OER Revisions and Ancillary Materials Creation Mini-Grant Application

Affordable Learning Georgia aims to support the sustainability of previous Textbook Transformation Grants implementations through revisions of created open educational resources or the creation of new ancillary materials for existing OER. Mini-grant participants do not need to be the original creators of the resource(s). While we welcome original authors to revise their original materials, the nature of open licenses allows for the revision and remixing of OER materials by anyone as long as the terms of the license are adhered to.

The final deliverable for this category is the revised or newly-created materials as proposed in the application, which will be hosted through GALILEO Open Learning Materials. All revised or newly-created materials will be made available to the public under a Creative Commons Attribution License (CC-BY), unless the original materials were under a more restrictive license such as the inclusion of SA (Share-Alike) or NC (Non-Commercial).

For the purposes of this grant, we define revision as the major improvement of a resource through updates for accuracy, accessibility, clarity, design, and formatting. We define ancillary materials as any materials created to substantially support the instruction of a course using an existing open educational resource(s).

While mini-grants do not normally require the Letter of Support process that larger Textbook Transformation Grants require, multi-institution collaborations on a mini-grant project do require a Letter of Support from each institution. This is to ensure that not only the Project Lead's institution is aware of the grant.

Applicant Name *

Antonio Velazquez

Applicant Position *

Assistant Professor

Applicant Institution *

Savannah State University

Applicant Email Address *

Please use your institutional email address.

velazqueza@savannahstate.edu

Other Team Members

Please provide both names and email addresses here.

Maziar Moaveni, moavenim@savannahstate.edu

Type of Project *

- ○ Revision of pre-existing OER
- ○ Creation of ancillaries for pre-existing OER
- ◉ Other: Creation of a new OER

Course Number(s)

ENGT-4903 (CRN: 21204)

Course Title(s)

Special Topics in Civil Engineering (Timber and Masonry Design)

Final Semester of the Project *

This is the semester in which the materials created/revised will be completed.

- (●) Spring 2021
- ( ) Summer 2021

Proposed Grant Funding Amount: *

This is the total (in a dollar amount) of funding you are requesting for the mini-grant. There is a maximum of $4800, with a maximum of $2000 per team member and $800 for project expenses.

4800

Currently-Existing Resource(s) to be Revised / Ancillaries Created *

Please provide a title and web address (URL) to each of the currently-existing resources that you are either revising or creating new ancillary materials for below.

No Existing Resources

Project Description *

In at least one paragraph, describe your project's goals and deliverables.

The objective of the present proposal is to develop an effective, productive and compelling textbook – and complementary software – material not only to alleviate the ever prevailing burden of book expenditures for the Civil Engineering undergrad student, but also to provide a high-impact pedagogical interactive tool that boosts the learning endurance via a self-reliant theoretical-experimental hands-on learning experience in two of the most misunderstood, misintepreted and undervalued core topics in the Civil Engineering curricula: Wood and Masonry Design. The goal is to build a textbook material filled with practical numerical step-by-step examples, including figures, sketches, schematic drawings and tables, paired with a mobile application that will act as a complementary tool for the coursework.

Science, technology, engineering and mathematics (STEM) majors are universally regarded as indispensible to a nation's economy. The United States has long been respected as a world innovator of science and technology but it is facing harsh competition from abroad in producing high-performance STEM alumni, in specific engineering technology students (Hagedorn and DuBray 2010). Previous research have found that an educational body of knowledge based on practical cognizance and pragmatic awareness not only influence greately the rate of success and retention in STEM disciplines (Uttal and Cohen 2012), but also increase overall Hispanic and African American students' odds of persisting and completing STEM majors (Valian, 2007).

Savannah State University (SSU), as the first HBCU institution in Georgia, is entrusted to deliver quality students in contemporary technological subjects of our time. To this aim, the SSU Engineering Technology program is constantly undergoing processes of revalidation and renovation. To this effect, the SSU ABET-accreditted Civil Engineering Technology program is in a process of readaptation and adequacy towards an upcoming ABET re-certification that contemplates the appraisal of Structural Engineering (SE) subjects. In this line of thinking, the SE academic portfolio has been assessed targeting topics of construction-wise building code design, including provisions in steel, reinforced concrete, wood and masonry structures. SSU currently offers the 'CIVT-4100K Structure Design' course that covers elemental design aspects of reinforced concrete and steel structures, but does not contemplate masonry (bricks) and wood (timber and lumber) design per se. Under this premise, the applicant and his colleage intend to target the Wood and Masonry Design course as the indisputable complement. The project will be part of a escalated plan for continuous improvement that will concatenate other sub-disciplines of interest such as MEP (mechanical, electrical, and plumbing engineering) or BIM (building information modeling). The proposed Wood and Masonry design scheme will set the student in a functional and realistic hands-on academic experience. The end result of the textbook – and complementary mobile app utility for that matter – will focus on the core fundamentals of construction code-wise wood and masonry design that could be easily implemented in conventional projects and professional practices, but also wil serve towards the preparation of the Fundamentals of Engineering (FE) and Professional Engineering (PE) examinations.

References:

Hagedorn, L. S. and D. Dubray (2010), "Math and science success and nonsuccess: Journeys within the community college", Jrnl. of Women and Minorities in Science and Engineering, Vol. 16(1): 31-50 p.p.

Uttal and Cohen (2012), "Spatial thinking and STEM education: When, why, and

how?", Ed. B. H. Ross, The Psychology of Learning and Motivation, Academic Press, 148-178 p.p.

Valian, V. (2007), "Women at the top in science and elsewhere.", Eds. Ceci. S. and W. Williams in 'Why aren't more women in science: Top Researchers debate the evidence", American Psychological Association, Washington DC, 27-37 p.p.

Timeline and Personnel *

Provide a project timeline with milestones below, keeping in mind your selected Final Semester above. Provide a short description of the roles any additional team members will take on during the activities in your timeline.

Chapter 1. Overview
Description: Classification of buildings, building codes, standard unit loads, tributary area, stress design, strength design, unified design, elastic and plastic designs, combination of loads, other loads, continuous load path.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~1 week

Chapter 2. Loads
Description: Dead loads, live loads, floor live loads, roof live loads, tributary area, effective area, reduction factors, snow loads.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~2 weeks

Chapter 3. Wood Design
Description: Requirements Engineering properties, sawn lumber, lumber factors, LRFD basis, structural glued laminated timber (glulam), composite lumber, cross-laminated timber, effective stiffness and strength.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~1 weeks

Chapter 4. Wood Tension, Compresion and Flexion
Description: Design of beams, bending criteria, shear criteria, shear strength, deflection criteria, bearing at supports, axial tension members, columns, column stability, critical buckling.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~4 weeks

Chapter 5. Wood Connections
Description: Types of connections and fasteners, dowel-type fasteners, yield limit theory, yield mechanisms, lateral loads (shear connections), withdrawal loads, adjustments of reference design values, nail and screw connections, bolt and lag screw connections.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~3 weeks

Chapter 6: Masonry Design Requirements
Description: Basic structural behavior, low-rise and bearing wall buildings, materials, mortar, grout, clay, concrete, code basis, gravity loads, wind loads, earthquake loads, mechanical behavior.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~1 week

Chapter 7. Unreinforced Masonry
Description: Strength design, unreinforced panel walls, bearing walls, shear walls, anchor bolts.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~3 weeks

Chapter 8. Reinforced Masonry
Description: Reinforced beams and lintels, curtain walls, bearing walls, shear walls, bond beams, modulus of rupture, nominal cracking, shear design, lateral support, doubly reinforced masonry beams.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~3 weeks

Chapter 9. Masonry Columns
Description: Axially loaded columns, axial strength, MSJC code provisions, combined axial load and bending, interaction diagrams, shear strength.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~2 weeks

Chapter 10. Gravity/Transverse Masonry Walls
Description: Bond patterns, walls under gravity and transverse loads, out-of-plane loads, pilasters.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration: ~2 weeks

Chapter 11. Shear Masonry Walls
Description: Ridigity and relative rigidity, openings, seismic lateral forces, horizontal diaphragms, building configurations, lateral force distributions, direct shear and torsional moments, multistory shear walls.
Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duraiton: ~2 weeks

Chaper 12. Retaining Masonry Walls
Description: Lateral pressures, external stability, subterranean or basement walls, construction considerations.

Roles. Velazquez: prepare course notes, visuals, handouts, schematic drawings, figures and tables, algorithms and pre-program coding, assignment sets, problem sets, appendices. Moaveni: writing and style, proofing, verification, attesations, peer review, auscultations, modifications, corrections and improvements.
Duration ~2 weeks

Chapter 13. Mobile App: Wood Design
Description: Android SDK and Java Software Development Kit (JDK) setups. nuances definitions, flow diagrams, user journey, resource allocation, timelines and bifurcations, software management, creating tasks, modules design, buffer analysis, mockup design, home page design and major inner pages of the website and screens for mobile application, agile development, programming and quality assurance, final deployment.
Roles. Velazquez: flow diagrams, user journey, resource allocation, software construction and management, modules design, mockup design, agile development, deployment. Moaveni: writing and documentation, proofing, testing, deployment, buffer analysis, web-page design, art design, quality assurance, peer review, auscultations.
Duration ~5 weeks

Chapter 14. Mobile App: Masonry Design
Description: Android SDK and Java Software Development Kit (JDK) setups. nuances definitions, flow diagrams, user journey, resource allocation, timelines and bifurcations, software management, creating tasks, modules design, buffer analysis, mockup design, home page design and major inner pages of the website and screens for mobile application, agile development, programming and quality assurance, final deployment.
Roles. Velazquez: flow diagrams, user journey, resource allocation, software construction and management, modules design, mockup design, agile development, deployment. Moaveni: writing and documentation, proofing, testing, deployment, buffer analysis, web-page design, art design, quality assurance, peer review, auscultations.
Duration ~5 weeks

Total duration: 36 weeks.

Budget *

Please enter your project's budget below. Include personnel and projected expenses. The maximum amounts for the award are as follows: $4,800 maximum award, $2,000 maximum per team member, $800 maximum for overall project expenses. Unlike standard-scale and large-scale transformations, the maximum of $800 is not a required element of the budget, but rather meant primarily for the purchase of specific tools and software which would help with improving resources.

Requesting $4,800 standard budget, $2,000 for each of the two member team and $800 project expenses standard (stationery costs, software licenses and travelling).

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