

**INTRODUCTION TO
ENGINEERING METHODS and COMPUTER PROGRAMMING
Course Syllabus**

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Course Description Summary: This course will introduce the fundamentals of structured computer programming and problem solving techniques using high level computer languages to students with little or no programming experience. Students will learn solution methodologies applicable to a broad range of technical and non-technical fields as well as to “think algorithmically”. Students will construct original computer code as well as use packaged software in their exploration of learning software based problem-solving techniques. Students will begin learning program design through the use of Python before advancing to C and JavaScript.

Solution strategies will emphasize problem solving in technical fields. The course is all inclusive. Thus, technical fundamentals required for problem solving will be covered as part of the course.

Prerequisites: Algebra II

Required Text and Materials:

Python Programming: An Introduction to Computer Science (first edition)
by John Zelle;
Think Python: How to Think Like a Computer Scientist
by Allen B. Downey (*on-line version*);
Absolute Beginner's Guide to C (second edition)
by Greg Perry;
Eloquent JavaScript: A Modern Introduction to Programming
by Marijn Haverbeke (*on-line version*);
Graphing Calculator; and
Wacom Intuos Tablet and pen
Home Windows OS (XP or “higher”) PC

Students must also have access to a Windows based PC outside of daily class time.

Dual Enrollment Credit:

Introduction to Engineering Methods (EGR 125), 3 credit hours; and
Introduction to Computer Programming (EGR 127), 3 credit hours
[Please note that both dual enrollment classes span the entire academic program. Dual enrollment credit is earned concurrently. Therefore, academic year students must complete both semesters of the course to receive any dual enrollment credit.]

Course Objectives: This course is designed to introduce the fundamental techniques of computational problem solving. The course will provide an understanding of the abilities and limitations of computation. At the conclusion of the course, students will have the ability to write object oriented code to accomplish useful goals.

Instructional Methods: The course is taught in a “real time”/synchronous lecture/programming Q&A session format via the Internet. To aid in programming concept discussion, class pages will be used at Piazza (<https://piazza.com>). Also, break-out groups will be used in class for problem solving collaboration and concept clarification.

To facilitate a student’s successful understanding of the concepts and methods required for programming and engineering analysis, additional study aids will be available to the student outside of the class. These include, but are not limited to

- Videos illustrating language use and general course related concepts;
- Supplemental technical documents and handouts;
- Computer based tutorials: instructional tutorials in the form of video link with slides;
- Numerous web sites, which offer supporting and additional material

Some course material will be made available through the Governor’s School Engineering Methods & Computer Programming web site. Course material will also be made available through a secondary web site.

Evaluation Methods: Grades will be based upon:

- Class participation;
- Programming assignments;
- Pop quizzes;
- Exams;
- Projects and other supplementary assignments; and
- Comprehensive mid-term and final exam(s).

Typically grades are determined weighted:

- Programming assignments: 70-80%
- Exam: 20-30%
- Comprehensive exam(s) 25% of academic period grade
- Class participation: up to 5%

Grade weight given to other assignments (e.g., programming projects) will be announced at the time of their assignment.

A grade assignment scale in accordance with the *Governor’s School Student Handbook* (i.e., 90-100: A, etc.), both numerical and letter, is used. Averaged grades reported for any one grading period may be scaled upward at the discretion of the instructor. Grades

for any semester and/or academic year period, which may also be scaled upward when reported, are determined using actual grades earned by the student. There is no “extra credit.”

Grading of Programming Assignments: Each programming problem in a problem assignment, unless otherwise announced prior to the assignment due date, will be graded on a ten (10) point scale as follows:

- *Excellent (10/10)* — Program solves problem for all cases. 8, 9 may indicate efficiency problems, awkward code, lack of comments, etc.
- *Good (7/10)* — Program solves problem for most cases, but has flaws. 5, 6, 7 may be used to indicate severity of flaws.
- *Marginal (4/10)* — Student made attempts to solve most problems, but missed some key conceptual ideas that make their program incorrect. Major portions of problem are unsolved or not attempted. Significant debugging would be required to make program work.
- *Unacceptable (2/10)* — Program does not even run without significant editing. Problem completely misunderstood. Solution completely incorrect.
- *Not Submitted (0/10)* — Self-explanatory.

Attendance: Students are required to attend all classes and to be “in class” at the scheduled daily start time. While in class, students are expected to be attentive and prepared to talk if called upon. Students observed conducting any activity not in keeping with the current class discussion or explicitly permitted by the instructor during that day’s class will be immediately dismissed from class for the day, not permitted to return, and receive a grade of zero “for the day”. [The grade of zero will be averaged with the student’s assignment grades as if an additional 20 point programming assignment were given with a grade of zero for the phantom programming assignment.]

It is not the responsibility of the instructor to remember a student’s schedule.

Students can be excused from class and/or class obligations only by the Governor’s School Engineering Methods & Computer Programming instructor. Local school officials cannot excuse a student from any Governor’s School assessment or course work requirement.

Scheduled Exams: Exam times and dates are announced well in advance both in class as well as in the Outlook calendar for the class. Students may access the Outlook calendar through their Governor’s School email account. Students must contact the instructor well in advance of any exam date which may be missed due to an excused scheduled absence. An alternate exam time and/or date, which must be before the announced scheduled time, will be scheduled at the discretion of the instructor. No “make-up” exam after a scheduled exam date will be given. Students failing to obtain an alternate date prior to their absence will receive a grade of zero for the missed exam. In exceptional cases, and

at the discretion of the instructor, other assessment grades may be averaged and the average grade so calculated subsequently used to replace a missed assessment.

Assignment Submission: All assignments must be submitted to the instructor no later than the announced and/or posted due date and time. **No late submissions will be accepted.** The time stamp placed on the email by the Governor's School's email server at the time of delivery to the instructor's email address shall be solely used to determine if a student's work has been submitted on or before the due date and time.

An excused absence does not relieve the student from their obligation to submit work by the announced due date. Also, short-term technical failures at any location do not provide justification for the acceptance of late submissions. For exceptional cases the course instructor will consider the waiver of the due date and time provided the instructor is consulted as soon as possible.

Any mailed submissions must be postmarked no later than the due date. It is always the student's responsibility to see that mailed course work is mailed at a time and place to ensure that this requirement is met.

To develop professional work practices and to facilitate grading of work and its return, all hand written assignment work – homework and/or exams - must meet the guidelines listed in the *Assignment Submission Guide*, which is posted on the Governor's School's Engineering Methods & Computer Programming course web site. Work not meeting all of the requirements detailed in the *Assignment Submission Guide* will not be graded, resulting in a recorded grade of zero (0) for the work.

Graded work is returned to the student in the PDF file format as an attachment to an email, which is sent to the student's Governor's School email account.

Course Content:

Topics to be covered include ...

- Python object-oriented programming
 - Primitive types and class types
 - Functions, including recursion
 - Basic statements: assignment, if-statements, loops, blocks, function calls
 - Objects and classes, including subclasses, inheritance, and polymorphism
 - Abstractions
 - Sequences and dictionaries
 - Testing and debugging
 - Program development; stepwise refinement (top-down design) and object-oriented design
 - Basic searching and sorting algorithms
 - A model of execution
 - Programming style considerations
- Python Windows based graphics

- C Programming
 - Data types, structure, syntax and semantics and differences from Python
- Javascript
 - Basic CSS and HTML
 - Javascript: Combining Python OO thinking with C syntax

Code of Conduct: Student must observe the course *academic honesty policy*. A copy of the policy is distributed to all students at the beginning of the term. A copy of the document is also available online by visiting <http://bnortonhgs.coursesites.com>.

All forms of academic dishonesty are dealt with harshly. The instructor refers matters of academic dishonesty to the Governor's School's Director for disposition of outcome. Nevertheless, the course instructor reserves the right to take independent action including, but not limited to, imposition of a failing grade for the work submitted or the course itself.

Policy Applicability: The policy stated in this syllabus as to exam dates, problem assignment submission requirements, academic honesty, etc. supersedes any student's home school policy.

Linwood Holton Governor's School Center for Computation and Applied

Mathematics: The Center, which is currently in development, will be a venue through which students are provided opportunities to work with local government, academia, and industry. It will also be a repository of information to serve the applied mathematics, computer science, and engineering students in the Governor's School as well as the community of Southwest Virginia at large. EM&CP students will be invited to do work for and/or through the center. Also, students will have the opportunity to have exceptional work, which they do as part of the requirements of the class, published by the Center. Additional details will be provided to students as the Center for Computation and Applied Mathematics is completed.

Information & Instructions for Individuals with Disabilities: Students may request academic accommodations for identified disabilities through Holton Governor's School's (HGS) main office, which is located on the second floor of the Southwest Virginia Higher Education Center on the Virginia Highlands Community College campus (276-619-4326). Administrative staff will evaluate the request, consult with appropriate officials from the student's home school, and develop a plan that outlines necessary and reasonable accommodations to be followed. All correspondence will be kept confidential.

Emergency Statement: In the event of a major interruption of technological connectivity or actual emergency affecting the student's school or the offices of Linwood Holton Governor's School, class meeting times or schedules, assignment deadlines, and grading schemes are subject to changes that may include alternative delivery methods, alternative methods of interaction with the instructor, alternate class materials, changes to class membership, a revised attendance policy; a revised semester calendar and/or grading scheme, etc..

For more general information about plans for dealing with such catastrophic events or emergencies, please consult the following resources:

- The student's home school's Emergency Notification and Response Plan
- The Holton Governor's School web site - <http://www.hgs.k12.va.us> – where instructions will be posted in the event of an emergency.

Should such a situation arise, HGS's Director will work closely with the appropriate school division to resolve it as soon as possible. Students will be contacted through available forms of communication and given specific directions as to how they will proceed to complete their course work, how timelines will be adjusted, etc.