



**PROGRAM OF STUDY AND CURRICULUM OVERVIEW**

The Governor's School @ Innovation Park provides an alternative learning environment in a university-setting designed to meet the needs of academically talented and highly motivated learners. The STEM program provides a uniquely designed integrated science, math, engineering, and technology curriculum with real world research and application opportunities.

Students attending The Governor's School will be engaged in multiple opportunities to develop their leadership skills and potential by applying their intellectual design based on research into action proposals.

Students attending the partial-day program at The Governor's School will have opportunity to continue being involved in the social and extracurricular activities offered by their base schools. By providing a dual enrollment program, The Governor's School @ Innovation Park enables college-bound students to be challenged with college level content while earning both high school and college credits in science and math. Students will also be awarded opportunities to interact with science researchers and learn about possible career opportunities.

**Interdisciplinary Connectivity and Technology Integration**

The Governor's School faculty collaborates to integrate content knowledge and skills across disciplines. Students are challenged to understand and engage in the process of scientific investigation using state-of-the art technology and to utilize their technical writing skills to present their findings.

**Courses and Dual Enrollment**

**NOTE: ALL COURSES ARE REPORTED ON HIGH SCHOOL TRANSCRIPTS AS WEIGHTED SEMESTER COURSES**

	<u>MATH</u>	<u>SCIENCE</u>	<u>TECHNOLOGY/ENGINEERING (ELECTIVES)</u>	<u>MENTORSHIP</u>
<b><u>JUNIOR YEAR</u></b>	Precalculus/Calculus I Or Calculus I/II	Biology I Chemistry I Physics I or Engineering I	Principles of Technology and Engineering I (Engineering students take Univ. Physics I & II)	Hands-on research in science area of interest
<b><u>SENIOR YEAR</u></b>	Calculus II/III Or Calculus III/Linear Algebra	Biology II Chemistry II Physics II or Engineering II	Principles of Technology and Engineering II	Hands-on research in science area of interest

**Course Equivalency and Transferability**

<b>GS Course Names</b>	<b>George Mason University Dual Enrollment Option</b>	<b>AP Exam Option</b>	<b>University Credit Transferability</b>
Pre-Calculus	(Math 105)	No	No
Calculus I/II	(Math 115 and 116)	Yes - Calc BC	Likely – AP waiver equivalent course
Calculus III	(Math 215)	No	Likely – comparable course
Linear Algebra	(Math 203)	No	Likely – comparable course
General Biology I and II (Juniors)	(Biology 103/105 – 107/106)	Yes	Possibly science elective
Microbiology and Anatomy & Physiology (Seniors)	(Biology 124 and 246)	No	Possibly science electives
General Chemistry I and II (Juniors)	(Chemistry 211/213 – 212/214)	Yes	Likely – AP waiver equivalent course
Chemistry for Changing Times and Environmental Chem (Seniors)	(Chemistry 104 and 155)	No	Possibly science electives

College Physics I and II	(Physics 243/244 – 245/246)	Phys 1 and 2	Likely – AP waiver equivalent course; Possibly science elective for Physics majors
University Physics I and II (E&M and Mechanics)	(Physics 160/161 – 260/261)	Phys C (both exams)	Likely – University Physics for Majors; some universities may want Physics majors to repeat at their university
Practicum in Engineering	ME 151	No	Likely – comparable courses
Statics	ME 211	No	Likely – comparable courses
Thermodynamics	ME 221	No	Likely – comparable courses
Principles of Technology and Engineering I	Computer Science 112, Engineering 107, Computing for Scientists 130)	No	Likely – comparable courses
Principles of Technology and Engineering I/II <b>Innovations</b> Strand	No	No	No
Principles of Technology and Engineering II Courses <b>other than Innovations</b>	(Civil and Infrastructure Engineering – CEIE 203, Computer Science 211)	Yes (CS only)	Likely – comparable courses
Junior and Senior Year Research/Mentorship	Yes	No	Possibly science elective

## Math Course Placement

### Schedule for Students enrolling in Pre-Calculus Junior Year:

	<i>Fall Semester</i>		<i>Spring Semester</i>	
	<u>Math Strand</u>	<u>Science Strand</u>	<u>Math Strand</u>	<u>Science Strand</u>
Junior	<b>Math 105</b> <b>(4 Mason Credits)</b>	Chem 211/213 lab (4 Credits) Biol 103/105 lab (4 Credits) Phys 243/244 lab (4 Credits)	<b>Math 115</b> <b>(4 Mason Credits)</b>	Chem 212/214 lab (4 Credits) Biol 107/106 lab (4 Credits) Phys 245/246 lab (4 Credits)
Senior	<b>Math 116</b> <b>(4 Mason Credits)</b>	Chem 104 (4 Credits) Biol 124 (4 Credits) Phys 160/161 (4 Credits)	<b>Math 215</b> <b>(3 Mason Credits)</b>	Chem 155 (4 Credits) Biol 246 (3 Credits) Phys 260/261 (4 Credits)

### Schedule for Students enrolling in Calculus I/II Junior Year:

	<i>Fall Semester</i>		<i>Spring Semester</i>	
	<u>Math Strand</u>	<u>Science Strand</u>	<u>Math Strand</u>	<u>Science Strand</u>
Junior	<b>Math 115</b> <b>(4 Mason Credits)</b>	Chem 211/213 lab (4 Credits) Biol 103/105 lab (4 Credits) Phys 243/244 (4 Credits) Engr 107 (2 Credits)	<b>Math 116</b> <b>(4 Mason Credits)</b>	Chem 212/214 lab (4 Credits) Biol 107/106 lab (4 Credits) Phys 245/246 lab (4 Credits) ME 151 (2 Credits)
Senior	<b>Math 215</b> <b>(3 Mason Credits)</b>	Chem 104 (4 Credits) Biol 124 (4 Credits) Phys 160/161 lab (4 Credits) ME 211 (3 Credits)	<b>Math 203</b> <b>(3 Mason Credits)</b>	Chem 155 (4 Credits) Biol 246 (4 Credits) Phys 260/261 lab (4 Credits) ME 221 (3 Credits)

## Math Course Descriptions

**Existing GMU Course Numbers/Name: MATH 105**

**Course Title: Precalculus (4 GMU credits) – GS@IP Junior Course**

**Prerequisite:** Appropriate score on the math placement test and completion of Alg II/Trig with a C or better.

**Course Description:**

Reviews mathematics skills essential to studying calculus. Topics include equations, inequalities, absolute values, graphs, functions, exponential and logarithmic functions, and trigonometry.

**Existing GMU Course Numbers/Name: MATH 115**

**Course Title: Analytic Geometry and Calculus I (Honors) (4 GMU credits) – GS@IP Junior Course**

**Prerequisite:** Completion of Pre-calculus Functions Analytical/Trig with a C or better and appropriate math entrance exam score.

**Course Description:**

This course will cover functions, limits, the derivative, maximum and minimum, the integral, and transcendental functions.

**Existing GMU Course Numbers/Name: MATH 116**

**Course Title: Analytic Geometry and Calculus II (Honors) (4 GMU credits) – GS@IP Junior and Senior Course**

**Prerequisite:** Completion of 115 with C or better.

**Course Description:**

This course will cover vectors and vector-valued functions, partial differentiation, multiple integrals, line integrals, surface integrals, and transformation of coordinates.

**Existing GMU Course Numbers/Name: MATH 215**

**Course Title: Analytic Geometry and Calculus III (Honors) (3 GMU credits) – GS@IP Junior and Senior Course**

**Prerequisite:** Completion of Math 116 with C or better.

**Course Description:**

This course will cover vectors and vector-valued functions, partial differentiation, multiple integrals, line integrals, surface integrals, and transformation of coordinates.

**Existing GMU Course Numbers/Name: MATH 203**

**Course Title: Linear Algebra (3 GMU credits) – GS@IP Senior Course**

**Prerequisite:** Completion of two semester of calculus Math 113 and Math 114 with C or better.

**Course Description:**

This course will cover systems of linear equations, linear independence, linear transformations, inverse of a matrix, determinants, vector spaces, eigenvalues, eigenvectors, inner products, and orthogonalization.

## Science Course Options: Physics Strand

**Existing GMU Course Numbers/Name: PHYS 243 and Lab 244**

**Course Title: College Physics I (3 GMU lecture credits + 1 lab credit) – GS@IP Junior Courses Fall Semester**

**Prerequisite:** Completion of Algebra II/Trig and Chemistry with a C or better.

**Course Description:**

Basic physics course with emphasis on topics of classical and modern physics of particular importance to science majors. Principles of mechanics, heat, electricity, magnetism, optics, and atomic and nuclear physics are discussed.

**Existing GMU Course Numbers/Name: PHYS 245 and Lab 246**

**Course Title: College Physics II (3 GMU lecture credits + 1 lab credit) – GS@IP Junior Course Spring Semester**

**Prerequisite:** Completion of Physics 243 and 244 lab with a C or better.

**Course Description:**

Successful completion of PHYS 243 with a C or better is prerequisite to PHYS 245. Two-semester basic physics course with emphasis on topics of classical and modern physics of particular importance to science majors. Principles of mechanics, heat, electricity, magnetism, optics, and atomic and nuclear physics are discussed.

**Existing GMU Course Numbers/Name: PHYS 160 and Lab 161**

**Course Title: University Physics I (3 GMU lecture credits + 1 lab credit) – GS@IP Senior Course Fall Semester**

**Prerequisite:** Completion of Physics 243-246 with a C or better. Corequisite Math 115.

**Course Description:**

This course is a calculus-based introductory physics sequence, designed primarily for science and engineering majors.

**Existing GMU Course Numbers/Name: PHYS 260 and Lab 261**

**Course Title: University Physics II (3 GMU lecture credits + 1 lab credit) – GS@IP Senior Courses Spring Semester**

**Prerequisite:** Completion of Physics 160 with C or better; Corequisite Math 116.

**Course Description:**

This course is calculus-based physics covering topics in waves, electricity and magnetism.

### **Science Course Options: Biology Strand**

**Existing GMU Course Numbers/Name: Biology 103**

**Course Title: Introductory Biology I (3 GMU lecture credits + 1 lab credit) – GS@IP Junior Courses Fall Semester**

**Prerequisite:** Completion of Pre-AP or Honors Biology with a C or better.

**Course Description:**

Introductory Biology I is a focused survey course with objectives centered on the chemistry of life; cells and molecular structure; cell functions; enzymes and their roles and functions; genetics and DNA; and diversity of life and evolution.

**Existing GMU Course Numbers/Name: Biology 107 (Lecture)/106 (Lab)**

**Course Title: Introductory Biology II (3 GMU lecture credits + 1 lab credit) – GS@IP Junior Courses Spring Semester**

**Prerequisite:** Completion of Biology 103 with a C or better.

**Course Description:**

Topics include animal (including human) structure, function, homeostatic mechanisms, organ systems, behavior, higher plant systems, and major concepts in ecology.

**Existing GMU Course Numbers/Name: Biology 124**

**Course Title: Human Anatomy and Physiology (3 GMU lecture credits + 1 lab credit) – GS@IP Senior Course Fall Semester**

**Prerequisite:** Completion of Biology 104 or AP Biology with a C or better.

**Course Description:**

The course is an introduction to the structure and function of the body's major organ systems. The course will cover basic principles of biology and chemistry required to understand physiology. We will discuss the

chemical, cellular and tissue levels of organization in the human body and begin our survey of organ systems with a study of the structure and function of the integumentary, skeletal, muscular and nervous systems. Laboratory exercises are designed to reinforce lecture material by providing opportunities for both observation and manipulation of anatomical structures and experiments in physiological principles.

**Existing GMU Course Numbers/Name: Biology 246**

**Course Title: Introductory Microbiology Lecture (3 GMU credits) and Lab (Lab- only High School Credit available) - GS@IP Senior Course Spring Semester**

**Prerequisite:** Completion of BIOL 104 or AP Biology with a C or better.

**Course Description:**

The course is an introduction to microbial cell structure, physiology, and pathogenicity of various microorganisms including bacteria, viruses, and fungi. Emphasis is on host-parasite relationships, epidemiology and immunology of infections. The students will also receive a broad coverage of various infectious diseases including etiological agents, modes of transmission, presentations of symptoms, and treatments and prevention. An environmental aspect will also be included to increase students' understanding of the utilization of microorganisms in environmental processes such as fermentation and waste management.

**Science Course Options: Chemistry Strand**

**Existing GMU Course Numbers/Name: CHEM 211**

**Course Title: General Chemistry I (3 lecture credits + 1 lab credit) – GS@IP Junior Course Fall Semester**

**Prerequisites:** Completion of Pre-AP or Honors Chemistry with a C or better.

**Course Description:**

Basic facts and principles of chemistry, including atomic and molecular structure, gas laws, kinetics, equilibrium, electrochemistry, nuclear chemistry, and properties and uses of the more important elements and their compounds.

**Existing GMU Course Numbers/Name: CHEM 212**

**Course Title: General Chemistry II (3 lecture credits + 1 lab credit) – GS@IP Junior Course Spring Semester**

**Prerequisites:** Completion of Chemistry 211 with a C or better.

**Course Description:**

Focused survey course with objectives that include physical and chemical changes and properties; interactions of matter; structures of atoms; and intermolecular forces.

**Existing GMU Course Numbers/Name: CHEM 104**

**Course Title: Chemistry for Changing Times (3 lecture credits + 1 lab credit) – GS@IP Senior Course Fall Semester**

**Prerequisites:** Completion of Chemistry 211, 212 or AP Chemistry with a C or better.

**Course Description:**

Modern course in to explore and discover chemistry in the 21st century with an emphasis on current societal concerns. Examines carbon- containing compounds such as, polymers, biomolecules, drugs, and fuels, which play a central role in medicine, manufacturing, green energy, and forensic science. Topics include examples from organic chemistry, conformational analysis, stereochemistry, genetics, and protein-protein interactions.

**Existing GMU Course Numbers/Name: CHEM 155**

**Course Title: Introduction to Environmental Chemistry I (3 lecture credits + 1 lab credit ) – GS@IP Senior Course Spring Semester**

**Prerequisites:** Completion of Chemistry 211, 212 with a C or better.

**Course Description:**

This course in modern chemistry is an introduction to major topics of environmental chemistry. Topics include atmospheric chemistry and air pollution, energy and climate change, water chemistry and water pollution, and select topics on toxic organic compounds. The laboratory component focuses on water chemistry yet includes atmospheric chemistry and analytical chemistry topics.

**Science Course Options: Engineering Strand****Existing GMU Course Numbers/Name: ENGR 107****Course Title: Introduction to Engineering (GMU 2 credits) – GS@IP Junior Course Fall Semester****Course Description:**

This course introduces students to fundamental disciplines and concepts in engineering. Basic problem solving skills will be developed as applied to various engineering disciplines. Introduces engineering profession fundamentals and problem-solving. Topics include description of engineering disciplines, functions of the engineer, professionalism, ethics and registration, problem solving and representation of technical information, estimation and approximations, and analysis and design.

**Existing GMU Course Numbers/Name: ME 151****Course Title: Practicum in Engineering (GMU 2 credits) – GS@IP Junior Course Spring Semester****Course Description:**

This course provides students with experiences in algorithmic thinking, visualization and communications of Engineering principals.

**Existing GMU Course Numbers/Name: ME 211****Course Title: Statics (GMU 3 credits) – GS@IP Senior Course Fall Semester****Course Description:**

An initial course in applied vector mechanics with emphasis on static equilibrium. Topics include forces, moments, couples, equivalent force-couple systems, centroids, distributed forces, and Coulomb friction. The application of the free body diagram in the analysis of static equilibrium of frames, machines and trusses is stressed.

**Existing GMU Course Numbers/Name: ME 221****Course Title: Thermodynamics (GMU 3 credits) – GS@IP Senior Course Spring Semester****Course Description:**

A basic thermodynamics course in which the first and second laws of thermodynamics are studied primarily from the classical macroscopic viewpoint and applied to both closed and open systems. Working substances include perfect gases, real gases and vapors in addition to solids and liquids.

**Principles of Technology and Engineering (PTE) Course Options****Existing GMU Course Numbers/Name: CS 112****Course Title: Introduction to Computer Programming (GMU 4 credits) – GS@IP Junior and Senior Course Fall Semester****Course Description:**

Utilizing JAVA programming language, focuses on problem solving, testing, and debugging; and introduces object-oriented programming. Topics include classes, inheritance, packages, collections, exceptions, and polymorphism. Examples in the course may include the use of basic data structures.

**Existing GMU Course Numbers/Name: CS 211****Course Title: Object Oriented programming (GMU 4 credits) – GS@IP Junior and Senior Course Spring Semester**

**Prerequisites:** C or better in CS 112.

**Course Description:**

Introduces the use of computer programming as a problem-solving tool. Topics in procedural programming include expressions, control structures, simple data types, input/output, graphical interfaces, testing, debugging, and programming environments.

**Existing GMU Course Numbers/Name:** ENGR 107

**Course Title:** Introduction to Engineering (GMU 2 credits) – GS@IP Junior Course Fall and Spring Semesters (Non-Engineering Strand Students)

**Course Description:**

This course introduces students to fundamental disciplines and concepts in engineering. Basic problem solving skills will be developed as applied to various engineering disciplines.

**Existing GMU Course Numbers/Name:** CEIE 203

**Course Title:** Geomatics and Engineering Graphics (GMU 3 credits) – GS@IP Senior Course Fall and Spring Semesters (Non-Engineering Strand Students)

**Course Description:**

Introduces topographic surveying and engineering drawing for civil engineering applications. Topics include surveying, GPS, GIS, digital terrain modeling, design of horizontal and vertical curve geometry for road applications, engineering drawing concepts, and drawing with CAD-based software. Field work required on selected topics.

**Existing GMU Course Numbers/Name:** BENG 101 (**Note: senior course only; students must take this course for dual enrollment credit**)

**Course Title:** Introduction to Bioengineering – online section taught by Mason faculty (GMU 3 credits) – GS@IP Senior Course Fall and Spring Semesters

**Course Description:**

Surveys the field of bioengineering and the global impact of technology innovation in solving problems in biology and medicine with an emphasis on engineering tools and concepts. Introduces mathematical modeling and analysis of bioengineering problems through the use of standard software packages for simulation. Discusses the history, ethical/social implications, and career paths in Bioengineering.

**Existing GMU Course Numbers/Name:** **No GMU Equivalent**

**Course Title:** Innovations Strand – GS@IP Junior and Senior Course Fall and Spring Semesters (students can repeat this course junior year and again senior year; priority given to those who haven't taken it)

**Course Description:**

As a result of the "Innovations" course, students will have gained an understanding of how to identify problems/issues that are global in nature, develop a thorough understanding of the nature of the problem/issue through research, design creative and innovative solutions to the problem/issue, evaluate the solutions to the problem/issue using cost and value optimization scales, and implement the solution to the problem/issue using marketing strategies.

**Existing GMU Course Numbers/Name:** CDS 130 (**Note: senior course only; students must take this course for dual enrollment credit**)

**Course Title:** Computing for Scientists – online section taught by Mason faculty (GMU 3 credits) – GS@IP Senior Course Fall and Spring Semesters

**Course Description:**

Covers use of computers to solve practical scientific problems. Topics include creating effective scientific presentations, analysis of experimental data, online literature, data/information ethics, scientific modeling, and

communication/collaboration tools. Designed to equip students with the knowledge and confidence they need to use future hardware and software systems both as students and throughout their scientific careers.

### **Research Courses:**

**Existing GMU Course Numbers/Name: COS 120 Introduction to Research I and II – GS@IP Junior Courses and Senior Courses Fall and Spring Semesters**

**Course Title: Introduction to Research I and II (GMU 1 credit)**

#### **Course Description:**

This course is designed to provide students with an opportunity to apply what they have learned from previous course work. They will design their own active inquiry experience, followed by engaging in research and preparing a technical paper and electronic presentation of their results. Students will have the opportunity not only to collaborate with their peers but with scientists from the industry and academia as well. Students enroll in mentorship research both junior and senior year, and have the option to either continue with the research topic chosen during the junior year for a more extended study during the senior year, or begin a new and more detailed topic of study for the senior year. (This is for those who want to earn a GMU dual-enrollment credit as part of their mentorship research.)