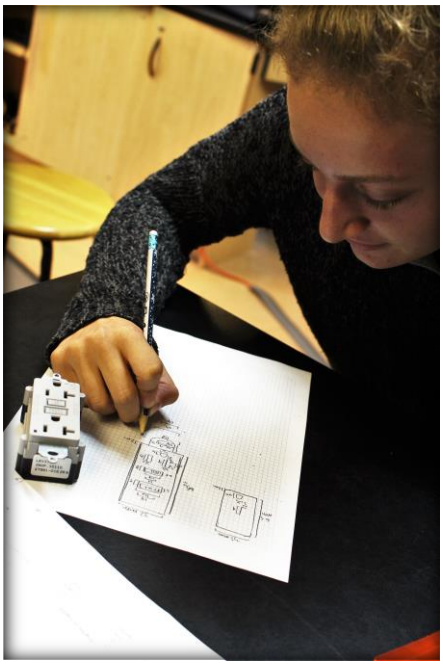
Key Strategies

The engineering program employs several key strategies as a means of accomplishing the stated vision and mission. It is important that applicants read and understand these strategies, as they describe in practical detail the unique methods and ethos that are experienced day by day.

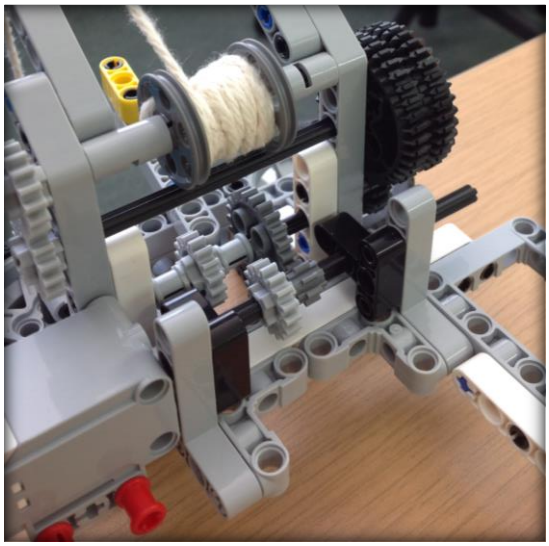
We accomplish the mission and vision…

1. By teaching rigorous classes that develop personal academic discipline, rather than mere technological proficiency
2. By encouraging teamwork and collaboration in all facets of the program
3. By demanding that students draw on the experiences of their core liberal arts classes to communicate effectively, reason logically, and think historically
4. By giving students opportunities to lead, take risks, and make mistakes
5. By presenting the different aspects of mathematics, engineering, and sciences as being fundamentally related and integrated



6. By allowing students to use their newly-acquired skills to engage in skilled volunteer work within the school and community
7. By inviting inspiring leaders in relevant fields to connect with students and share about their profession, passions, and faith
8. By training students to use all forms of technology responsibly: tool, not toy; servant, not master; means, not end
9. By frequently providing projects that allow students to tangibly prove their growth in skill and knowledge
10. By intentionally drawing attention to relevant aspects of a well-designed Creation
11. By encouraging students to consider university degrees and professions that will allow them to continue to lead and grow in similar fields

Program Expectations



Academic Performance

Students are expected to maintain strong grades, hand in homework on time, and generally participate fully in *all* of their classes—not just their engineering classes. Students in the engineering program should not be on academic probation, or be receiving Ds or Fs in any of their classes. Suitability for the program will be reconsidered in such cases.

Commitment to the Program

This is a full four-year program, with a carefully designed sequence of classes. The ideal progression begins in the 9th grade, and continues on to the 12th. While there certainly are situations that would deviate from this (school transfers, academic difficulty, etc.), a student's general intention should be one of long-term commitment. Only students who have participated fully for the years they are at Providence will be recognized at graduation as having successfully completed the program.

Pursuit of Engineering Opportunities

Participants will, with the assistance of faculty members, pursue engineering opportunities as they arise. This will flavor the student's education in a particular way, and will provide valuable experiences. Some such avenues might be: engineering-related volunteer work; communicating with professionals as mentors; participating in competitions; attending conferences or camps; and so on. Seniors will be strongly encouraged to relate their Senior Project thesis to an engineering specialization.

Special Credit Requirements

Given the fact that mathematics is the language of all engineering, students are required to complete four full years of mathematics, ideally culminating in *AP Calculus AB*. Also, to help make room in a student's schedule for the four extra engineering classes, participants are required to take only two years of Fine Arts classes, instead of the usual three. See the next page for a sample schedule for a student in the Providence Engineering Academy.

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Sample Schedule

This sample schedule gives an idea of the typical schedule that a student in the Providence Engineering Academy might follow. Most of these classes are required, as described in the Providence Student Handbook and in this packet; the classes marked in grey are suggestions or recommendations.

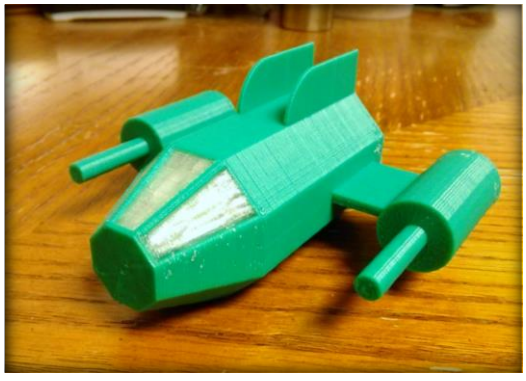
	9th Grade	**10th Grade**	**11th Grade**	**12th Grade**
Humanities	Humanities I	Humanities II	Humanities III	English Literature (AP optional) Economics / US Government
Mathematics	Geometry	Algebra II	Precalculus	AP Calculus AB
Science	Conceptual Physics	Biology	Chemistry	AP Physics 1
Foreign Language	Spanish I	Spanish II	Spanish III	AP Spanish IV
Fine Arts	Art I	Art II	Art III or Choir	AP Art or Choir
Foundations	Old Testament Hermeneutics	New Testament Hermeneutics		Christian Theism and Christian Worldview
Senior Project				Senior Project
Engineering	3D Design / Logic and Programming	Robotics / Mathematics for Engineers	Statics	Aerodynamics

9th Grade / 10th Grade – Foundations of Engineering

3D Design: A one-semester introductory course teaching the basics of three-dimensional computer design. Projects focus on architectural models and product design. Students are given the option to produce a physical piece using 3D printing. Taking this class early on in the sequence ensures that students possess important skills for various applications in following years.

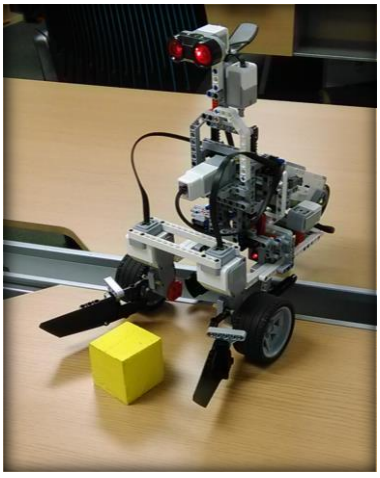
Logic and Programming: A one-semester introductory course beginning with the principles of formal logic. From here, students use computer applications such as Excel and Python as a means of efficiently applying logical principles to real-world problems. Like *3D Design*, this class is intentionally taught early on so that the skills learned may be used in future project work.

Robotics: A one-semester course that shows how logic and programming principles may be used in conjunction with sensor technology and mechanical design to produce simple but useful robots. For students who took the *Intro to Engineering* class in middle school, this will be a chance to further develop skills and improve the elegance of their designs.



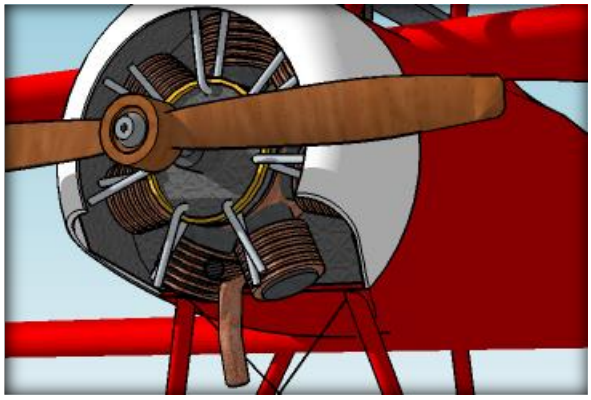
Mathematics for Engineers: A one-semester course that delves into topics not usually taught deeply within a typical high school mathematics/science program. These topics find use in many important engineering applications, and may include: trigonometry; vectors; statistics; matrices; complex numbers; polar coordinate systems.

11th Grade / 12th Grade – Advanced Engineering



Statics: This is a year-long course that considers many aspects of the physics of stationary objects and systems ("statics," as opposed to "dynamics"). We begin with a discussion of forces, moments, and equilibrium and move from there into the various loading actions (tension, compression, shear, etc.), and how Hooke's Law approximates the outcome. Properties of cross-sections (area, second moment of area, and centroids) are then considered, as well as material properties (density, strength, Young's Modulus, etc.), and this allows us to begin to analyze and design beams, columns, and other typical structural members. Two-dimensional truss systems will then be discussed, with matrix methods used for their solution. The year will culminate with a long-term project in which students use their newly acquired skills to design a simple structure.

Aerodynamics: This year-long course gives a first look into the world of fluid flow and its applications to the aerospace industry. The fundamental properties and behavior of fluids are first discussed, so as to give a working vocabulary for all that follows. From here, students learn how aerodynamic forces are created, and the equations which predict them. Aircraft anatomy is then introduced, with a discussion of aerodynamic control and stability, which will then lead into the beginning phases of the design of a large, unpowered glider. Computer methods will be employed to simulate aerodynamic flow and to run rapid iterations of the aircraft's critical dimensions. This exciting long-term final project is created completely "from scratch" and in accordance with the design principles taught throughout the year, serving as a capstone project for program participants. Current trends and developments, such as UAVs and high-efficiency aircraft, are also discussed throughout the year.



Notes

The exact class titles, topics, and sequences listed above are subject to revision from year to year, but are good and likely representations of the coursework that will be followed.

As well as these more focused classes, students will take *Conceptual Physics*, *Biology*, and *Chemistry*, with the option for *AP Chemistry*. In the near future, *AP Physics* may also become available, and would be recommended. Students are also expected to take a full four years of mathematics, ideally going all the way through to *AP Calculus AB* in the 11th or 12th grade. While this may sound overly demanding to some, it should be remembered that mathematics is the language of science and engineering, and those hoping to go on to further studies in this field must be readily conversant.

Frequently Asked Questions

Is there a minimum GPA to get in?

No. The ideal candidate will have a strong academic history, especially in their mathematics and science classes, but there is no defined cut-off for grades. We consider the whole person in the application process, including past experiences, hobbies, motivation, and leadership ability.

How long am I signing up for?

This is a four-year cohesive and sequential program, in which each year builds on the previous. We want participants to be in the Engineering Academy for the rest of their high school career at Providence. Note that a failure to keep up with the coursework (including the usual Providence core classes) may mean that we reconsider your involvement in the program.

Will I be taking extra classes?

Yes. There will be specific, exclusive classes that participants are required to take for this program. There are others that we will strongly recommend. This may create a situation where a student in the Engineering Academy would not be able to select certain other electives or programs that the school offers.

Why do you keep mentioning liberal arts in an engineering program?

Simply put, Providence *is* a liberal arts school. Furthermore, engineers in particular need to be aware of history, think logically, be well grounded in ethics, and communicate persuasively and effectively. This engineering program has been designed to operate complementary to the school's existing liberal arts focus.

Why is a Christian school doing engineering?

An engineer is someone who uses mathematics and science and technology to creatively solve real-world problems. As Christians, we are free to recognize and celebrate that our Father God is the Master Engineer who miraculously created an expansive, well-designed universe. As children made in His image, we create because He creates. Such ideas will be discussed and intentionally woven into the curriculum.

Why the cautionary statements about technology?

There is often a tendency to think that we, as humans, can solve any problem, with enough time and the right technology. There may be a grain of truth here in the sense of *scientific* problems, but we ought never to extrapolate this to the *human* problem of sin. Technology may be a useful servant, but it will never be a savior, and will never truly speak to life's most important questions. We will use technology frequently and appropriately, but only as a means and never as an end.

Will I receive any recognition for participating in this program?

Students who successfully complete the program will receive a special distinction at graduation. Another avenue for recognition will be college recommendation letters, which will help raise the profile of a student's application, especially if applying to study in related fields.

Will we enter into robotics competitions like other schools?

This is not a "robotics academy," and therefore the program will not make winning robotics competitions one of its primary goals. Other schools already do this and do it well, but we are seeking uniquely different ends. We will certainly be open to participating in various events and competitions from time to time, but this will by no means drive the program.

What kind of skilled volunteer work do you envision?

Several established not-for-profit organizations exist to carry out engineering and design work to solve global problems concerning poverty, housing, power generation, etc. We will be looking for opportunities to come alongside these organizations, in order to emphasize Christian service through engineering as a primary value. Tutoring other students would be another natural service outlet for participants.

What kinds of classes will be taught?

See the section that describes the year-by-year academy structure. In summary, topics will include static and dynamic analysis, solid mechanics, computer science and programming, robotics, aerospace applications, and engineering-specific mathematics topics.

What kinds of speakers will be coming in?

We have good connections with a range of local professionals who work in various fields of engineering and technology, many of whom are Christians and leaders within their industry. As well as describing their daily work and making career recommendations, speakers will address topics such as the developing world, Christian creativity, engineering ethics, and proper use of technology.

Are there extra costs associated with the program?

At this point, there are no plans to charge extra for participation. It is possible that specific opportunities may arise (conferences, volunteer projects, competitions, etc.), at which time extra costs may be evaluated.

Do I have to take *Intro to Engineering* in middle school?

No—but it's great if you do! Similar topics will be taught (albeit in more depth) in the high school curriculum. The purpose of the middle school course is to stimulate interest for those considering the high school program, but it neither obliges a student to continue on nor guarantees a position.

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Your Application

Having read everything in this packet, please answer the following questions and submit your application either on paper or electronically to Mr. Rodney Meadth (rmeadth@providencesb.org). There is no minimum or maximum word count. We simply want you to be honest and accurate with your answers—we want a truthful picture of your abilities, experiences, and interests.

You must also submit a brief letter of recommendation from your current math or science teacher, describing your suitability for the program.

Note that your submission of this application will be taken to be your agreement with the course description and expectations detailed in this packet.

Application Questions

Please answer all questions.

1. What is your full name?
2. What is today's date?
3. Into which grade will you enter next school year?
4. How old will you be at the beginning of next school year?
5. What school do you currently attend?
6. What classes did you take last semester, and what were your final average grades in them?
7. How did you hear about the Providence Engineering Academy?
8. Why are you interested in the Providence Engineering Academy?
9. Have you ever taken part in any other STEM programs, electives, classes, clubs, etc.? If so, describe them.
10. Have you ever been given leadership responsibility, or participated in a leadership program? If so, describe.
11. Can you describe in your own words what you think engineering is?
12. Do you have a leaning toward a particular future career?
13. Describe a teamwork experience that you have had in the context of school, church, sports, clubs, etc. What did you learn from this experience?
14. What is the most challenging academic experience you have had up to this point? How did you rise to meet the challenge?
15. Do you have any further questions about anything you read in this packet?
16. If accepted, what kind of positive contributions would you bring to the Providence Engineering Academy?