PROGRAM COMPONENT (Group B) OR NON-SUBSTANTIVE MINOR REQUEST FORM
Short Form

Instructions: Please use one form for each request/action. Clearly mark all changes using Track Change or strikethroughs for deletions and underlines for additions. Following the approval of the appropriate college curriculum committee, a single representative for the college will e-mail the completed form to the Office of the Provost and Executive Vice President, provost@uidaho.edu for approval and then submission to the Academic Publications Editor in the Registrar’s Office for review by the University Curriculum Committee (UCC).

Deadline: This form must be submitted to the Office of the Provost and Executive Vice President by December 15th for inclusion in the next available General Catalog and to be available for scheduling beginning with the next summer session.

When applicable a Curriculum Change Form and Course Approval Forms must accompany the short form when submitted to provost@uidaho.edu

Submission Information
This section must be completed

| College: | College of Engineering |
| Department/Unit: | Technology Management |
| Dept/Unit Approval Date: | 11/18/16 | Vote Record: | 3/0 |
| College Approval Date: | 12/13/16 | Vote Record: |
| CIP code (Consult Institutional Research): | |
| Primary Point of Contact (Name and Email): | Michael Haney mhaney@uidaho.edu |

Rationale and Overview of Program Component Request or Name Change
This section must be completed

Provide the rationale and overview of this request. Include an explanation of how the department will manage the added workload for a new program component; describe whether the program component curriculum and admissions requirements remain the same; describe the rationale for a name change or degree designation change if applicable.

It is requested to add a new certificate named Certificate of Critical Infrastructure Resilience.

The certificate consists of 15 credits, i.e., it requires five 3-credit courses. At least 50% of credit hours must be at 500-level. A grade of ‘B’ or higher is required in all coursework for this academic certificate. The first course listed on page five is required. The remaining are electives that meet specific objectives. Group 1 of electives cover fundamentals of security and risk management. Students choose two of these courses. Group 2 of electives provide domain-specific engineering fundamentals of cyber-physical systems. Group 3 of electives provide computer security concepts and skills.

Background: With the growing need for a highly skilled and well versed cyber security workforce, especially in sectors of our nation’s critical infrastructure, there is a need for guidance and recognition of accomplishment in graduate studies in this area. The Idaho National Laboratory and area businesses have requested this certificate to be created and expressed an urgent need for employees with this training and experience.

The certificate will be offered in the Technology Management program to masters-level students in Idaho Falls. Masters students in TM, CS, and ECE will be eligible to earn this cross-disciplined certificate.
### Name or Degree Change Only Requests

Leave blank if not making a name and/or degree change only request.

This section to be completed **ONLY** for changes to the name of: degree, major, minor, option, emphasis, certificate, teaching endorsement. If there are accompanying curriculum or course changes, complete the next section and attach the curriculum and/or course forms. **Note:** a substantive change to a program degree, major, or program component may require a program proposal form.

<table>
<thead>
<tr>
<th>Current Name:</th>
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<tbody>
<tr>
<td>New Name:</td>
<td></td>
</tr>
<tr>
<td>Current Degree:</td>
<td></td>
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<tr>
<td>New Degree:</td>
<td></td>
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<tr>
<td>Other Details:</td>
<td></td>
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<tr>
<td>Effective Date:</td>
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### Program Component Request

Leave blank if not adding, discontinuing, or modifying a program component. Program components consist of option, emphasis, minor, academic certificate less than 30 credits, or teaching endorsement.

- Clearly mark all changes to existing program components by using Track Change or strikethroughs for deletions and underlines for additions.
- A curriculum change form and/or course approval forms associated with this request are required to be submitted with this short form.

<table>
<thead>
<tr>
<th>Create New:</th>
<th>Modify:</th>
<th>Discontinue:</th>
<th>Implementation Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Graduate Level:</th>
<th>Undergraduate Level:</th>
<th>Law Level:</th>
<th>Credit Requirement:</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
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</tbody>
</table>

Are new courses being created: | No | Yes | X |

If yes, how many courses will be created: | 2 |

If the request is for an option or emphasis enter the associated major and degree:

<table>
<thead>
<tr>
<th>Major:</th>
<th>Degree:</th>
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</table>

Enter the name of the program component in the appropriate row:

<table>
<thead>
<tr>
<th>Option:</th>
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<tbody>
<tr>
<td>Emphasis:</td>
<td></td>
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<tr>
<td>Minor:</td>
<td></td>
</tr>
<tr>
<td>Academic Certificate less than 30 credits:</td>
<td>Certificate of Critical Infrastructure Resilience (15 credit hours)</td>
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<tr>
<td>Teaching Endorsement (Major/Minor):</td>
<td></td>
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</table>

### Learning Outcomes and Assessment Information

This section must be completed if program component request section is completed.

1. List the intended learning outcomes for the program component, using learner centered statements that indicate what will students know, be able to do, and value or appreciate as a result of completing the program:

   There are four core requirements to earn the proposed certificate. Upon completing the selection of five courses for this certificate, a student will have the following:

   1. An understanding of the fundamental principles of critical infrastructure, the various sectors, and the many pressures to maintain the resilience of that infrastructure, including legal and regulatory, as well as nation-state cyber threats.
   2. An understanding of the issues involving security, particularly cyber security, and risk management, with the ability to perform a formal and quantitative risk assessment and set strategic direction for policies, procedures and technology to manage the risk.
3. A set of skills, jargon, and experience for one or more specific engineering domains that affect critical infrastructure (e.g. power systems, water systems, nuclear power).

4. A set of skills, jargon, and experience for one or more specific cyber security technical focus areas (e.g. incident response, forensics, reverse engineering).

2. Describe the assessment process that will be used to evaluate how well students are achieving the intended learning outcomes of the program component:

The assessment of the intended learning outcomes will be quantified primarily in two ways. The first is that assessment activities, including tests/quizzes and instructor grading of student work products, will be embedded in the course "Fundamentals of Critical Infrastructure Resilience" which is required of all students attempting to earn this certificate. The Fundamentals course also includes a capstone project required of all students which is designed to measure and assess how the stated learning objectives have been met. The assessment materials for the Fundamentals course will be reviewed annually by the certificate coordination leadership, along with a sampling of student work products. Feedback will be given to the Fundamentals course instructor(s) to inform modifications and improvements for future course offerings.

The second means of assessment to evaluate how well students are achieving the intended learning outcomes will be through tests/quizzes and instructor grading of student work products embedded within the various elective courses used to meet the requirements of the certificate. The assessment materials and sampling of student work products will be requested by the certificate coordination leadership from the instructors of these courses and reviewed on an annual basis and used to inform suggested modifications and improvements to the course coordinators for future course offerings. Specific classes that are likely to be taken by a majority of the students pursuing this certificate include TM 529: Risk Assessment, CS 536: Adv. Info. Assurance, ECE 504: Resilient Control in the Power Grid, ECE 470: Control Systems, ME 481: Control Systems, and CS 439/539: Applied Security Concepts.

3. How will you ensure that the assessment findings will be used to improve the program?

On an annual basis, the certificate coordination leadership will meet to review the assessment materials and sampling of student work products provided by the Fundamentals course instructor and requested of other instructors from elective courses used by students to fulfill the certificate requirements. These assessment materials and results will be reviewed to determine the extent to which they properly assess the stated learning objectives, and if these objectives have been met for the students earning the certificate. Feedback from this review process will be provided to the course coordinators to improve the courses provided. Emphasis will be placed on modifying and improving the Fundamentals course required of all students to address desired learning outcomes and objectives in this course.

4. What direct and indirect measures will be used to assess student learning?

Direct measures of student learning will include class quizzes and exams, as well as individual and group projects or hands-on labs. Indirect measures will be taken through student participation at class time, attendance, and level of engagement. These measures of student learning will be directly aligned with the stated objectives and outcomes of this certificate in the Fundamentals course. Feedback from the certificate coordination leadership will be provided to course coordinators of various elective courses for this certificate on an annual basis, as described above.

5. When will assessment activities occur and at what frequency?

Continuous assessment will be performed during the course instruction, either through indirect measures, or through ongoing evaluations of the students (e.g. quizzes and tests) embedded in the courses. On an annual basis, the certificate coordination leadership will meet and review the assessment materials and measures as described above and provided to course coordinators to suggest modification and improvement of instruction. Specific recommendations to address any gaps or shortcomings in the certificate learning outcomes will be used to improve the Fundamentals course required of all students pursuing this certificate.

**Financial Impact**

This section must be completed if program component request section is completed

<table>
<thead>
<tr>
<th>Greater than $250,000 per FY:</th>
<th>Less than $250,000 per FY:</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brief Description of financial impact:</td>
<td>This effort is supported with current UI faculty and course offerings. The new course &quot;Fundamentals of Critical Infrastructure Resilience&quot; will be offered initially by the certificate coordinator Michael Haney, and subsequently supported by faculty associated with the Center for Secure and Dependable Systems. The CSDS includes faculty who are currently the course coordinators for the majority of elective classes currently being offered that meet the requirements of this certificate. We expect minimal financial impact.</td>
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</tbody>
</table>

**Distance Education Availability**
To comply with the requirements of the Idaho State Board of Education (SBOE) and the Northwest Commission on Colleges and Universities (NWCCU) the University of Idaho must declare whether 50% or more of the curricular requirements of a program may be completed via distance education. **If the program component is to be offered via distance education, additional or different formwork may be required.** Contact provost@uidaho.edu for assistance.

The U.S. Department of Education defines distance education as follows:

*Distance education means education that uses one or more of the technologies listed below to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and the instructor, either synchronously or asynchronously. The technologies may include:*

1. The internet;
2. One-way and two-way transmissions through open broadcast, closed circuit, cable, microwave, broadband lines, fiber optics, satellite, or wireless communications devices;
3. Audio conferencing; or
4. Video cassettes, DVDs, and CD-ROMs, if the cassettes, DVDs, or CD-ROMs are used in a course in conjunction with any of the technologies listed in paragraphs (1) through (3).

Can 50% or more of the curricular requirements of this program component be completed via distance education? | Yes | X | No
--- | --- | --- |

*If Yes, can 100% of the curricular requirements of this program component be completed via distance education? | Yes | X | No

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### Geographical Area Availability

This section must be completed if program component request section is completed

Identify the geographical area(s) this program component can be completed in:

<table>
<thead>
<tr>
<th>Location</th>
<th>X</th>
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<tbody>
<tr>
<td>Moscow</td>
<td></td>
</tr>
<tr>
<td>Coeur d'Alene</td>
<td></td>
</tr>
<tr>
<td>Boise*</td>
<td>X</td>
</tr>
<tr>
<td>Idaho Falls*</td>
<td></td>
</tr>
<tr>
<td>Other**</td>
<td>Location(s):</td>
</tr>
</tbody>
</table>

*Note: Programs offered in regions 3, 4, and/or 5 may require additional formwork from the State Board of Education. Contact the Office of the Provost and Executive Vice President for additional information.

**Note: If Other is selected identify the specific area(s) this program component will be offered.
Critical Infrastructure Resilience Certificate

Required (3 cr):
TM 504: “Fundamentals of Critical Infrastructure Resilience” cr arr

Electives Group 1 – choose 2 (6 cr):
TM 529 Risk Assessment 3 cr
CS 536 Advanced Information Assurance 3 cr
ECE 475/575: Resilient Control of Critical Infrastructure 3 cr
INDT 470: Homeland Security 3 cr
INDT 472: NIMS – National Incident Management System 3 cr
TM 516: Nuclear Rules and Regulations 3 cr

Electives Group 2 (3 cr):
CHE 445 Digital Process Control 3 cr
CS 452: Real Time Operating Systems 3 cr
ECE 340: Microcontrollers* 3 cr
ECE 443: Distributed Process and Control Networks 3 cr
ECE 444/544 Supervisory Control and Critical Infrastructure Systems 3 cr
ECE 477 Digital Process Control 3 cr
ECE 470 Control Systems 3 cr
INDT 333 Industrial Electronics and Control Systems* 3 cr
ME 481: Control Systems 3 cr
TM 514 Nuclear Safety 3 cr

Electives Group 3 (3 cr):
CS 438/538: Network Security 3 cr
CS 439/539: Applied Security Concepts 3 cr
CS 447/547: Computer and Network Forensics 3 cr

Note: courses marked (*) may or may not count towards a graduate credit, depending on the degree being sought.
Courses to total 15 credits