

ACM Curriculum Guidance for 2-year Cybersecurity Programs

SIGCSE 2019

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Cara Tang, Portland Community College, OR
Cindy Tucker, Bluegrass Community & Tech. College, KY
Christian Servin, El Paso Community College, TX
Melissa Stange, Lord Fairfax Community College, VA

Outline

ACM CCECC and Curricular Guidelines for 2-Year Colleges

- ACM CCECC
- CSEC2Y History and Timeline

CSEC2Y

- Introduction to StrawDog
- Overview of KAs and KUs

Breakout and Feedback on KA/KUs

Group Report and Next Steps

ACM CCECC and Curricular Guidelines

Introduction to ACM CCECC



Committee for Computing Education in Community Colleges

- 40++ years of service to computing education
- Standing committee of the ACM Education Board for 25+ years

Global Mission

Serve and support community and technical college educators in all aspects of computing education

Engage in curriculum and assessment development, community building, and advocacy in service to this sector of higher education

ccecc.acm.org

ACM Curriculum Guidelines for Undergraduate Programs

www.acm.org/education

CC2005 (Computing Curricula 2005): The Overview Report

- Computer Engineering – CE2016
- Computer Science – CS2013
- Information Systems – IS2010
- Information Technology – IT2017
- Software Engineering – SE2014
- Cybersecurity – CSEC2017

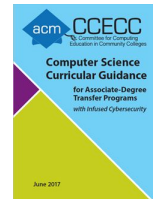
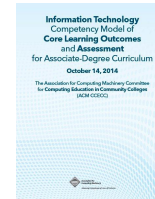
Under Development

- CC2020
- Data Science

ACM Curriculum Guidelines for Associate-Degree Programs

Produced by the CCECC

- Information Technology - IT Competency Model 2014
 - Guidelines for the core of A.A.S. / career programs
 - Infused with cybersecurity
- Computer Science - CTransfer2017
 - Guidelines for A.S. / transfer programs
 - Infused with cybersecurity



Current Projects

- Cybersecurity - CSEC2Y
- IT Transfer

CSEC2Y

CSEC2Y Project Scope

- Curriculum guidelines for associate degree programs (2 years)
 - Transfer programs (A.S. degree)
 - Career programs (A.A.S. degree)
- Based on ACM CSEC2017
- Updated for currency & appropriateness at the two-year college level
- Other influences:
 - CAE2Y knowledge units (KUs) - 2019 Foundational + Technical Core
 - NICE Cybersecurity Workforce Framework
 - Others

CSEC2017

Vision: *The CSEC2017 curricular volume will be the leading resource of comprehensive cybersecurity curricular content for global academic institutions seeking to develop a broad range of cybersecurity offerings at the post-secondary level.*

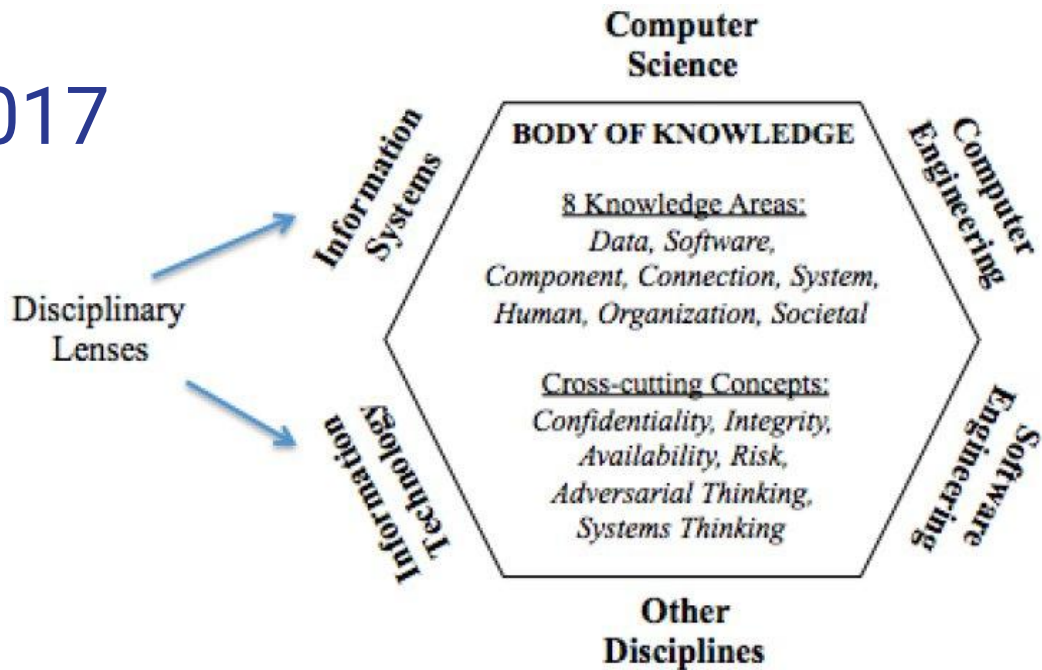
Organization

- Knowledge areas, knowledge units, topics
- Cross-cutting concepts
- Disciplinary lenses

cybered.acm.org



CSEC2017



Community College Exemplars

- Curriculum exemplar: Portland Community College, OR
- 4-Course exemplar: El Paso Community College, TX
- Course exemplar: Cosumnes River College, CA

CSEC2Y Task Group

Cara Tang*+ | Portland Community College, Portland, OR

Cindy Tucker* | Bluegrass Community and Technical College, Lexington, KY

Christian Servin* | El Paso Community College, El Paso, TX

Markus Geissler* | Cosumnes River College, Sacramento, CA

Melissa Stange* | Lord Fairfax Community College, Middletown, VA

Nancy Jones | Coastline Community College, Garden Grove, CA

James Kolasa | Bluegrass Community and Technical College, Lexington, KY

Amelia Phillips | Highline College, Des Moines, WA

Lambros Piskopos | Wilbur Wright College, Chicago, IL

Pam Schmelz | Ivy Tech Community College, Columbus, IN

* Steering Committee

CSEC2Y Advisors

Antonio Bologna | Rapid 7

Elizabeth Hawthorne | Union County College

Phil Helsel | Microsoft

Sidd Kaza | Towson University

Sepehr (Sepi) Hejazi Moghadam | Google

Bill Newhouse | NICE (National Initiative for Cybersecurity Education)

Casey O'Brien | National CyberWatch Center

Allen Parrish | Mississippi State University

John Sands | Moraine Valley Community College, CSSIA

Brian Ventura | SANS Instructor

CSEC2Y Timeline

2018 April: First Task Group Meeting

2019 February: StrawDog (SIGCSE)

2019 July: IronDog (3CS)

2019 Dec: Final Version

Project overview and status:

ccecc.acm.org/guidance/cybersecurity

CSEC2Y Draft

Maintain CSEC2017 organization into 8 Knowledge Areas (KAs)

- Data Security
- Software Security
- Component Security
- Connection Security
- System Security
- Human Security
- Organizational Security
- Societal Security

CSEC2Y Draft

CSEC2017 Structure

Within each of the 8
Knowledge Areas

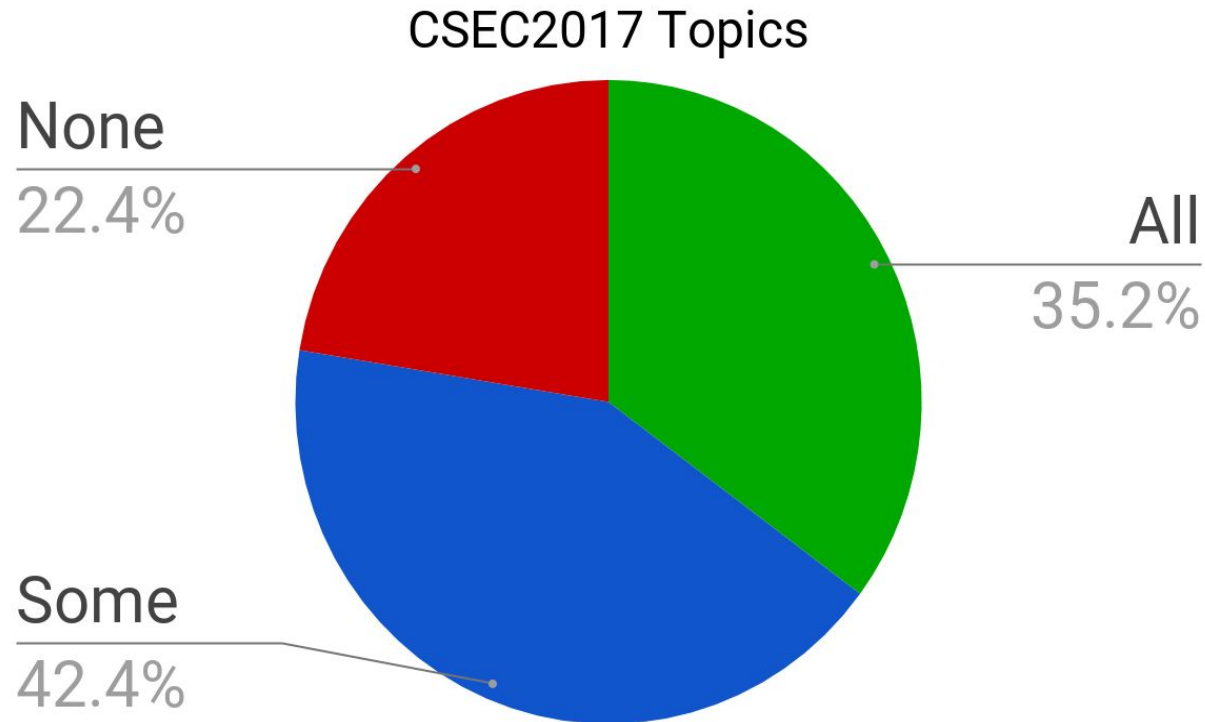
- Essentials
- Knowledge Units
 - **Topics**

CSEC2Y

Each CSEC2017 **topic** marked as one of

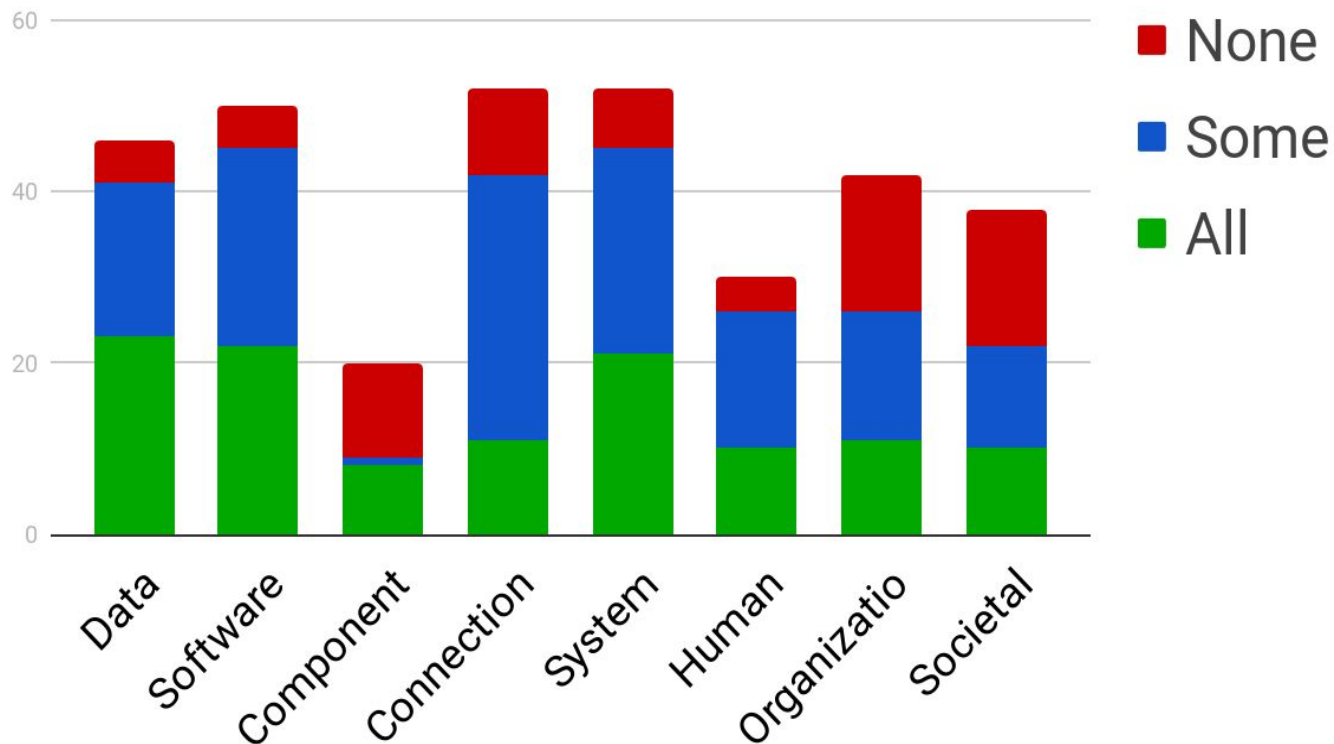
- **All:** appropriate for all 2-year cyber programs -> **Essential**
- **Some:** appropriate for some 2-year cyber programs -> **Supplemental**
- **None:** not included in 2-year guidance

CSEC2Y Draft



CSEC2Y Draft

CSEC2017 Topics



CSEC2Y Draft - Learning Outcomes

- Learning outcomes for each KU and topic
- Focus on **student achievement**
- Focus on what students *can do* rather than what students *know*
- Avoid traditional body of knowledge focus on topics and contact hours

Essential

- 8 Knowledge Areas
 - Knowledge Units (KUs)
 - **Learning Outcomes**

Supplemental

- 8 Knowledge Areas
 - Knowledge Units (KUs)
 - **Learning Outcomes**

Learning Outcomes Approach

Learning Outcomes (LOs) are

- **Active** - action verbs describe what students should be able to do
- **Aligned** - with the rest of the curriculum; LOs contribute to achievement of course outcomes, which in turn contribute to program outcomes
- **Achievable** - written at the threshold level for a pass, not aspirational
- **Assessed** - measurable; possible to assess several learning outcomes with one assignment and can also be assessed informally, based on classroom tasks or discussions

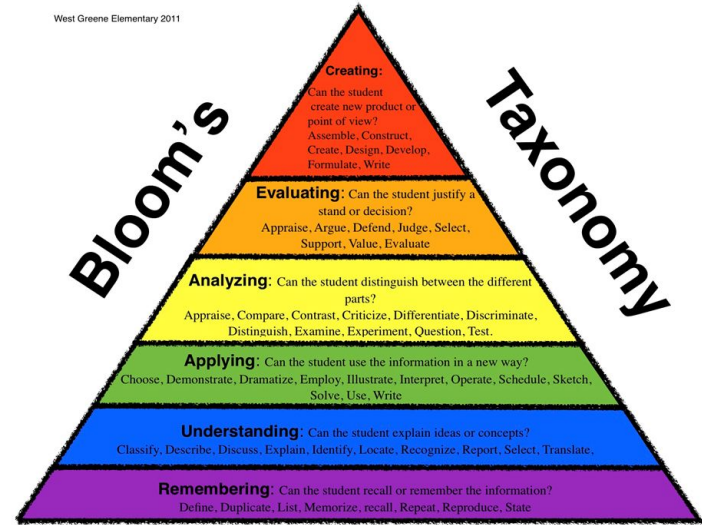
Utilize Bloom's Revised Taxonomy

Bloom's Revised Taxonomy

Six levels of thinking skills in cognitive domain

- Creating
- Evaluating
- Analyzing
- Applying
- Understanding
- Remembering

West Greene Elementary 2011



Assessment Verbs by Bloom's Level



Lower Order
Thinking Skills

Higher Order
Thinking Skills

Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
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StrawDog Layout

Introduction

- Overview
- How to use the Guideline
- Two-year/Community College Environment
- Diversity in the Computing Profession
- Ethics and Professionalism
- Mathematics Requirement*
- The Cybersecurity Discipline

Knowledge Areas (for each...)

- Essential Learning Outcomes
- Supplemental Learning Outcomes

Mathematics for Cybersecurity

A variety of mathematics courses may be appropriate for undergraduate cybersecurity majors.

Feedback Opportunity: What is most appropriate?

- Discrete mathematics
- Statistics
- Linear algebra
- College algebra
- Pre-calculus
- Calculus
- Other?

Breakout

Review the **Essential LOs** in StrawDog by KA/KU

Questions to consider:

- What is missing
- Should an essential LO be removed or become supplemental (only for some cybersecurity programs)
- How can/should an essential LO be updated

Breakout

- Data Security
- Software Security
- Component Security
- Connection Security
- System Security
- Human Security
- Organizational Security
- Societal Security

Questions to consider:

- What is missing
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Report Out

- Group 1
- Group 2
- Group 3
- Group 4

Summary of Breakout

Next Steps for CSEC2Y

NEXT STEP for CSEC2Y StrawDog

Provide your input to shape and improve CSEC2Y

- Review StrawDog and complete a feedback survey

StrawDog: ccecc.acm.org/files/publications/CSEC2Y-StrawDog.pdf

StrawDog Survey:



Related Cybersecurity Initiatives

ABET Cybersecurity Program Accreditation

ABET accredits 4-year computing programs in

- Computer Science
- Information Systems
- Information Technology
- **Cybersecurity** - new; first 4 schools accredited in pilot round 2017-2018

ABET has begun a project to develop criteria for accrediting **2-year cybersecurity programs**.

- **Criteria will be based on CSEC2Y**

Visit the ACM CCECC Website

ccecc.acm.org

StrawDog

