1. Definition and Overview

According to the definition from the Association of American Colleges and Universities (AAC&U), the goal of “Undergraduate Research” is to “involve students with actively contested questions, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions” (https://www.aacu.org/leap/hips).

The Council of Undergraduate Research (CUR) defines undergraduate research as “an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline” (http://www.cur.org/about_cur/, emphasis added).

CU Denver expands the definition to “Undergraduate Research and Creative Activity” (URCA) in order to make this experience available to any undergraduate in all disciplines. URCA may involve inquiry, design, investigation, research, creation, discovery, application, writing, performance, or other professionally relevant scholarly activities of the discipline.

URCA is mentored original work that uses the defining methods of the discipline, is project-based and a cumulative learning experience, produces results that are communicated in the format appropriate to the discipline or profession, and may be either individual work or involve collaborative teamwork.

Because URCA generally requires previous training in the methods and concepts of the discipline and provides students with the experience of using the skills and techniques of that field at a pre-professional or even professional level, it is less suitable for lower-division courses without a high degree of scaffolding, but rather more appropriate for scaffolded lower-division courses, upper-division courses, and especially capstone courses.

2. Best-Practices Guidelines

The minimum standard features of URCA-intensive courses, based on national best practices, are as follows:

- **Original**: Students are asked to solve a challenging problem or address a complex issue in an original way. They are involved in conceptualizing, designing, and/or developing the project. The project engages them in innovation, discovery, or creation, even if incremental.

- **Methodological**: Students apply defining methods of the discipline, whether the scientific method, research methods, scholarly best-practices, or artistic techniques.
Project-based: The project requires multiple stages of preparation, investigation, trial-and-error, or refinement, and involves occasions for feedback, whether from the mentor(s) or the mentor and peers, and reflection upon the process, whether solo or collaboratively.

Communicated: The project results are communicated according to standard practice in the discipline or profession, whether in writing, orally, by poster presentation, performance, exhibit, website, or other professionally relevant outlet. When possible and appropriate, the student should be encouraged to present results at professional meetings or venues.

Integrated: The URCA experience is explicitly integrated into the course, if not the culminating event of the course, as evidenced in learning outcomes, assignment/activities, and grades.

3. Learning Outcomes for Undergraduate Research and Creative Activity (URCA)

National best practices recommend that URCA-intensive courses deliver the learning summarized by one or both of two AAC&U Essential Learning Outcomes (ELOs): Inquiry and Analysis and/or Creative Thinking.

URCA course syllabi ideally should reference and use the ELO VALUE rubric for Inquiry and Analysis and/or Creative Thinking, integrating those general learning outcomes into the discipline-specific learning outcomes for the course. The ELO(s) should be expressed in the terms of that discipline or profession and serve the delivery of disciplinary knowledge and skills.

In addition, individual faculty may choose whether or not to incorporate one or more of the other ELOs, as appropriate to the discipline, and integrated into the disciplinary or professional content or used as vehicle for that content. Other ELOs that may be especially relevant to URCA courses include: Problem Solving and Integrative and Applied Learning.

This concludes the abbreviated URCA best-practices guidelines document. The complete version additionally includes a Suggested Resources or references section and a Sample Courses section.
4. Suggested Resources

5. Sample of Courses at CU Denver

**ELEC 4309 - Senior Design Project I:** Design methodology and tools, project planning and team building, ethics in engineering and research, career planning and portfolio building. Project designs are completed and presented to the class. Prereq: Students must complete their Senior/30 hour check prior to enrollment. Prereq/Coreq: all required ELEC 3000-level classes and labs. ELEC 4309 and ELEC 4319 must be completed in subsequent academic semesters. **Semester Hours:** 3.

**ELEC 4319 - Senior Design Project II:** Project designs completed in ELEC 4309 are constructed and tested. Oral and written presentations of the completed project performance are required. Prereq: ELEC 4309. All required ELEC 3000-level classes and labs. Students must complete their Graduation Agreement prior to enrollment. ELEC 4309 and ELEC 4319 must be completed in subsequent academic semesters. **Semester Hours:** 3.

**PHYS 4850 - Physics for Design and Innovation I:** A service-learning project using fundamental physical principles to design a prototype scientific instrument, technical device, or technical process for a real-world client. Includes instruction on project management, intellectual property, and market analysis. Cross-listed with PHYS 5850. **Semester Hours:** 3

**PHYS 4852 - Physics for Design and Innovation II:** A capstone project using fundamental physical principles to prototype a scientific instrument, technical device or technical process. The focus is on the student’s own product idea. Includes online-guided readings on the wider context of product development. Students should consult with instructor on necessary physics and mathematics preparation for the project. Prereq: PHYS 4850. Cross-listed with PHYS 5852. **Semester Hours:** 3