Affordable Materials Grants, Round 19:

Transformation Grants

(Spring 2021-Spring 2022)

Proposal Form and Narrative

# Notes

* The proposal form and narrative .docx file is for offline drafting and for our review processes. Submitters must use the online Google Form for proposal submission.
* The only way to submit the official proposal is through the online Google Form. The link to the online application is on the [Round 19 RFP Page](https://www.affordablelearninggeorgia.org/about/rfp_r19).
* The italic text provided below is meant for clarifications and can be deleted.

The Round 18 Kickoff will include an asynchronous training module, required for all team members to complete, followed by the synchronous Kickoff Meeting on March 26, 2021 from 1pm-4pm. At least two team members from each awarded team (unless the award is for one individual) are required to attend the synchronous Kickoff Meeting.

# Applicant and Team Information

| Requested information | Answer |
| --- | --- |
| Institution(s) | Augusta University |
| Applicant name | Clément Aubert |
| Applicant email  | caubert@augusta.edu |
| Applicant position/title | Assistant Professor in Computer Science |
| Submitter name  |  |
| Submitter email  |  |
| Submitter position/title |  |

| Team member | Name | Email address |
| --- | --- | --- |
| Team member 1 | [Clément Aubert](http://spots.augusta.edu/caubert/) | caubert@augusta.edu |
| Team member 2 | [Michael Dowell](https://spots.augusta.edu/mdowell/) | mdowell@augusta.edu |
| Team member 3 | [Richard DeFrancisco](https://www.augusta.edu/faculty/directory/view.php?id=RDEFRANCISCO) | rdefrancisco@augusta.edu |
| Team member 4 | [Reza Rahaeimehr](https://www.augusta.edu/faculty/directory/view.php?id=RRAHAEIMEHR) | rrahaeimehr@augusta.edu |
| Team member 5 | Neea Rusch | nrusch@augusta.edu |
| Team member 6 | [Edward Tremel](https://edwardtremel.com/) | etremel@augusta.edu |

If you have any more team members to add, please enter their names and email addresses in the text box below.

|  |
| --- |
| * [Stacy Kluge](https://www.augusta.edu/innovation/team.php) - skluge@augusta.edu
* [Anthony Lawrence](https://www.augusta.edu/faculty/directory/view.php?id=ANTLAWRENCE) - antlawrence@augusta.edu
* [Michael Nowatkowski](https://www.augusta.edu/faculty/directory/view.php?id=MNOWATKOWSKI) - mnowatkowski@augusta.edu
* Wennie Squires - wsquires@augusta.edu

Whose participation in this project is completed as a part of their normal contractual duties. |

# Project Information

| Requested information | Answer |
| --- | --- |
| Priority Category / Categories | * **Collaborative Projects with Professional Support**

Augusta University’s [Center for Instructional Innovation](https://www.augusta.edu/innovation/), through our “liaison agent” Stacy Kluge, will critically assist the project, notably in maximizing student engagement in lab, and in implementing a backward design approach to identify dependencies between course components.* **Student Participation in Materials Evaluation and/or Development**

Undergraduate Course Assistants (UCAs) will be hired to assist with the reviewing, testing and proof-reading of our material, as well as to help the team in gathering feedback from enrolled students and identifying their concerns and difficulties with the developed material. Present during lab and with their own office hours, those UCAs will collect and organize feedback, and share their observations during weekly meetings with the team members. Direct feedback will also be collected from enrolled students through anonymous evaluations, final exams and anonymous surveys, as well as using a “feedback loop” platform.* **Departmental Scaling Projects**

All current and future instructors of the concerned class are involved in this proposal, which received the unanimous support of the School's Undergraduate Curriculum Committee, of the Director of Undergraduate Studies, and of the Dean of the School of Computer & Cyber Sciences. The instructor of the follow-up class is also part of our team, as well as Michael Nowatkowski, Head of the Cyber Program of Study. |
| Requested Total Amount of Funding | $29,900Breakdown:* 5 × $5,000 for one month of summer support,
* 1 × $1,000 for partial summer support,
* 5 × $780 for student assistants (UCA) hired to test and proof-read the resources, and to gather feedback from students during labs and office hours ($13 an hour, for 4 hours per week during 15 weeks, 8 hours per week during 7.5 weeks for the Summer semester) throughout the duration of the project.
 |
| Final Semester of Project | Spring 2022 |
| Using OpenStax Textbook? | No.We will develop our own platform to accommodate our specific needs (cf. “Preliminary Phase 1: Workflow Design and Platform Development”), and release it under an open-source licence. |

# Impact Data

## Course 1

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | CSCI 1301 Principles of Computer Programming I |
| N/A | Course instructor |  |
| 1 | Average number of students enrolled per section | 25 |
| 2 | Average number of affected course sections scheduled in a summer semester | 2 |
| 3 | Average number of affected course sections scheduled in a fall semester | 6 |
| 4 | Average number of affected course sections scheduled in a spring semester | 6 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 14 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 350 |
| 7 | Original required commercial materials | Visual C# How To Program 6th edition, Paul Deitel and Harvey Deitel, by Deitel ISBN 978-0-13-460154-0$173.70 Publisher: <https://www.informit.com/store/visual-c-sharp-how-to-program-9780134601540?ranMID=24808>Official bookstore: <https://www.jagstore.net/buy_courselisting.asp>?Select “CSCI” as Department, then “1301”, and the first section |
| 8 | Original cost per student section enrollment | $ 173.70 |
| 9 | Average post-project cost per student section enrollment | $ 0 |
| 10 | Average post-project savings per student section enrollment | $173.70 |
| 11 | Projected total annual student savings per academic year | $60, 655 |

Even if it is difficult to assess the number of affected students each semester, it is worth mentioning that our proposal will facilitate completion of this class without the need for a computer running Microsoft Windows. As Windows currently holds [29.26% of US operating system market share](https://gs.statcounter.com/os-market-share/all/united-states-of-america), requiring Windows could prove a financial burden to some students. By adapting all our material to work on any platform, we will make it easier for students to access this class without the need for new computer equipment. This dimension is increasingly critical as the pandemic prevents some students from accessing our lab equipment.

# Narrative Section

## 1. Project Goals

The goal of this project is to cultivate a consistent set of skills across all Augusta University (AU) students upon completion of the CSCI 1301 course, by providing comprehensive free online resources covering the principles of programming with security, accessibility and compatibility in mind. We aim to achieve this standard by unifying course materials, evaluation methods, and teaching strategies across all course sections, and by tailoring them to the original specificities of the School of *Cyber* and Computer Sciences.

[CSCI 1301 Principles of Computer Programming](http://catalog.augusta.edu/content.php?filter%5B27%5D=CSCI&filter%5B29%5D=1301&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=38&expand=&navoid=4647&search_database=Filter#acalog_template_course_filter) is a required course for five different degree programs at AU: [Computer Science](https://www.augusta.edu/ccs/bs-cs.php), [Cyber Operations](https://www.augusta.edu/ccs/bs-cyber-ops.php), [Cybersecurity](https://www.augusta.edu/ccs/bs-it-cybersecurity.php), [Cybersecurity Engineering](https://www.augusta.edu/ccs/bs-cybersecurity-engineering.php), and [Information Technology](https://www.augusta.edu/ccs/bs-it). It is also the most frequently taken of two required programming course options for Mathematics and Physics majors, as the alternative, [ENGR 2060](http://catalog.augusta.edu/content.php?filter%5B27%5D=ENGR&filter%5B29%5D=2060&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=38&expand=&navoid=4647&search_database=Filter#acalog_template_course_filter), is rarely offered.

CSCI 1301 is known as a “CS1” course: the introductory programming course in Computer Science. It is one of the only courses in the School of Computer and Cyber Sciences to offer a lab component, bringing its credit hours to 4 and giving students *hands-on* experience. This adds another dimension to a rigorous class that requires students to understand abstract principles while mastering computer usage. As a beginning programming course, it is important to consider which language to use for instruction, and Augusta University's CS1 course (as well as follow-up courses) uses the C# programming language. Tailored for mobile application and game development (it is the language used by the popular game engine [Unity](https://gamedevacademy.org/best-game-engines/)), and [with multiple advantages over other programming languages](https://www.pluralsight.com/blog/software-development/everything-you-need-to-know-about-c-), this programming language offers a learning curve intermediate in difficulty [between Python](https://medium.com/sololearn/why-is-c-among-the-most-popular-programming-languages-in-the-world-ccf26824ffcb) and [Java](https://www.computerscience.org/resources/c-sharp/) that makes it the “sweet spot” to challenge and motivate the diverse students taking CS1 while leaving as many doors as possible open, and providing [a valuable skill on the job market](https://towardsdatascience.com/top-10-in-demand-programming-languages-to-learn-in-2020-4462eb7d8d3e?gi=3524386a336e). Furthermore, its open-source framework, [Mono](https://en.wikipedia.org/wiki/Mono_%28software%29), makes it completely free of charge and accessible on an extremely large range of devices and operating systems. However, this unorthodox choice for the academic world means there are fewer resources for our students than would normally be available for CS1 courses using other programming languages. Our goal of creating quality OER resources for introductory C# programming will help to fill this void for our students, leading to increased student success and enforcing the security dimension at the core of the School of Cyber and Computer Sciences.

Augusta University and its Computer Science program has recently undergone many changes. The University was formed from the consolidation of Augusta State University and Georgia Health Sciences in 2013, with the School of Computer and Cyber Sciences established in 2017. During this time, four new degree programs were created, and over twenty-five new faculty, along with new staff and administrators, were hired. This sudden growth was accompanied by a surge in enrollment: as of August 2020, the School leads the University in enrollment both in terms of percentage points increase, +14%, and in absolute enrollment increase, +76, accounting for over 25% of the University's overall growth.

With these many additions and changes, and with the sustained growth of our enrollment, many different instructors have been teaching CSCI 1301, but all of them had to develop original material to address the (numerous) short-comings of the currently used textbook: its general structure and tone was unanimously criticized, but as no satisfactory replacement was advanced, all of the instructors started to develop their own set of labs, exercises, and made choices regarding the material that needed to be covered. Our School having a focus on security, all the instructors started to introduce secure practices, but quite often focusing on different aspects or introducing them at different paces. This has resulted in a hodge-podge of student experiences and has unfavorably impacted the follow-on courses (including but not limited to [CSCI 1302 -Principles of Computer Programming II](http://catalog.augusta.edu/content.php?filter%5B27%5D=CSCI&filter%5B29%5D=1302&filter%5Bcourse_type%5D=-1&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=37&expand=&navoid=4541&search_database=Filter#acalog_template_course_filter), which has taken the brunt of this impact). Through the creation of lecture notes, slides, evaluation resources and common *integrated* labs we intend to standardize the topics covered in this course and jump-start instructors new to C# or teaching in general, in our School or otherwise. This standardization will increase student success in follow-on courses, including but not limited to Computer Science, and help to disseminate quality, up-to-date resources on C# that are currently unavailable, especially from a security point of view.

We would like to use this opportunity to enforce the specialty of AU's School of Computer and *Cyber* Sciences: our programs are all tailored with security in mind, a core value that is too often an after-thought in the CS1 courses. This impacts our course design in numerous ways, from the initial set-up on the student's computer (“*How to make sure the software you are installing is safe?*”) to the labs (“*Do not blindly execute code you found on the internet*”), and especially regarding the order in which topics are introduced: the notion of an “object”, introduces a fundamental distinction between what the “programmer sees” and what the “user can access” that is central to security in many programming languages including C#, and given a *first-class role* in our instruction. As such, our goal is to develop material that enables our students to apply good security practices right from the conception of their CS education. This will be facilitated by the adaptation of the “[SEI CERT Coding Standards](https://wiki.sei.cmu.edu/confluence/display/seccode/SEI%2BCERT%2BCoding%2BStandards)” to the C# language.

Currently, the lab equipment and instructions require students to use [Visual Studio](https://visualstudio.microsoft.com/downloads/), a piece of proprietary software with a limited free version, on [Windows 10](https://www.microsoft.com/en-us/windows/get-windows-10), Microsoft’s closed-source operating system. We aim to bring our materials to students where they are technologically, instead of forcing them to conform to one specific platform. There are three dimensions to accessibility, a) “*how can the material be read?*”, b) “*where can the programs be written?*”, and c) “*where can the programs be executed?*”. We pledge to make our material accessible, in meanings of the word, on all devices (tablet, phone, computer, e-reader) and operating systems (macOS, Android, Windows and Linux), and to ensure that our students will be able to experience the full extent of our course regardless of their preferred coding environments. To meet a), our material will be shared as printable documents (pdfs), webpages (html), possibly tailored for e-reader (epub), but also as locally editable documents (odt and possibly docx), so that students can annotate them as they see fit. The accessibility of the material will be automatically tested and validated by our team before being released. Regarding b) and c), we will test all code on a variety of platforms, with full [Mono](https://www.mono-project.com/) support. Mono is an open-source implementation of C# supported by most operating systems (including but not limited to macOS, Android, Windows and Linux), allowing students to develop on any platform and target any platform with their applications. We will study and document multiple candidates to replace Visual Studio, including [MonoDevelop](https://www.monodevelop.com/), an [open-source (LGPLv2)](https://en.wikipedia.org/wiki/MonoDevelop) free and multi-platform environment to edit, compile and execute C# programs.

The material will be developed with face-to-face delivery in mind (which is the privileged form of delivery for introductory classes [at the USG level](https://www.usg.edu/coronavirus)), but will easily accommodate hybrid or fully on-line needs if required.

## 2. Statement of Transformation

As our School and enrollment have continued to see important growth over the last 4 years, there has been a proportional increase in the number of CSCI 1301 course sections and instructors, that unfortunately resulted in a hodge-podge of topics covered, unfavorably impacting the follow-up courses. While our instructors generally agree that the course delivery should be uniformized and that our current textbook ought to be replaced, no strategy to achieve uniformity or to cover security extensively has yet been established. This lukewarm standardization agreement has led to the previously selected textbook being assigned to sections by default, where it has been frequently ignored or not used in any meaningful sense. This has also left some students with different computer set-ups or instructional needs feeling unaccommodated. Also, as security is absent from said textbook, each instructor has broached this topic in different ways, leaving subsequent course instructors with an unknown degree of student security knowledge.

The purpose of this project is to create lecture notes, slides, common labs, and a set of homework and exam questions to match the specific needs and goals of the School and its programs. By offering these items to all instructors, we will standardize the topics covered in this course and jump-start instructors who are new to teaching or unfamiliar with the C# programming language. This standardization will not only increase student success in the follow-up Computer Science course but will benefit all AU degree programs by cultivating security awareness in the minds of students, with the goal of propagating our platform to other classes as well.

Instructors will be able to maintain academic freedom in terms of lecture order and evaluation methodology, and will be free to use the common materials as they choose. This freedom will be tempered by formalized guiding principles and enforced through a common final exam and shared required topics. Furthermore, we will implement *inter-section* metrics via surveys and peer evaluation to detect and encourage virtuous practices and measure improvement in the follow-up courses.

Students will be given access to the lecture notes, slides, and labs as OER material. This will alleviate the need for a textbook and will ensure a more standard experience in this course. The development of labs will see a complete overhaul in our unified course. As the current textbook does not offer a lab component, every instructor has been forced to write their own lab material. These labs are sometimes only loosely connected to the material in the required textbook, harming students who could not always distinguish between core notions and “asides” or extra topics. This has at times resulted in declining lab engagement. We will coordinate with the Center for Instructional Innovation to implement an “[integrated lab](http://learndialogue.org/pdf/LearnDialogue-Boyer-SIGCSE-2007.pdf)” policy to make the lab a first-class citizen of the course, and not an after-thought.

## 3. Action Plan

### Specificities of the Proposed Approach

Our proposal has four core specificities:

1. Security should always be present when discussing any topic.
2. No assumptions should be made about development and execution platforms, nor on how students access material (in print, on a mobile device, or computer with any operating system).
3. The structure and presentation of the course should emphasize object-oriented design and programming.
4. The lab component should be fully integrated with the lecture, and students should always be able to provide feedback on the lab and its connection to the course.

### Current State of OER Resources

Using C# for this class has many advantages ([built-in portability](https://en.wikipedia.org/wiki/C_Sharp_%28programming_language%29#Portability), [an open-source core](https://github.com/mono/mono), [the increasing popularity of the language](https://jaxenter.com/curious-rise-of-c-sharp-171852.html), [the possibility to use the popular game engine Unity](https://unity3d.com/learning-c-sharp-in-unity-for-beginners), etc.) but significantly reduces the range of open, no-cost and/or low-cost material. Among the existing textbooks using C#, we can list [*Fundamentals of Computer*](https://introprogramming.info/) *Programming with C#,* [*Programming Basics with C*#](https://csharp-book.softuni.org/) (which were developed by the same team), *and* [*C# Yellow Book*](http://www.csharpcourse.com/)*.* [*Dissecting a C# Application*](https://everobotics.org/pdf/Dissecting_A_CSharp_Application.pdf)and [*.NET Book Zero*](http://www.charlespetzold.com/dotnet/) will not be discussed here, as they date back respectively to 2004 and 2006, and C# has significantly evolved between its 2.0 (2006) and 9.0 (current) versions.

All of these textbooks fail to discuss security, some do not discuss objects at all, and none to our knowledge were tested on Mono, the open-source implementation of C#. Two textbooks are offered only as massive pdfs or websites, without the possibility to download source code or edit the notes. Our project will ensure *all code studied in class is readily available to students* (i.e. to download, without having to copy-and-paste) in an *editable format*. No existing open material meets this standard, nor those established in our core specificities.

Our proposal will fill this void by developing our own set of free, open material. We will have a preliminary phase primarily spanning the Summer, with the Fall and Spring semesters used to measure our success, identify weak points, clarify our resources and gather feedback from students in a *virtuous circle*. We are aware that our timeline is extremely aggressive, but confident that pulling from our previously-developed resources and building the first draft while the class is taught during the Summer will enable rapid development of our material.

There are three dimensions to our preliminary action plan: 1) Develop and implement the infrastructure to compose our new material (how the material and source code will be developed and made accessible), 2) Determine the content for this material, 3) Lay out the first version of our resources by pulling from our previously-developed material.

### Preliminary Phase 1: Workflow Design and Platform Development

Neea Rusch, a senior software engineer and CSCI 1301 instructor, will lead the effort to invent and maintain a robust solution for the development and sharing of our material. The outcome will be a common “matrix”, shared among the instructors, that can be used to generate tested material (“packages”) that will be then shared with the students in a variety of formats, on which they will be able to comment. She will be tasked with designing a workflow to enable the following three phases:

1. Instructors share their previously-developed exercises, notes, slides, and labs, along with the accompanying source code.
2. The text and graphical material, along with the source code, is tested on a variety of platforms, and packaged into odt, html and pdf documents (as well as possibly docx and epub) with identical content.
3. Students and instructors can provide feedback on any package using github issues, annotating documents or sending an email precisely referencing the discussed material. Feedback is retroactively propagated into the “matrix” of the material.

Essential to this solution will be [pandoc](https://pandoc.org/), a “universal” document converter that will allow us to convert one document into multiple formats, while checking for errors and accessibility issues.

The “matrix” of the packages will be hosted privately on [github](https://github.com/) with periodic public releases, and duplicated on [AU’s personal webpage host](https://spots.augusta.edu/) or on [box](https://www.augusta.edu/its/box/), AU’s file sharing platform. Editing access will be granted not just to all instructors and student assistants, but also locally to any interested instructor upon motivated request. Outside instructors will be given read access and the possibility to “fork” (create their own copy of) our project to further tweak it to suit their needs. We anticipate this will typically be used to help disseminate our material to other instructors. All material will be released under the [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) or later license and precise authorship will be tracked via the [git](http://git-scm.com/) versioning system.

“Packages” will be delivered to students on [Desire 2 Learn](https://www.augusta.edu/orientation/d2l.php) (D2L), AU’s learning management system and/or [on the instructor’s personal AU webpage](https://spots.augusta.edu/) depending on instructor preference. Packages will include multiple formats (odt, html, pdf as well as possibly docx and epub) along with the source code of the programs studied, and will be periodically archived on [Galileo](https://oer.galileo.usg.edu/).

Our workflow will use primarily open-source software (such as [LibreOffice](https://libreoffice.org/), [git,](http://git-scm.com/) [LaTeX](https://www.latex-project.org/get/) and [pandoc](https://pandoc.org/)) and file formats. Everything will be precisely documented to ease maintenance and reuse by other groups, and tested automatically for accessibility (typically, using the [WAVE Web Accessibility Evaluation Tool](https://wave.webaim.org/) for webpages and an [Accessibility Checker](https://www.access-for-all.ch/en/pdf-accessibility-checker.html) for pdfs).

### Preliminary Phase 2: Goals, Dependencies and Assessment Design

The second phase will begin with consultation with Michael Dowell, present and past instructor of CSCI 1301 and the follow-up class CSCI 1302, and “architect” of [our ABET accreditation](https://www.augusta.edu/ccs/abet-accreditation.php#!), and Stacy Kluge, instructional designer and [Affordable Learning Georgia’s Design Champion.](https://www.augusta.edu/oer/) Our action plan will be focused on:

* Re-assessing our learning objectives and Student Learning Outcomes, and, in coordination with Anthony Lawrence, Director of Undergraduate Studies, ensuring they align with the curriculum as well as with the missions and needs of the programs, School and University. An important facet of this task is pinpointing programming-related security goals required to sustain the growth of AU’s programs. This dimension will also benefit from the expertise of [Michael Nowatkowski](https://www.augusta.edu/faculty/directory/view.php?id=MNOWATKOWSKI), current Head of the Cyber Program of Study.
* Implementing a backward design approach to ensure that all learning objectives are met, that clearly labels the “extra material” given to students who wish to go above and beyond course requirements, or to prepare for CSCI 1302. This necessitates clearly labeled dependencies between course components, to ensure all core notions are addressed in a logical order, but allowing “branches” for motivated students, and some degree of modularity for instructors.
* Developing metrics for position tests and final exams, using previously identified required components, and leveraging the experience of the [Center for Instructional Innovation](https://www.augusta.edu/innovation/) in surveying and evaluating student engagement.
* Having a plan to ensure notational and graphical consistency across media (labs, lecture notes, slides, homework, etc.) and knowing how/when to duplicate or consolidate material to avoid student frustration.
* Establishing foundations for our “integrated lab policy”. Lab sessions typically immediately follow lecture, and we will design a global methodology to ensure student work in lab matches the material covered in lecture, to reinforce the material introduced and maximize student engagement.

### Preliminary Phase 3: Gathering Forces

The third portion of our preliminary phase will consist of gathering and organizing previous materials independently developed by each instructor. This previous material must now be organized using the template and backward design principles established in the previous two phases, clearly identifying lab/lecture pairs, required and optional topics, and topic dependencies.

Each team member has agreed to share their previous material to construct the first version of our “matrix”, requiring each to:

* Adopt the template and format determined in preliminary phase 1.
* Clearly label each exercise, example, homework, lab, etc., while indicating dependencies according to the design established in preliminary phase 2.
* Review existing material to ensure there is no significant overlap in the newly proposed material.

Some degree of material overlap is beneficial insofar as it would allow more practice exercises, diverse examples, and a variety of resources and illustrations frequently requested by students. A balance must be struck to give students these resources while making each lecture/lab different enough to remain engaging.

This phase will allow us to identify currently missing course components. These might include up-to-date guides to create a working environment on any operating system, security emphasis on some core notions, historical and practical examples of faulty software as well as “hindsight” on research activities at Augusta University. The School currently employs approximately 20 Undergraduate Research Assistants, most of whom were introduced to research questions during their initial semester: we want to make sure that additional activities connecting this class to current research at Augusta University will be offered on a regular basis.

Core Phase: The Virtuous Circle
Once we have established the practical and instructional dimensions of the preliminary phases, as well as populated our matrix with “rough” material, the project will enter a virtuous circle. Every semester of our proposal:

* The instructor will share material (lab, lecture notes, slides) with the students on a weekly basis, as well as exams, projects and homework when appropriate.
* We will identify weak points and new material to develop based on student reactions, surveys, feedback and performances (notably but not only during the final exam, that will be shared across sections and designed and graded by all the instructors currently teaching a section).
* We will further adjust and discuss previous material as necessary.

Students will be integrated into the project along three axes:

* The Undergraduate Course Assistants (UCAs) will *pre-test* all material one week in advance and provide feedback to the instructor during weekly meetings. These meetings will be held before and after new material is presented in class, taking advantage of the UCA’s direct connection with students during lab and office hours.
* Enrolled students will be encouraged to share their feedback during labs to the instructor and the UCAs, and their comments, attitudes and performance during lab will help clarify instructions and identify targets for uniformization.
* The enrolled students’ questions, hesitations and performance will guide the instructor in reinforcing material where most needed, and their errors will help us in annotating our resources with “common pitfalls”.

Enrolled students with exceptional engagement and performances will potentially become UCAs in following semesters, reinforcing the virtuous circle with constant input from students extremely familiar with the material.

Our team members will gather at the end of each semester to re-assess our priorities along with the work established in the preliminary phases. Current instructors will have weekly meetings with the UCAs to collect direct feedback and discuss their position with respect to the identified core requirements.

Each semester, a common final exam will be designed and graded collectively, with each active instructor grading the same problems across all sections. This will ensure the consistency of the evaluation and uniformity of the rubric.

### Implementation Details

Preliminary phase 1 will be primarily conducted by Neea Rusch (30 hours), Clément Aubert and Edward Tremel (20 hours each), who currently use a workflow similar to the one proposed, but in dire need of improvement, documentation and coordination.

Preliminary phase 2 will be led by Michael Dowell (10 hours), with the assistance of Anthony Lawrence, Clément Aubert and Stacy Kluge (5 hours each).

Preliminary phase 3 will require each instructor to share and label their material (15 hours), and will be ultimately organized by:

* Edward Tremel (30 hours) for the slides, with [an emphasis on making them accessible](https://affordablelearninggeorgia.org/assets/documents//OERAccessibility_PowerPoint.pdf).
* Richard DeFrancisco (30 hours) and Reza Rahaeimehr (30 hours) for the testing and packaging of the source code for the windows platform.
* Neea Rusch (30 hours) and Clément Aubert (30 hours) for the testing and packaging of the source code for Unix platforms (Linux, macOS and possibly Android).

Lecture materials will be globally organized, integrating the precise slides and lecture notes needed, and ensuring security is discussed in every lecture/lab. We expect that our combined material will include enough examples, exercises and notes to cover all required topics, but Richard DeFrancisco and Reza Rahaeimehr will reserve 20 hours each to develop additional material if need be. Neea Rusch will conduct a pilot run during Summer 2021, allowing us to integrate material following her progress, and to fill possible gaps with other available instructors over the Summer.

Each team member will receive the assistance of an Undergraduate Course Assistant (UCA) for 1 semester (4 hours/week for 15 weeks) to help gather feedback from students during lab or office hours (2 hours/week), discuss general strategy (1 hour/week) and proof-read all material (1 hour/week, or more during students breaks). The UCAs will be selected based on their past performance in CSCI 1301 and will be critical allies in discerning between unintentional student confusion and the genuine puzzling that we will strive to encourage. They may assist multiple instructors at the same time or across semesters based on their interest, performances, and scheduling conflicts. Wennie Squires, our Academic Program Coordinator, has a great degree of experience hiring, training and monitoring UCAs that we will leverage for this task; she already prepared a preliminary list of potential hires.

Finally, every semester, each team member currently teaching the class will schedule 1 hour per week to coordinate with the other instructors and UCAs. Additionally, all team members will reserve 10 hours to write a common exam and discuss any required adjustments to material that would demand large reorganization or synchronization, such as swapping the order in which notions are introduced or developing “guiding examples” across chapters.

## 4. Quantitative and Qualitative Measures

As described in our action plan, resources will be allocated to the development of meaningful and actionable measurements, in close coordination with the Center for Instructional Innovation. Our initial plan is to measure student engagement, performance and satisfaction in three different ways: at the beginning of the semester and at mid-term using surveys, each week using feedback from our UCAs, and through the final exam. Usual metrics such as course-level retention, enrollment and end-of-semester evaluation using AU’s service [campuslab](https://campuslabs.com/) will be leveraged alongside our proposed metrics to further tailor our resources. No institutional review board will be needed.

### At the beginning of the semester

In the past, some of the instructors used surveying at the beginning of the semester to gauge student interests and previously acquired skills. Unfortunately, questions such as “*Do you already know a programming language?*” do not provide actionable data: student understanding of what “knowing” means can vary greatly. To gather more meaningful data, we will initiate a brief and anonymous “position quiz” to measure student expectations, previous knowledge in coding, and level of comfort with the class at the beginning of each semester in CSCI 1301. The anonymity will ensure students respond without undue pressure. An additional rubric will allow students to share their identities and possible comments about their situations, to get to know them, but it will not be correlated with the anonymous quiz.
A similar, but more technically-advanced, quiz will be shared every semester in CSCI 1302 under the same modalities. This will allow us to measure student progress and engagement in the previous class.
Typical questions will include a mix of a knowledge test (“*Write a variable declaration*”, “*Define the signature of a method*”, “*Write a statement that displays the number between 1 and 100 at the screen*”, etc.), quantitative data (“*Are you decided on your major?*”, “*Do you know what an open license is?*”, “*Have you ever been exposed to programming languages?*”) and qualitative data (“*Why did you picked this major*”, “*What are your expectations for this class?*”).
This quiz will be consistent across all sections and delivered via [Desire 2 Learn](https://www.augusta.edu/orientation/d2l.php) (D2L) or on paper (instructor’s choice, but a 100% participation rate will be required), and anonymity will be preserved through data aggregation.

### Every week

Students will have an opportunity to provide feedback directly to the instructor, or through the UCA as a proxy. Feedback may be given through [github issues](https://guides.github.com/features/issues/), [anonymous pads](https://etherpad.wikimedia.org/), during labs or office hours (that can be held in person or remotely), during the weekly meetings with the UCA, but also by returning their annotated labs. Qualitative data on student engagement, difficulties and feedback will be shared among instructors and acted upon immediately when necessary.

### At mid-term

Students will be asked to complete an anonymous survey around mid-term, after the first round of evaluations (which will generally include a quiz, an exam and a project) have been completed and graded. This short qualitative and anonymous survey will use the “Continue / Stop / Start” approach (that was suggested by Deborah Richardson, from the Office of Faculty Development and Teaching Excellence) to clearly identify aspects of the delivery that “works” and gauge student enjoyment for each topic, as well as to gather possible suggestions. This anonymous survey will be distributed cross-section using D2L.

### At the end of the semester

A common final exam will be designed and distributed to all students. If, for scheduling reasons or to accommodate safety regulations, it is not possible to have all students take the exam at the exact same time, then alternate versions of each exercise and problem will be developed, with each graded by the instructor who developed them across all sections to ensure grading consistency. The exam will be taken on paper or using D2L and the [lockdown-browser](https://sn.augusta.edu/kb_view.do?sysparm_article=KB0010514), and aggregated data will be shared between instructors and with the Director of Undergraduate Studies to identify weak points and cohort progress.

In addition to this student-oriented data, qualitative data will be produced by the instructors:

* After each semester of teaching, the instructor will share their reflection on the unfolding of the semester.
* Each instructor will peer-review all others at least once during the project, to disseminate good practices and benefit from external perspectives. We will follow the School’s “Guideline for the Peer Evaluation of Classroom Teaching” and fill its “Peer Evaluation Form” that was designed by Clément Aubert and Michael Dowell. Whether those forms will be part of the reports will be up to the observer and observed team member.

Clément Aubert’s engagement in the University-wide “Course Evaluations Process Project”, led by Augusta University’s Associate Provost for Faculty Affairs, will provide expertise in bias mitigation and instrument development to our assessments. His involvement with the School’s sub-committee on CSCI 1301 enrollment data, success and engagement, will tie-in with our project’s collected data, to establish a longer-term perspective.

## 5. Timeline

Our project’s intended timeline is as follows:

* March 19th: Notification
* March 26th: Online Kickoff
* March 29th – April 27th: *Preliminary Phase 1: Workflow Design and Platform Development* and *Preliminary* *Phase 2: Goals, Dependencies and Assessment Design* start their investigations in parallel.
* April 27th − May 5th: Before the end of the semester, selection and interview of potential Undergraduate Course Assistants for the duration of the project is conducted.
* May 5th: End of Spring 2021
* May 6th — May 18th: *Preliminary Phase 1 and 2* gather feedback from all team members to ensure agreement on tools and goals. Team delivers its packages at the end of the period, as an operative platform ready to be filled with existing material for Phase 1, and as a guide for topic dependencies that further distinguishes “core” required components from “optional” ones.
* May 19th: Beginning of Summer 2021, Neea Rusch teaches one section of CSCI 1301, Mike Dowell teaches one section of CSCI 1302. Both start the semester by giving the “position quiz”, one UCA is hired to assist Neea Rusch 8 hours per week for the duration of the semester.
* May 19th — July 14th: *Preliminary Phase 3: Gathering Forces* is conducted in parallel to Neea Rusch’s delivery of CSCI 1301, all the team members follow Neea Rusch’s progression and share their work following her schedule and organization. Adjustments to the pace, schedule and content of the class are performed as needed, based on student feedback. The first common exam is developed and graded by all team members at the end of the period.
* June 4th: Around mid-term, Neea Rusch administer the mid-term survey we will have developed together.
* July 15th: Our first Semester status report is completed using the metrics collected by Neea Rusch and Mike Dowell, as well as the first blue print of our “matrix” and the first round of “packaged” material.
* August 11th: Beginning of Fall 2021, Edward Tremel, Richard DeFrancisco and Reza Rahaeimehr each teach two sections of CSCI 1301, Mike Dowell teaches two sections of CSCI 1302. All sessions start the semester by giving the “position quiz”, Edward Tremel, Richard DeFrancisco and Reza Rahaeimehr all hire a UCA to assist them in proof-reading the material and gathering feedback from students 4 hours per week for the duration of the semester.
* August 11th − December 12th: all CSCI 1301 sessions now use the matrix previously developed, in whichever packaged form they prefer, and the surveying tools previously developed are administered uniformly across sections.
* October 4th: Around mid-term, Edward Tremel, Richard DeFrancisco and Reza Rahaeimeh administer the mid-term survey.
* December 13th: Second status report is completed, and including a comparison between CSCI 1302’s “position quiz” from last Summer and last Fall.
* December 14th − January 6th: Winter break. “Transition” between the “former” and “current” instructors is orchestrated: clear marks on missing components is established, content is proof-read with uniformity in mind, tweaking the matrix as needed. If need be, second round of selection and interview of potential Undergraduate Course Assistants.
* January 7th: Beginning of Spring 2022. Clément Aubert, Richard DeFrancisco and Neea Rusch each teach two sections of CSCI 1301, Mike Dowell teaches one section of CSCI 1302. All sessions start the semester by giving the “position quiz”, Clément hires a UCA to assist him in proof-reading the material and gathering feedback from students 4 hours per week for the duration of the semester, possibly sharing him/her with other instructors to maximize feedback, as the material may be less in need of testing and proof-reading.
* January 7th − May 5th: all CSCI 1301 sessions now use the matrix previously developed, in whichever packaged form they prefer, and the surveying tools previously developed are administered uniformly across sections. If need be, final “optional material” is added and instructions on how to set up students’ computers are updated.
* March 2nd: Around mid-term, Clément Aubert, Richard DeFrancisco and Neea Rusch administer the mid-term survey.
* May 10th: Final report is submitted. It includes, for all semesters of the project, D/W/F rates, enrollment, student surveys and position quiz's aggregate data, as well team members’ peer evaluations and reflections, and a group reflection on the successes and where there is room for improvement.

For the duration of the project, each team member will be given an opportunity to conduct a peer evaluation of all the other team members’ delivery of a particular class, to increase discussion opportunities and take inspiration from each other’s best practices. The Center for Instructional Innovation and the Director of Undergraduate Studies will be called “by need” and given access to all material, including but not limited to status and final reports. Concertation with the School's Undergraduate Curriculum Committee and Michael Nowatkowski, Head of the Cyber Program of Study, will also take place to assist in strategic goals and to help pinpointing the security requirements suitable for CSCI 1301.

## 6. Budget

Each team member teaching CSCI 1301 during the project (Clément Aubert, Richard DeFrancisco, Reza Rahaeimehr, Neea Rusch and Edward Tremel) will receive a $5,000 summer salary to

* Actively contribute to the original gathering and labelling of their material, including but not limited to installation instructions, slides, exercises, homework, lecture notes, exams, labs and other documents,
* Develop and implement the quantitative and qualitative measures,
* Continuously implement improvements based on mutual agreement and student feedback,

in addition to their more specific tasks discussed in the “Implementation Details” section of our “2. Statement of Transformation”.

Michael Dowell will receive a $1,000 summer salary for bringing his expertise in curriculum design and clearly setting the expectations for CSCI 1302, as well as collecting data on this follow-up class. He will also share the material he developed for CSCI 1301.

Five Undergraduate Student Assistants will be selected, interviewed and hired by the five team members teaching CSCI 1301 during the project, to test and proofread material, assist students during lab and office hours, and gather feedback on student perception of the class and its material. They will be paid at the University's contractual salary of $13 an hour, for 4 hours per week (8 hours per week for the Summer semester), for the duration of each semester, adding up to 5 × $780 = $3,900.

Stacy Kluge and Anthony Lawrence, in their respective qualities of “liaison agent” with the Center for Instructional Innovation and Director of Undergraduate Studies, will not receive a stipend for their work in maximizing student engagement, designing assessment tools and verifying the alignment of the course with the missions of the Programs, School, and University. Their participation on this project is completed as a part of their normal contractual duties. The same goes for Michael Nowatkowski and Wennie Squires.

## 7. Sustainability Plan

Enrollment in CSCI 1301 has grown significantly over the past few years at Augusta University, for “demographic” and “strategic” reasons. As of August 2020, the School of Computer and Cyber Sciences leads the University in enrollment both in terms of percentage points increase, and in absolute enrollment increase. The “Cyber growth” that is making Augusta a national leader for cyber security is a strategic effort of University and School, leading to an increase in student interest in our program. As a result, the School anticipates CSCI 1301 enrollment to sustain its growth, and wants to use this class to simultaneously attract the best students in our programs and help them navigate our selection of degrees. Using the same standardized, free-of-charge and editable material across sections will lower the barrier of entry to our programs and become key in recruiting and retaining interested students.

The sustainability of our work is backed up in multiple ways:

* Five out of our six team members are either assistant or associate full-time professors and are scheduled to teach CSCI 1301 for the foreseeable future, ensuring stability in the updating and maintenance of our material.
* The specialties of our School, program and course make it difficult to abandon our platform once developed, as no existing resources put “security first” when teaching introduction to programming, a core feature of this proposal.
* The School is committed to maintaining the hiring of Undergraduate Course Assistants to assist students during lab and office hours, and to provide feedback and suggestions to help improve the OER used in class. The fact that future hires will have themselves studied this very same material will benefit both the UCAs and the new students.
* Our collected data will be key in assessing and re-assessing learning outcomes over time. This will be critical when we renew our accreditations ([ABET](https://www.augusta.edu/ccs/abet-accreditation.php), [Center of Academic Excellence in Cyber Defense](https://www.augusta.edu/ccs/bs-it-cybersecurity.php), and possibly [CAE Cyber Operations certification](https://www.nsa.gov/resources/students-educators/centers-academic-excellence/cae-co-centers/)), and tailored to fit their needs. The surveys will see long-term use and will possibly be included in other introductory classes.
* Neea Rusch, in charge of designing and implementing our workflow, is an expert in the development of open-source systems with excellent durability and traceability: our system will be clearly documented, including its precise dependencies and our contact information, to guarantee ease of use and adoption by internal and external classes.
* All selected technologies are “future proof” and open source: from [git](https://simpleprogrammer.com/git-relevant-in-2021/) to [markdown](https://commonmark.org/), [odt](https://fr.wikipedia.org/wiki/OpenDocument) to [LaTeX](https://www.latex-project.org/), and [Mono](https://www.mono-project.com/) to [Libreoffice](https://www.libreoffice.org/), the selected formats and software are resilient, documented and thanks to their open licenses, they will be independently accessible for the foreseeable future without license fees.
* Aside from GitHub, we only use Augusta University's platforms (box, lms and internal hosting), granting us independence from external services and platforms. Github offers a hosting solution for git repositories that can be easily migrated to other free platforms ([bitbucket](https://bitbucket.org/), [rocketgit](https://rocketgit.com/), [framagit](https://framagit.org), etc.) if need be.
* It is our hope that our “meta” material (surveys, development platform, workflow) will be adopted by other classes offering multiple sections per semester. Possible targets include CSCI 2700 - Ethics in Computer Science and CYBR 2600 - Introduction to Networking and Cyber Security.
* The inclusion of Micheal Dowell, currently responsible for the follow-up class CSCI 1302, in our team will ease possible future development of OER material for this class. Should our proposal be funded and successful, extending the material to this follow-up class, which still requires the current textbook, would be only natural.
* The team will be developing a “Welcome guide” for new instructors to rapidly adopt the material we will have produced. This guide will be tailored for internal use, but will serve as a basis for external adoption. It is also our hope that the security “twist” of our material will not go un-noticed, and could inspire other classes across the State.

Last but not least, the School’s Undergraduate Courses & Curriculum Committee has unanimously approved this proposal and has already had a sub-committee sketch the roles of “Course owner” and “Course coordinator” to formalize and guarantee the success and longevity of the work achieved during the grant period.

As witnessed by the attached letter, our Director of Undergraduate Studies, Anthony Lawrence, steadfastly backs this proposal, and our Dean, Alexander Schwarzmann, repeatedly championed the refinement and uniformization of the CSCI 1301-1302 sequence. Michael Nowatkowski, current Head of the Cyber Program of Study, also expressed his strong support and willingness to help the team in pinpointing the core security requirements.

Finally, the applicant, Clément Aubert, is fully devoted to the long-term development and maintenance of good quality OER. As an example, he was the recipient of [Proposal M71](https://www.affordablelearninggeorgia.org/documents/M71_Augusta_Aubert.pdf) of the [Round 13 “Mini-Grant for Ancillary Materials Creation and Revision”](https://www.affordablelearninggeorgia.org/about/r13_grantees) to develop a set of exams, lecture notes, exercises and lab for his CSCI 3410 - Database Systems Lecture Notes. Since this project terminated in Spring 2020, the applicant has [updated the material weekly,](https://rocketgit.com/user/caubert/CSCI_3410) making it [reach over 300 pages](https://spots.augusta.edu/caubert/db/ln/CSCI_3410_lecture_notes.pdf), and had [two capstone projects](https://spots.augusta.edu/caubert/db/ln/README.html#authors-and-contributors) where 8 total students improved its accessibility and re-usability. This work was featured in the “[awesome-mysql](https://github.com/shlomi-noach/awesome-mysql)” “curated” resource list. It can be accessed at <https://spots.augusta.edu/caubert/db/ln/> and its [readme](https://spots.augusta.edu/caubert/db/ln/README.html) details how to reuse, adopt and modify this material, as well as give credit to contributors.

# [Creative Commons Terms](https://github.com/shlomi-noach/awesome-mysql)

[We understand that any new materials or revisions created with ALG funding will, by default, be made available to the public under a Creative Commons Attribution License (CC-BY), with exceptions for modifications of pre-existing resources with a more restrictive license.](https://github.com/shlomi-noach/awesome-mysql)

[More particularly, our surveys, platform for the development of our course, as well as the totality of the material we will be developing will be shared under Creative Commons Attribution 4.0 (CC-BY-4.0) or](https://github.com/shlomi-noach/awesome-mysql) [[more permissive licences](https://github.com/shlomi-noach/awesome-mysql)](https://opendefinition.org/licenses/)[.](https://github.com/shlomi-noach/awesome-mysql)

# [Accessibility Terms](https://github.com/shlomi-noach/awesome-mysql)

[We understand that any new materials or revisions created with Affordable Learning Georgia funding must be developed in compliance with the specific accessibility standards defined in the](https://github.com/shlomi-noach/awesome-mysql) [[Request for Proposals](https://github.com/shlomi-noach/awesome-mysql)](https://www.affordablelearninggeorgia.org/about/rfp_r18)[.](https://github.com/shlomi-noach/awesome-mysql)

[Using the markdown format and converting it into odt, html and pdf documents (as well as possibly docx and epub) with pandoc will ensure consistency and syntactical validity. Automated and human tests will be enforced to assess correctness, portability and uniformity of style of the code and material shared with the students.](https://github.com/shlomi-noach/awesome-mysql)

# [Letter of Support](https://github.com/shlomi-noach/awesome-mysql)

*[The Department Chair from the corresponding project, or the Department Chair’s direct report such as the Dean or Provost, must provide a signed Letter of Support for the project. This letter should acknowledge the following:](https://github.com/shlomi-noach/awesome-mysql)*

* *[The department will provide support for fund disbursement in correspondence with the Grants/Business Office.](https://github.com/shlomi-noach/awesome-mysql)*
* *[The department approves of the work on the proposal by the applicant(s).](https://github.com/shlomi-noach/awesome-mysql)*
* *[The department acknowledges the sustainability of the use of these affordable resources after the grant work is complete.](https://github.com/shlomi-noach/awesome-mysql)*

*[In the case of multi-institutional affiliations, all participants’ institutions must provide a letter of support.](https://github.com/shlomi-noach/awesome-mysql)*

*[Please provide the name and title of the department chair (or other administrator) who provided you with the Letter of Support.](https://github.com/shlomi-noach/awesome-mysql)*

|  |
| --- |
| [Anthony Lawrence](https://www.augusta.edu/faculty/directory/view.php?id=ANTLAWRENCE)[, Director of Undergraduate Studies,](https://github.com/shlomi-noach/awesome-mysql) [antlawrence@augusta.edu](https://github.com/shlomi-noach/awesome-mysql) |

# [Grants or Business Office Letter of Acknowledgment](https://github.com/shlomi-noach/awesome-mysql)

*[Institutional Grants/Business Offices will be responsible for fund disbursement, often in correspondence with the Department Chair, including expense and travel reimbursement. Applicants will need to provide a short Letter of Acknowledgment stating that the Grants/Business Office knows about the applicant’s intent to apply for an Affordable Materials Grant. Either the Department Chair or the Project Lead can work with the Grants/Business Office to get this signed letter.](https://github.com/shlomi-noach/awesome-mysql)*

*[In the case of multi-institutional affiliations, all participants’ institutions must provide a letter of acknowledgment.](https://github.com/shlomi-noach/awesome-mysql)*

*[Please provide the name and title of the grants or business office representative who provided you with the Letter of Acknowledgment.](https://github.com/shlomi-noach/awesome-mysql)*

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| [[Diego R. Vazquez](https://github.com/shlomi-noach/awesome-mysql)](https://www.augusta.edu/faculty/directory/view.php?id=DIVAZQUEZ)[, Executive Director of AURI/Associate VP of Sponsored Programs Administration at AU,](https://github.com/shlomi-noach/awesome-mysql) [divazquez@augusta.edu](https://github.com/shlomi-noach/awesome-mysql) |