Program Overview
The Marin Academy Research Collaborative (MARC) Program is specifically designed to engage a diverse group of students in cutting-edge science and engineering research. This multidisciplinary program provides the opportunity for interested students to identify their particular skills and interests, partner with the larger scientific community to pursue a research project of their own design, and complete a rigorous college prep curriculum. Throughout this process students will:

- Connect with local scientific community
- Develop mastery in a chosen field
- Think critically
- Communicate effectively
- Develop professional skills necessary for a successful scientific career
- Use innovative technology
- Take academic risks
- Make new discoveries

Program Goals
This is a two-year research program and requires a great commitment. At the end of this program students will have designed and completed their own research project in collaboration with mentors both inside and outside of Marin Academy.

How it Works
MARC students have the unique opportunity to delve deeply into an aspect of science that particularly fascinates them. MARC students are challenged to complete original and independent research that is characteristic of college-level courses: students generate a research question, conduct a literature review, collaborate with content-area experts, develop hypotheses, collect and analyze data, and learn how to publicly present as well as publish their work. This two-year program offers students the chance to perform novel research and participate in the scientific community as they work closely with faculty and an outside mentor, typically a professional scientist.

Students begin the MARC program in the fall of 11th grade and finish in the spring of 12th grade. There are no textbooks or traditional tests for this course; rather students set their own path and create their own curriculum. They spend the first semester of 11th grade identifying their topic of research and conducting an extensive review of the scientific literature on that topic. This process gives students the opportunity to develop and dissect a very specific question or set of questions in depth. Students choose a topic from engineering and computer sciences, physical sciences, life sciences, social sciences, or psychology that they wish to research during the next 1.5 years and then identify an outside mentor with the guidance and support of the MARC coordinators. Students conduct research whereby they create testable hypotheses, perform experiments, analyze the results, and provide conclusions from their work. Students are encouraged to spend time working in the lab of their outside mentor during the school year or take part in a summer science research internship program. In their twelfth-grade year, students will create a final paper and presentation that documents the entire experience. Students also have the option of entering local, state, and national science competitions. While MARC students are required to demonstrate a high degree of autonomy, initiative, and time management, classes are held during the week and the teacher meets with each student for one hour every two weeks to discuss hypotheses, goals and objectives. In addition, throughout the MARC program, students share their ongoing research with each other and mentor students new to the program.
Eligibility Requirements
Due to the unique demands of the MARC program, only a limited number of students can be admitted. Students must be entering 11th grade, and be in good academic standing, and (GPA > 2.0) have taken Biology and Chemistry. Applicants are required to submit an essay, two letters of recommendation from teachers, and have the approval of their academic counselor. While not required, previous enrollment in the 9th grade MARC Minicourse and the optional MARC Elective: Exploring Experimental Design is highly recommended. Concurrent enrollment in a Physics elective is required during 11th or 12th grade and concurrent enrollment in Statistics for one year is recommended.

Important Dates
November 17, 2016: Informational Meeting
December 1, 2016: Application Available
January 12, 2017: Informational Meeting
February 17, 2017: Applications Due
March 24, 2017: Applicant Notified

List of Courses related to the MARC Program
9th Grade MARC Minicourse: A Science Lover’s Odyssey— Exploring New Frontiers
MARC Elective: Exploring Experimental Design
MARC Elective: Independent Research I (Year 1)
MARC Elective: Independent Research II (Year 2)

Course Descriptions
9th Grade MARC Minicourse: A Science Lover’s Odyssey— Exploring New Frontiers.
Open to all Freshmen
Prerequisites: None
Are you interested in finding out what it’s like to be a research scientist? Are you curious about why things work? Are you the kind of person that likes designing things? This minicourse is designed to allow you to work as a team with your peers as you develop the skills and mindset to solve novel problems. You will have the opportunity to develop a better understanding of hypothesis testing and experimental design while exploring topics in physics, chemistry, biochemistry, and biology. You also will have a chance to perform fieldwork (e.g., stream and biological index sampling) and laboratory experiments (e.g., bacterial morphology/biochemistry and PCR). The course also includes a trip to the Exploratorium, visits by research scientists, and trips to research labs in the area. If you are considering applying to the Marin Academy Research Collaborative (MARC) program, this minicourse will give you an insight into the skills, process, challenges, and rewards involved in research.

MARC Elective: Exploring Experimental Design
Open to all Sophomores, Juniors, and Seniors
Prerequisites: Biology, Chemistry (concurrent enrollment OK)
Exploring Experimental Design is a semester-long introductory course that focuses on research design, hypothesis testing, and basic laboratory skills. The instructional component of the course will focus on research methods and practices including, but not limited to such topics as: connections between knowledge of existing literature and/or preliminary data; research question and hypothesis generation; experimental design; quality of collected data; data analysis; and scientific reading and writing. This course is designed to allow you to work with your peers as you develop the skills and mindset to solve novel problems. The class includes visits by research scientists and field trips to local universities and research facilities. You will be exposed to a wide range of research fields (e.g., engineering and computer sciences, physical sciences, life sciences, social sciences, psychology) and have the opportunity to conduct “hands-on” research in our own MARC Research Lab in the Science and Innovation Center. If you are considering applying to the MARC program, this course will give you an insight into the skills, process, challenges, and rewards involved in research.
**MARC Elective: Independent Research I.**
Open to Juniors enrolled in the MARC program  
**Prerequisites:** Biology, Chemistry, MARC application; **Recommended:** Exploring Experimental Design, Physics, Statistics  
This year-long elective focuses on advanced research design, data collection, and research ethics. The hands-on component is geared toward the design and execution of a project idea for investigation by the student, with the intent of leading to an "Intel level" research project. Time will also be spent in the establishment of connections between students and professional mentors who will assist in the guidance of students as they perform their research. Students are expected to be self-motivated and collaborate with scientists on long-term projects. This elective provides the students with an individualized opportunity to pursue the research question of their choosing. Ideally, students will have both a MA science teacher and an outside mentor advising them during the school year. Students are encouraged to spend time working in the lab of their outside mentor during the school year or taking part in a summer science research internship program. Enrollment in this course is a two-year commitment and will continue through senior year.

**MARC Elective: Independent Research II.**
Open to Seniors enrolled in the MARC program  
**Prerequisites:** Biology, Chemistry, Independent Research I, Physics (concurrent enrollment OK); **Recommended:** Exploring Experimental Design, Statistics  
This year-long elective is focused on advanced research skills, data analysis, mentoring skills, and scientific communication. During 12th Grade, students will complete the research projects they began in Independent Research I. In addition, they will take on mentorship roles for those students just entering the program. The culmination of this program will require that students write their own research papers and prepare presentation materials. Students may enter the senior level contests appropriate to their area of study, such as the Siemens Competition or the Intel Science Talent Search, or they may present at appropriate conferences or science fairs. Students will also present their findings during the MA Science Symposium. Students are expected to be self-motivated and collaborate with scientists on long-term projects.

**Information for Parents of Prospective MARC Program Student Researchers**

**Q:** My child is interested in science. Why should they consider the MARC program?  
**A:** If your child is interested in science as a possible career choice, they should expose themselves to an in-depth perspective of the field of interest and the process of science. In this program, students not only learn the theoretical background and explanations of a particular subject area but are also given the opportunity to test and experiment with the unknown realms of that particular topic of interest.

**Q:** When should a student begin the opportunity of participating in the MARC program?  
**A:** Students should begin as soon as they get excited about conducting individual research. There are opportunities at every level. As freshmen, students can participate in the Science-Lover’s Odyssey Minicourse. As sophomores, they can enroll in the Exploring Experimental Design elective. In order to be accepted into the MARC program, they must apply in the spring semester of their sophomore year. If that deadline has passed, it is possible to participate in an alternative internship program.

**Q:** What should a 10th grader who is preparing to enter the MARC program in 11th grade expect within the first few months of the program and throughout the next two years?  
**A:** This depends on whether or not they have completed the Exploring Experimental Design elective and what level of preparedness they have coming in to the program. Generally, the first semester will be geared towards reading scientific literature, formulating a question and hypothesis, and designing an experiment. Beyond the first semester, students will be working with mentors to conduct their own novel research. The program will culminate in a paper and presentation of the findings at the MA Science Symposium and may lead to presentations at local and national science fairs.

**Q:** What are the 11th grade course objectives?  
**A:** Students will learn how to critically and scientifically think, write, and speak. They will learn how to conduct a literature search, identify and select an area of interest in which to complete a scientific study, learn to write a scientific abstract and research paper, learn advanced laboratory techniques, and prepare project displays for presentation.
Q: What are the 12th grade course objectives?
A: This year-long elective will focus on advanced research skills, data analysis, mentoring skills, and scientific communication. During 12th grade, students will complete the research projects they began in Independent Research I, and in addition, they will take on mentorship roles for those students just entering the program.

Q: What course objectives extend past gathering scientific literature and data collection?
A: Students learn to design and present displays of their work. They are encouraged to build their self-confidence and speak proficiently in front of large audiences.

Q: Which student types perform best in this program?
A: Any student can be successful in this course, if they are innately motivated, have strong initiative, are organized, have a deep interest in science, and are willing to prioritize MARC as a time commitment.

Q: Does my child need to double in science to participate in the MARC Program?
A: Yes, students in the MARC program will need to double in science either their junior or senior year to complete their MA science requirements. Students are required to complete three years of laboratory science including 9th Grade Biology, 10th Grade Chemistry, and one year of Physics (Physics, Advanced Physics with Calculus, Electrical Engineering and Computer Science, or Astrophysics). Physics may be taken in either the junior or senior year.

Q: Is this program widely recognized by college admission boards?
A: Yes, colleges look favorably on students who have remained committed to a course of study completed at an extremely in-depth level of comprehension.

Q: How will this course help my child prepare for college?
A: Students will use apparatus and techniques usually first introduced as undergraduates or possibly a graduate student in college. Students also learn how to effectively conduct literature searches and develop advanced laboratory techniques while learning how to write research papers and a research abstract (techniques needed to complete masters and doctoral theses).

Q: In which disciplines can a student complete research?
A: Students can choose a topic from engineering and computer sciences, physical sciences, life sciences, social sciences, or psychology.

Q: Is my child required to work in a research facility during the summer between their junior and senior year?
A: No, but students are encouraged to spend time working in the lab of their outside mentor during the school year or taking part in a summer science research internship program.

Q: If my child has additional questions about the MARC program, how can they get more information?
A: Students can contact Stori Oates (soates@ma.org) or Liz Gottlieb (lgottlieb@ma.org) for more information about the MARC Program or internship opportunities.