## ACESLogo.gif2018/2019 RSGC ACES Program

It is the belief of the RSGC ACES program that the quality of one’s life is bolstered, in part, by their ability to imagine, design, create, and implement solutions to problems that lay before them. It is to this vision that RSGC established its **Design Engineering Studio** in 2015 to provide a one-of-a-kind innovative learning environment. The power of this physical space rests within a curriculum that includes a sequence of three courses designed to prepare engineering-minded Georgians for the future that we envision. Our curriculum can aptly be described as *problem immersion* with an emphasis on project-based solutions and skill development. *Design* and *communication* technologies are fully integrated into the *engineering* technology process to produce remarkably comprehensive outcomes. Please tour our website (*top, left*) to explore the manifestation of our philosophy.

**ICS2O-E ⎯ DC Circuits (10)**This hands-on half-course builds on the Science 9 introduction to Electricity. Students work their way through concepts in and analog and digital circuitry employing curriculum designed specifically for our RSGC ACES program. Topics include reading schematics, prototyping, semiconductors, integrated circuits, as well as safety, environmental, and societal awareness. This course provides the foundation for our subsequent **ICS3U-E AVR Foundations** course. Detailed reports on projects develop strong technical writing and formatting skills.





**ICS4U-E ⎯ AVR Optimization (12) ICS3U graduates** are now prepared to explore the deepest level computer architecture from a homebrew, 4-bit TTL-based processor to 8-bit AVR microcontrollers. Only through the knowledge, skill, and application of assembly language instructions can these devices be truly optimized for performance. In addition to common core curriculum, students undertake three Independent Study Projects (ISPs) on areas of interest to *them*, thereby affirming and solidifying their individual passions and skill sets enabling them to make well-informed, university-related decisions.

**ICS3U-E ⎯ AVR Foundations (11)** Students are introduced to the architecture and implementation of microcontroller applications using the AVR family of microcontrollers. Topics include analog and digital concepts including the binary number system, ADC and DAC, PWM and interrupts. Printed Circuit Board layout and CAD/CAM skills are introduced enabling complete prototyping of projects based on light, sound, temperature, distance, mechanics, pressure, and power. Detailed reports on projects maintain strong technical writing and formatting skills.



**University Placement in Computer, Electrical, Mechanical or Software Engineering**

## A Focus on Skills

RSGC’s three-year ACES program provides students with a unique set of practical skills that are developed in parallel with the acquisition of theory and knowledge of electrical, computer and software engineering concepts. It is only through the pursuit of working prototypes that assumptions can be fully challenged, oversights exposed and the unforeseen and unexpected behaviour of so-called ‘ideal’ components be tested. Furthermore, by the time students get to university, with their emphasis on theory-heavy curriculum, students (and their group partners!) will appreciate the advantage of a practical foundation in this domain.

Finally, potential employers are looking for candidates that go beyond a high GPA and can actually demonstrate their knowledge through the creation of physical prototypes.

Below is a partial list of skills introduced in each of our ACES’ courses.

## Grade 10 (ICS2O-E)

1. Design Tools I (Fritzing)

2. Reading and Creating Schematic Diagrams

3. Breadboarding a Prototype

4. Troubleshooting (Debugging) Circuits

5. Design Tools II (EAGLE)

6. Using a Digital Multimeter

7. Through-Hole Soldering

8. Testing a Transistor

9. Technical Writing Skills

10. Advanced Word and Excel Techniques

11. Technical Presentations Skills

12. Time-Management Skills Involving Suppliers and Couriers

## Grade 11 (ICS3U-E)

13. Computer-Assisted Drawing (ViaCAD)

14. Printed Circuit Board (PCB) Layout Design (EAGLE)

15. PCB Ordering and Fabrication

16. Arduino/C Programming

17. 3D Printing and Vacuum Forming Skills I

18. Online Database Search Techniques and Parts Ordering

19. Global Awareness and Outsourcing of PCB Manufacturing and Ordering

## Grade 12 (ICS4U-E)

20. Surface Mount Soldering

21. ATMEL Assembly Language Programming

22. 3D Printing and Vacuum Forming Skills II

23. Building a Processor from TTL Chips

24. Teaching, Mentoring, and Technical Support for Younger ACES and DES Users