



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</u>	<u>MENTORSHIP</u>
<u>JUNIOR YEAR</u>	Precalculus/Calculus I Part A Or Calculus I/II	Biology I Chemistry I Or Physics I	Principles of Technology and Engineering I	Hands-on research in science area of interest
<u>SENIOR YEAR</u>	Calculus I Part B/II Or Calculus III/Linear Algebra	Biology II Chemistry II Or Physics II	Principles of Technology and Engineering II	Hands-on research in science area of interest

Course Equivalency and Transferability

GS Course Names	George Mason University Dual Enrollment Option	AP Exam Option	University Credit Transferability
Pre-Calculus	(Math 105)	No	No
Calculus I Parts A and B	(Math 123 – 124)	Yes - Calc AB (Senior year)	Likely- AP waiver equivalent course
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 – 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 – 212)	Yes	Likely AP waiver equivalent course; General Chem for Majors at GMU
Intro to Organic Biochem 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
Principles of Technology and Engineering Courses other than Innovations	Computer Science 112 and 211; Engineering 107 (jr class); Civil and Infrastructure Engineering CEIE 203 (sr class); Bioengineering BENG101 (sr class); Comp. for Sci CDS130 (sr. class)	Computer Science only	Likely – comparable courses
Principles of Technology and Engineering Innovations Strand	No	No	No
Research/Mentorship	COS 120	No	Possibly science elective

Math Course Placement

Schedule for Students enrolling in Pre-Calculus Junior Year:

	Fall Semester		Spring Semester	
	<u>Math Strand</u>	<u>Science Strand</u>	<u>Math Strand</u>	<u>Science Strand</u>
Junior	Math 105 (4 Mason Credits)	Chem 211 (4 Credits) Biol 103 (4 Credits) Phys 243 (4 Credits)	Math 123 (3 Mason Credits)	Chem 212 (4 Credits) Biol 107/106 (4 Credits) Phys 245 (4 Credits)
Senior	Math 124 (3 Mason Credits)	Chem 104 (4 Credits) Biol 124 (4 Credits) Phys 160/161 (4 Credits)	Math 116 (4 Credits)	Chem 155 (4 Credits) Biol 246 (3 Credits) Phys 260/261 (4 Credits)

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

	Fall Semester		Spring Semester	
	<u>Math Strand</u>	<u>Science Strand</u>	<u>Math Strand</u>	<u>Science Strand</u>
Junior	Math 115 (4 Credits)	Chem 211 (4 Credits) Biol 103 (4 Credits) Phys 243 (4 Credits)	Math 116 (4 Credits)	Chem 212 (4 Credits) Biol 107/106 (4 Credits) Phys 245 (4 Credits)
Senior	Math 215 (3 Credits)	Chem 104 (4 Credits) Biol 124 (4 Credits) Phys 160 (4 Credits)	Math 203 (3 Credits)	Chem 155 (4 Credits) Biol 246 (4 Credits) Phys 260 (4 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 123

Course Title: Calculus with Algebra and Trigonometry (Part A) (3 GMU credits) – GS@IP JUNIOR COURSE

Prerequisite: Completion of Math 105 / Pre-calculus with a C or better.

Course Description:

Calculus with Algebra and Trigonometry Part A is the first half of a two semester course that covers all the topics of Analytic Geometry and Calculus I (Calculus I Math 115). During this second semester course the rules of differentiation and the applications of derivative and technologies will be utilized to study topics including maximum and minimum problems, integrals, and transcendental functions. Each topic will be introduced utilizing an application approach which emphasizes the students' ability to analyze, model, and provide solutions for real world problems, such as physical and engineering science programs.

Notes: Juniors who successfully complete Math 123-124 are considered the same as having successfully completed MATH 115 and would be eligible to take Math 116, Calculus II the following year.

Existing GMU Course Numbers/Name: MATH 124

Course Title: Calculus with Algebra and Trigonometry (Part B) (3 GMU credits) – GS@IP JUNIOR AND SENIOR COURSE

Prerequisite: Completion of Math 123 with a C or better.

Course Description:

Calculus with Algebra and Trigonometry Part B is the Second half of a two semester course that covers all the topics of Analytic Geometry and Calculus I (Calculus I Math 115). During this second semester course the rules of differentiation and the applications of derivative and technologies will be utilized to study topics including maximum and minimum problems, integrals, and transcendental functions. Each topic will be introduced utilizing an application approach which emphasizes the students' ability to analyze, model, and provide solutions for real world problems, such as physical and

engineering science programs. **Notes:** Juniors who successfully complete Math 123-124 are considered the same as having successfully completed MATH 115 and would be eligible to take Math 116, Calculus II the following year.

Existing GMU Course Numbers/Name: MATH 115

Course Title: Analytic Geometry and Calculus I (Honors) (4 GMU credits) – GS@IP Junior and Senior 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: Introduction to Organic and Biochemical Chemistry (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:

This course in modern chemistry is an introduction to the major classes of organic compounds and biomolecules. Topics include structure, nomenclature, chemical and physical properties, and reactions of organic compounds as well as a survey of the biochemistry of proteins, carbohydrates, lipids and nucleic acids.

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.

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

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

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 (limited enrollment)

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. CDS-130 is an introductory course in how to think computationally. Thinking computationally is a problem solving methodology where computational tools (e.g.,MATLAB) are used to solve scientific problems. Thinking computationally approaches problem solving by first developing a theoretical model to represent what is happening in a natural event and then converting that model into a computer simulation to solve the problem being investigated.

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 – (limited enrollment)

Course Description:

CDS-130 is an introductory course in how to think computationally. Thinking computationally is a problem solving methodology where computational tools (e.g.,MATLAB) are used to solve scientific problems. Thinking computationally approaches problem solving by first developing a theoretical model to represent what is happening in a natural event and then converting that model into a computer simulation to solve the problem being investigated.

Existing GMU Course Numbers/Name: Non-Mason Equivalent

Course Title: Innovations Strand – GS@IP Junior and Senior Course Fall and Spring Semesters (students can repeat this course)

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.

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: Research I and II

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.