

851: WATER RESOURCES ENGINEERING GRADUATE CERTIFICATE

In Workflow

1. Curriculum Management Programs (janice.nave-abele@oregonstate.edu)
2. Catalog Coordinator (belinda.sykes@oregonstate.edu)
3. 16 Dean Designee (david.blunck@oregonstate.edu)
4. Provost Designee (alix.gitelman@oregonstate.edu)
5. BEE Head (adam.ward@oregonstate.edu)
6. Ecampus Programs (shannon.riggs@oregonstate.edu; ecampus.academicprograms@oregonstate.edu; kathryn.howard@oregonstate.edu)
7. Library Evaluation (ralpht@oregonstate.edu; jane.nichols@oregonstate.edu)
8. 14 Day Review (belinda.sykes@oregonstate.edu)
9. Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen@oregonstate.edu)
10. Graduate Assessment (kristin.nagycatz@oregonstate.edu)
11. 16 College Committee Approver (justin.wolford@oregonstate.edu)
12. Curriculum Management Programs (janice.nave-abele@oregonstate.edu)
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14. Budgets and Fiscal Planning Committee Chair (jeff.luck@oregonstate.edu)
15. Graduate Council Co-Chairs (john.becker-blease@bus.oregonstate.edu)
16. Curriculum Management Programs (janice.nave-abele@oregonstate.edu)
17. Curriculum Council Co-Chairs (iannie@oregonstate.edu; jim.coakley@oregonstate.edu)
18. Executive Committee (vickie.nunnemaker@oregonstate.edu)
19. Faculty Senate (vickie.nunnemaker@oregonstate.edu)
20. NWCCU (janice.nave-abele@oregonstate.edu)
21. Catalog Coordinator (belinda.sykes@oregonstate.edu)
22. Graduate Curriculum Tables (jared.thomas@oregonstate.edu; john.henry@oregonstate.edu)
23. Catalog Coordinator (belinda.sykes@oregonstate.edu)

Approval Path

1. Fri, 15 Sep 2023 21:05:31 GMT
Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele): Rollback to Initiator
2. Fri, 15 Sep 2023 21:29:45 GMT
Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele): Approved for Curriculum Management Programs
3. Thu, 28 Sep 2023 04:32:24 GMT
Belinda Sykes (Office of the Registrar, Catalog & Curriculum Coordinator) (belinda.sykes): Approved for Catalog Coordinator
4. Fri, 13 Oct 2023 05:56:03 GMT
David Blunck (College of Engineering, Associate Dean for Undergraduate Programs) (david.blunck): Approved for 16 Dean Designee
5. Fri, 13 Oct 2023 18:41:21 GMT
Alix Gitelman (Vice Provost for Academic Affairs) (alix.gitelman): Approved for Provost Designee
6. Mon, 06 Nov 2023 15:39:12 GMT
Adam Ward (Biological & Ecological Engineering, Department Head) (adam.ward): Approved for BEE Head
7. Thu, 07 Dec 2023 17:29:28 GMT
Kathryn Howard (Ecampus, Program Intake Coordinator) (kathryn.howard): Approved for Ecampus Programs
8. Tue, 19 Dec 2023 01:29:21 GMT
Jane Nichols (Libraries & Press, Head - Teaching & Engagement Department) (jane.nichols): Approved for Library Evaluation
9. Tue, 02 Jan 2024 10:27:13 GMT
Approved for 14 Day Review
10. Tue, 02 Jan 2024 22:02:00 GMT
Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen): Approved for chaplenf
11. Wed, 03 Jan 2024 16:21:52 GMT
Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz): Rollback to chaplenf for Graduate Assessment
12. Thu, 25 Jan 2024 17:17:58 GMT
Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen): Approved for chaplenf
13. Thu, 25 Jan 2024 17:39:10 GMT

- Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz): Rollback to chaplenf for Graduate Assessment
14. Thu, 25 Jan 2024 17:48:22 GMT
Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen): Approved for chaplenf
 15. Thu, 25 Jan 2024 17:51:50 GMT
Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz): Rollback to chaplenf for Graduate Assessment
 16. Thu, 25 Jan 2024 18:02:36 GMT
Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen): Approved for chaplenf
 17. Thu, 25 Jan 2024 18:06:33 GMT
Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz): Approved for Graduate Assessment
 18. Wed, 14 Feb 2024 22:40:27 GMT
Justin Wolford (School of Electrical Engineering & Computer Science, Senior Instructor I) (justin.wolford): Approved for 16 College Committee Approver
 19. Wed, 14 Feb 2024 22:50:05 GMT
Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele): Approved for Curriculum Management Programs
 20. Thu, 15 Feb 2024 00:54:55 GMT
Frank Chaplen (Biological & Ecological Engineering, Associate Professor) (frank.chaplen): Approved for chaplenf
 21. Thu, 29 Feb 2024 00:32:31 GMT
Jeffrey Luck (School of Social & Behavioral Health Sciences, Associate Professor, and Budgets & Fiscal Planning Committee Chair) (jeff.luck): Approved for Budgets and Fiscal Planning Committee Chair
 22. Thu, 07 Mar 2024 22:24:33 GMT
John Becker-Blease (College of Business, Associate Dean of Graduate Programs, and Graduate Council Chair) (john.becker-blease): Approved for Graduate Council Co-Chairs
 23. Fri, 08 Mar 2024 17:39:42 GMT
Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele): Approved for Curriculum Management Programs
 24. Thu, 14 Mar 2024 21:57:31 GMT
Jim Coakley (College of Business, Associate Professor and Curriculum Council Co-Chair) (jim.coakley): Approved for Curriculum Council Co-Chairs
 25. Tue, 02 Apr 2024 20:26:35 GMT
Vickie Nunnemaker (Faculty Senate, Special Assistant to the Faculty Senate President) (vickie.nunnemaker): Approved for Executive Committee

New Program Proposal

Date Submitted: Fri, 15 Sep 2023 21:13:24 GMT

Viewing : Water Resources Engineering Graduate Certificate

Last edit: Mon, 11 Mar 2024 18:58:20 GMT

Changes proposed by: chaplenf

Proposal

Effective Term

Fall 2024

Justification

Water Resources Engineering is a core strength at Oregon State University, with strength spanning multiple units. Training in Water Resources Engineering is a highly employable skill-set, with the Water Resources Graduate Program Director reporting more requests from employers than graduates on an annual basis. Moreover, graduate credentials are viewed positively in the field, leading to career advancement and contributing to continuing education requirements for professional licensure. OSU's forthcoming partnership with the Office of Personnel Management - Federal Academic Alliance programs lowers the bar for a cohort of water resource engineering professionals from several agencies (Bureau of Reclamation, USEPA, USACoE, USGS, USFS, and more) to participate in our program. Skills development including modeling of surface- and groundwater systems is a focus for the proposed electives, while proposed requirements ensure coverage of critical areas within the field (groundwater, hydraulics, hydrology, and water quality).

To build upon OSU's existing reputation in the Water Resources Engineering space, complement existing graduate offerings, and continue to build linkages amongst the several units who support water resources on campus, we are proposing to develop and offer an ECampus graduate certificate in Water Resources Engineering. This development leverages the existing ECampus strengths in natural resources, agriculture, and forestry while adding depth in engineering. The certificate will be administered by the Dept. of Biological & Ecological Engineering, working closely with the WRGP to ensure coordination of offerings, curriculum, and advertising to best serve a growing body of Water Resources Engineering students.

Primary Originator**Name**

Adam Ward (Biological & Ecological Engineering, Department Head)

Frank Chaplen (Biological & Ecological Engineering, Associate Professor)

Liaisons**Academic Unit**

College of Engineering - Graduate (ENGR, OP)

Biological & Ecological Engineering (BEE)

School of Civil & Construction Engineering (ARE, CE, CCE, CEM, EMGT)

School of Chemical, Biological & Environmental Engineering (BIOE, CBEE, CHE, ENVE)

Water Resources (WRE, WRP, WRS)

College of Earth, Ocean & Atmospheric Sciences - Graduate (ATS, GEO, GEOG, GPH, OC, OEAS)

College of Forestry

Fisheries, Wildlife & Conservation Sciences (FW)

Crop & Soil Science (CROP, CSS, SOIL)

Geography - Graduate (GEOG)

School of Mechanical, Industrial & Manufacturing Engineering (AAE, ESC, ESE, HEST, IE, MATS, ME, MFGE, MIME, ROB)

Forest Engineering, Resources & Management (FE, FOR)

Applied Economics (AEC)

College of Agricultural Sciences (AGRI, BRR, IAWS, SUS)

Environmental Sciences - Graduate (ENSC)

Forest Ecosystems & Society - Graduate (FES, MNR, SNR)

Program Information**Program Level**

Graduate

Program Type

Certificate

Name

Water Resources Engineering Graduate Certificate

CIP Code

140805 - Water Resources Engineering.

College

Engineering (16)

Academic Unit

Biological & Ecological Engineering

Is this program jointly administered?

No

Date the Early Alert was submitted for this proposal

04/22/2023

What degree types are available for this graduate or professional program?

Certificate

Campus Locations

Ecampus

Is this program currently or planned to be offered in hybrid format?

No

Will this program lead to professional licensure in any U.S. state or territory?

Yes

List the type of professional licensure/s

Professional Engineer - The program objectives are to provide a credential that will lead to career transition and advancement opportunities for engineering practitioners and also meet continuing engineering requirements for professional certifications.

Executive Summary**Executive Summary**

Water Resources Engineering (WRE) is a core strength at Oregon State University, with strength spanning multiple units. Training in WRE is a highly employable skill-set, with the Water Resources Graduate Program (WRGP) Director reporting more requests from employers than graduates on an annual basis. Skills development through completion of the graduate certificate will include modeling of surface- and groundwater systems with proposed requirements ensuring coverage of critical areas within the field (groundwater, hydraulics, hydrology, and water quality). This eCampus Graduate Certificate Program builds on OSU's existing reputation in WRE. The program will consist of Core (at least 12 credits) and Elective (at least 6 Credits) courses in WRE and related areas to a total of 18 credits. The certificate will be administered by the Dept. of Biological & Ecological Engineering, working closely with the WRGP to ensure coordination of offerings, curriculum, and advertising to best serve a growing body of WRE students.

HECC - Higher Education Coordinating Commission**Program Description****HECC Description**

Water Resources Engineering (WRE) is a core strength at Oregon State University, with strength spanning multiple units. Training in WRE is a highly employable skill-set, with the Water Resources Graduate Program (WRGP) Director reporting more requests from employers than graduates on an annual basis. Skills development through completion of the graduate certificate will include modeling of surface- and groundwater systems with proposed requirements ensuring coverage of critical areas within the field (groundwater, hydraulics, hydrology, and water quality). This eCampus Graduate Certificate Program builds on OSU's existing reputation in WRE. The program will consist of Core (at least 12 credits) and Elective (at least 6 Credits) courses in WRE and related areas to a total of 18 credits. The certificate will be administered by the Dept. of Biological & Ecological Engineering, working closely with the WRGP to ensure coordination of offerings, curriculum, and advertising to best serve a growing body of WRE students.

Brief overview of the proposed program, including its disciplinary foundations and connections; program objectives; programmatic focus; degree, certificate, minor, and concentrations offered

The proposed Graduate Certificate program leverages existing graduate programs at Oregon State University in Water Resources at the MS and PhD level and models itself on the Graduate Certificate in Water Conflict Management & Transformation in terms of structure and delivery format.

The program objectives are to provide a credential that will lead to career transition and advancement opportunities for engineering practitioners and also meet continuing engineering requirements for professional certifications.

The Certificate program will consists of 18 credits split between core (12 credits) and elective content (6 credits) in Water Resources Engineering and Water Resources Science, Economics, Policy and Management. Water Resources Engineering has roots in Agricultural Engineering, Environmental Engineering, and Civil Engineering. Many other disciplines also contribute to the knowledge base for the discipline.

Manner in which the program will be delivered, including program location (if offered outside of the main campus), course scheduling, and the use of technology (for both on-campus and off-campus delivery)

Delivered via Ecampus

Course Scheduling:

Most courses are offered once per year. Students from other programs can enroll in the courses as they see fit.

Technology Use:

Students have access to Microsoft Windows products including spreadsheet and word processing software.

Other software applications utilized through Canvas integration include: Peerceptiv, Turnitin, Google Docs, Google Jamboard, and Perusall.

Adequacy and quality of faculty delivering the program

7 well-qualified faculty and instructors will deliver the core elements of the programs (7 courses).

Adequacy of faculty resources – full-time, part-time, adjunct

Faculty and instructors are both full and part time. Available time is adequate and assumes overload teaching for five of seven core courses including during summer for faculty and instructors on 9 month appointments..

Other staff

A Director (0.2 FTE) and appropriate administrative support will be provided through the Dept. of Biological & Ecological Engineering

Adequacy of facilities, library, and other resources

Facilities, library, and other resources leverage off those in use for the Water Resources Graduate Programs. Faculty are in place and have office space. Other resources are lecture. There are no requirements for teaching laboratories.

Relationship to Mission and Goals**Manner in which the proposed program supports the institution's mission, signature areas of focus, and strategic priorities**

The Strategic Plan states that OSU "promotes economic, social, cultural and environmental progress for the people of Oregon, the nation and the world". Graduate certificates in the area of Water Resources Engineering will both allow the transition of engineers with the appropriate background in Civil, Environmental, and Ecological Engineering to more in depth activities consistent with the vision and values of the strategic plan. Water is perhaps the major issue of the 21st Century and Water Resource Engineers stand ready to contribute in terms of supply and reducing the environmental impacts of humankind on water quality as a consequence of societal discharges.

The program will produce skilled graduates and critical thinkers in the area of Water Resources Engineering that will contribute to the quality of life in communities statewide and speaks to all three signature areas of the institution's mission.

Manner in which the proposed program contributes to institutional and statewide goals for student access and diversity, quality learning, research, knowledge creation and innovation, and economic and cultural support of Oregon and its communities

The distance education format of this Graduate Certificate program allows students from any part of Oregon to more easily participate without interrupting employment or disrupting peer and family relationships.

Manner in which the program meets regional or statewide needs and enhances the state's capacity to:**Improve educational attainment in the region and state:**

Offering the certificate program online, asynchronously, allows students from any region across the nation or globally to access the curriculum. Furthermore, students located at the Corvallis and Bend campuses will have the option of taking additional electives during the year and more importantly during the summer when there are relatively few professional course offerings.

Respond effectively to social, economic, and environmental challenges and opportunities:

This program allows students to continue to advance their education, without disrupting their peer and family relationships or their careers, thus improving their chances of overall success. The flexibility of the program allows students the opportunity to continue to work, minimizing personal and family economic impacts. The online program means students are not using physical resources on the Oregon State University campus or engaging in increased travel to visit their home communities, reducing environmental impacts.

Address civic and cultural demands of citizenship

The curriculum of this program will engage students at a global level. Courses are offered in socio-technical aspects of Water resources Engineering. The water challenges facing all communities continue to grow. This program strives to create graduates who will not only be aware of those challenges but be prepared to address them.

Accreditation**Accrediting body or professional society that has established standards in the area in which the program lies, if applicable**

Not applicable.

Ability of the program to meet professional accreditation standards. If the program does not or cannot meet those standards, the proposal should identify the area(s) in which it is deficient and indicate steps needed to qualify the program for accreditation and date by which it would be expected to be fully accredited

Not applicable

If the proposed program is a graduate program in which the institution offers an undergraduate program, proposal should identify whether or not the undergraduate program is accredited and, if not, what would be required to qualify it for accreditation

Not applicable

If accreditation is a goal, the proposal should identify the steps being taken to achieve accreditation. If the program is not seeking accreditation, the proposal should indicate why it is not

Not applicable

Need

Anticipated fall term headcount, FTE enrollment, and expected degrees/certificates produced over each of the next five years

Year One:

Fall Term Headcount:

3

FTE Enrollment:

0

Expected Degrees/Certificates

5

Year Two:

Fall Term Headcount:

9

FTE Enrollment:

3

Expected Degrees/Certificates:

15

Year Three:

Fall Term Headcount:

15

FTE Enrollment:

9

Expected Degrees/Certificates

25

Year Four:

Fall Term Headcount:

21

FTE Enrollment:

15

Expected Degrees/Certificates

35

Year Five:

Fall Term Headcount:

24

FTE Enrollment:

21

Expected Degrees/Certificates

40

Characteristics of students to be served (resident/nonresident/international; traditional/ nontraditional; full-time/part-time, etc.)

Oregon residents, out-of-state students, on campus students who complete classes as electives, international students. Many students will be non-traditional students who have employment or family obligations that make the online format optimal.

Evidence of market demand

E-campus and Carley Reis did market research that supported creation of this Grad Cert and led to the approval of the E-campus MOU (Attached as supporting documentation)

If the program's location is shared with another similar Oregon public university program, the proposal should provide externally validated evidence of need (e.g., surveys, focus groups, documented requests, occupational/employment statistics and forecasts)

Not applicable

Estimate the prospects for success of program graduates (employment or graduate school) and consideration of licensure, if appropriate. What are the expected career paths for students in this program?

Training in Water Resources Engineering is a highly employable skill set, with the demand from employers exceeding the supply of graduates on an annual basis. Graduate credentials are viewed positively in the field, leading to career advancement and contributing to continuing education requirements for professional licensure. OSU's forthcoming partnership with the Office of Personnel Management - Federal Academic Alliance programs lowers the bar for a cohort of water resource engineering professionals from several agencies (Bureau of Reclamation, USEPA, USACoE, USGS, USFS, and more) to participate in our program. Skills development

including modeling of surface- and groundwater systems is a focus for the proposed electives, while proposed requirements ensure coverage of critical areas within the field (groundwater, hydraulics, hydrology, and water quality).

Outcomes and Quality Assessment

Expected learning outcomes of the program

1. Develop and utilize hydrological models of watersheds;
2. Identify key sociotechnical aspects of water resource problems;
3. Apply design concepts and open channel models to rivers and irrigation systems;
4. Characterize water and wastewater flows through modeling and measurement;
5. Analyze the physical, environmental, and sociopolitical aspects of water resources engineering problems;
6. Develop holistic engineering approaches to resolving complex engineering problems in water resources.

Methods by which the learning outcomes will be assessed and used to improve curriculum and instruction

Learning outcomes will be mapped to each core course in the program, student outcomes will be developed and assessed directly using standard pedagogical approaches. Yearly analysis of measurements by the Program Director will be used to suggest course and programmatic changes to better meet the needs of students and potential employers. Employers will be surveyed three years after the initial cohort and every 5 years following to determine the success of the program and provide important feedback for program improvement. This approach parallels the tracking, assessment, and commitment to continuous improvement that our unit implements to maintain our ABET accreditation and track outcomes at the undergraduate level, making for an efficient approach that is already engrained in our unit culture and management.

Nature and level of research and/or scholarly work expected of program faculty; indicators of success in those areas

Tenure line faculty with research appointments will be expected to produce 2-3 journal quality products each year along with normal scholarly activities such as advising students, providing research service to their communities etc. The level of activity will be consistent with Position Descriptions and indicators of success will be identified and assessed by faculty supervisors. Both Tenure and Instructor line faculty will be expected to maintain familiarity with cutting-edge pedagogical advancements for course improvement consistent with program outcomes assessment and feedback from the Director.

Program Integration and Collaboration

Closely related programs in this or other Oregon colleges and universities

The Water Resources Graduate Programs at SOU provide a framework and context for delivery of the Graduate Certificate in Water Resources Engineering. These programs are unique to Oregon State University in Oregon.

Ways in which the program complements other similar programs in other Oregon institutions and other related programs at this institution. Proposal should identify the potential for collaboration

Not Applicable

If applicable, proposal should state why this program may not be collaborating with existing similar programs

Not Applicable

Potential impacts on other programs

The Graduate Certificate will enhance enrollments for electives for students in the Water Resources Graduate Programs and increase the richness of available course offerings for those in MS, PhD and related certificate programs in Water Resources.

Graduate Learning Outcomes (GLOs) for Graduate Students

Will this program fulfill more than one learning outcome?

No

Conduct research or produce some other form of creative work

List the measures or instruments used to assess each outcome. How do students demonstrate their attainment of the learning outcome? How is their learning evaluated? At least one of these must be a direct measure. In order to explore trends in the data, we advise that assessment method remain consistent from year-to-year

Not applicable

Has this assessment method changed since the last reporting cycle?

No

What benchmark or milestone - related to the specific measure or instrument - is used to determine whether the outcome has been satisfactorily met by the students? In order to explore trends in the data, we advise that benchmarks remain consistent from year-to-year

Not applicable

Describe any changes to the benchmark or milestone since the last reporting cycle

Not applicable

Describe the data collection process (e.g., Who is involved? How is the data collected?)

Not applicable

What do the data show about student learning relative to the specific learning outcome? Describe any result, pattern, or trends that you identify as meaningful or that highlights an area(s) of concern or success

Not applicable

Describe any course-level (content, pedagogical, structural, etc.) changes that are an outgrowth of the current year's assessment of this outcome. Include timelines

Not applicable

Describe any program or degree-level changes that are an outgrowth of the current year's assessment of this outcome. Include timeline

Not applicable

If this learning outcome has been assessed previously and is being reported on again this year, what impact have the changes had (if any) on student learning? If you have not previously assessed this learning outcome, indicate the year you will revisit this outcome

Not applicable

Demonstrate mastery of subject material

List the measures or instruments used to assess each outcome. How do students demonstrate their attainment of the learning outcome? How is their learning evaluated? At least one of these must be a direct measure. In order to explore trends in the data, we advise that assessment method remain consistent from year-to-year

Exams, homeworks, papers, in class activities

Has this assessment method changed since the last reporting cycle?

No

What benchmark or milestone - related to the specific measure or instrument - is used to determine whether the outcome has been satisfactorily met by the students? In order to explore trends in the data, we advise that benchmarks remain consistent from year-to-year

Course learning outcomes (CLOs) will be developed for each required course and mapped to the Program Learning Outcome (PLOs). CLOs will be quantitatively assessed using standard pedagogical measurements. The benchmark will be 75% of students achieving a score of 85% for assessments associated with each CLO and by extension each PLO

Describe any changes to the benchmark or milestone since the last reporting cycle

New Program. Not applicable

Describe the data collection process (e.g., Who is involved? How is the data collected?)

New Program. Not applicable

What do the data show about student learning relative to the specific learning outcome? Describe any result, pattern, or trends that you identify as meaningful or that highlights an area(s) of concern or success

New Program. Not applicable

Describe any course-level (content, pedagogical, structural, etc.) changes that are an outgrowth of the current year's assessment of this outcome. Include timelines

New Program. Not applicable

Describe any program or degree-level changes that are an outgrowth of the current year's assessment of this outcome. Include timeline

New Program. Not applicable

If this learning outcome has been assessed previously and is being reported on again this year, what impact have the changes had (if any) on student learning? If you have not previously assessed this learning outcome, indicate the year you will revisit this outcome

New Program. Not applicable

Conduct scholarly or professional activities in an ethical manner

List the measures or instruments used to assess each outcome. How do students demonstrate their attainment of the learning outcome? How is their learning evaluated? At least one of these must be a direct measure. In order to explore trends in the data, we advise that assessment method remain consistent from year-to-year

Exams, homeworks, papers, in class activities

Has this assessment method changed since the last reporting cycle?

No

What benchmark or milestone - related to the specific measure or instrument - is used to determine whether the outcome has been satisfactorily met by the students? In order to explore trends in the data, we advise that benchmarks remain consistent from year-to-year

New Program. Not applicable

Describe any changes to the benchmark or milestone since the last reporting cycle

New Program. Not applicable

Describe the data collection process (e.g., Who is involved? How is the data collected?)

New Program. Not applicable

What do the data show about student learning relative to the specific learning outcome? Describe any result, pattern, or trends that you identify as meaningful or that highlights an area(s) of concern or success

New Program. Not applicable

Describe any course-level (content, pedagogical, structural, etc.) changes that are an outgrowth of the current year's assessment of this outcome. Include timelines

New Program. Not applicable

Describe any program or degree-level changes that are an outgrowth of the current year's assessment of this outcome. Include timeline

New Program. Not applicable

If this learning outcome has been assessed previously and is being reported on again this year, what impact have the changes had (if any) on student learning? If you have not previously assessed this learning outcome, indicate the year you will revisit this outcome

New Program. Not applicable

Process

Describe the process the program used to reflect on the outcome data

Learning outcomes will be mapped to each core course in the program, student outcomes will be developed and assessed directly using standard pedagogical approaches. Yearly analysis of measurements by the Program Director will be used to suggest course and programmatic changes to better meet the needs of students and potential employers. Employers will be surveyed three years after the initial cohort and every 5 years following to determine the success of the program and provide important feedback for program improvement.

Were there any challenges or concerns?

New Program. Not applicable.

How are the results of your assessment effort related to strategic planning and overall program review?

New Program. Not applicable.

Are there specific data archiving notes for the outcome(s) you are reporting on in this report?

New Program. Not applicable.

Plans

Describe the unit's (or sub-units) assessment plans for the upcoming year

Program will be implemented in AY 2024-2025. Not applicable

Information for the Catalog

How many total credits are required for completion of this program?

18

Catalog Description (this will display on the Overview tab in the Catalog)

A graduate Certificate in Water Resources Engineering is offered with specialization in groundwater engineering, hydraulics, hydrology, and water quality. Courses in water resources engineering are offered by the Water Resources Graduate Program and other programs across Oregon State University. The graduate certificate is structured around courses designed to broaden the student's education in one of the above areas of concentration. University departments and schools that offer courses related to water resources engineering include the departments of Biological & Ecological Engineering; Crop & Soil Science; Forest Ecosystems & Society; Forest Engineering, Resources & Management; the School of Chemical, Biological & Environmental Engineering; the School of Civil & Construction Engineering; and the College of Earth, Ocean & Atmospheric Sciences. About 20 departments conduct teaching or research programs in water resources.

Requirements (this will display on the Requirements tab in the Catalog and be coded into MyDegrees)

Code	Title	Credits
Required Core		
BEE 512	PHYSICAL HYDROLOGY	3
WRP 524	SOCIOTECHNOLOGICAL ASPECTS OF WATER RESOURCES	3
CE 544	OPEN CHANNEL FLOW	3
ENVE 599	SPECIAL TOPICS (Water & Wastewater Characterization)	3
Engineering Electives		
Select a minimum of 3 credits from the following courses:		3
BEE 514/CE 514/GEO 514	GROUNDWATER HYDRAULICS	
BEE 546	RIVER ENGINEERING	
BEE 599	SPECIAL TOPICS	
ENVE 518	GROUNDWATER MODELING	
Science, Economics, Policy, and Management Electives		
Select a minimum of 3 credits from the following courses:		3
AEC 556	SUSTAINABLE AGRICULTURAL DEVELOPMENT	
BEE 511	GLOBAL ENVIRONMENTAL CHANGE: USING DATA TO INFORM DECISIONS	
CROP 514	PRECISION AGRICULTURE	
FES 545	ECOLOGICAL RESTORATION	
FES 560	GREEN INFRASTRUCTURE	
FW 537	STRUCTURED DECISION MAKING IN NATURAL RESOURCE MANAGEMENT	
FW 556	FRESHWATER ECOLOGY AND CONSERVATION	
FW 562	ECOSYSTEM SERVICES	
FW 573	FISH ECOLOGY	
FW 579	WETLANDS AND RIPARIAN ECOLOGY	
FW 597	AQUACULTURE	
GEOG 540	CONFLICT, COOPERATION, AND CONTROL OF WATER IN THE US	
GEOG 541	THE WORLD'S WATER	
GEOG 551	PLANNING PRINCIPLES AND PRACTICES FOR RESILIENT COMMUNITIES	
GEOG 560	GISCIENCE I: INTRODUCTION TO GEOGRAPHIC INFORMATION SCIENCE	
GEOG 561	GISCIENCE II: ANALYSIS AND APPLICATIONS	
GEOG 562	PROGRAMMING FOR GEOSPATIAL ANALYSIS	
GEOG 580	REMOTE SENSING I: PRINCIPLES AND APPLICATIONS	
HES 562	SYSTEM DYNAMICS MODELING FOR HUMANITARIAN ENGINEERING	
SNR 520	SOCIAL ASPECTS OF SUSTAINABLE NATURAL RESOURCES	
SNR 521	ECONOMICS OF SUSTAINABLE NATURAL RESOURCE MANAGEMENT	
SNR 530	ECOLOGICAL PRINCIPLES OF SUSTAINABLE NATURAL RESOURCES	
SNR 535	SUSTAINABLE MANAGEMENT OF AQUATIC AND RIPARIAN RESOURCES	
SNR 540	GLOBAL ENVIRONMENTAL CHANGE	
SOIL 545	ENVIRONMENTAL SOIL CHEMISTRY	
SOIL 555	BIOLOGY OF SOIL ECOSYSTEMS	
WRP 521	WATER CONFLICT MANAGEMENT AND TRANSFORMATION	
WRP 523	ENVIRONMENTAL WATER TRANSACTIONS	
Total Credits		18

Letters of Support**External Letters of Support**

OSU Support Letter Wright.pdf

Accessibility Form**Accessibility Guidelines**

I have reviewed the listed documents

Faculty Guidelines

I have reviewed the listed documents

Information Technology Guidelines

I have reviewed the listed documents

By submitting this form, we affirm that we have reviewed the listed documents and will apply a good faith effort to ensure accessibility in curricular design, delivery, and supporting information.

Library Evaluation**Will this program require the creation of new courses?**

Yes

Provide peer comparator review

No peer comparators. The E-campus Water Resources Engineering Grad Cert is first of its kind.

Provide projected faculty and student FTE for your program

No additional faculty or students relative to existing.

Provide detail about any special research areas of interest

This is a graduate certificate for professionals. There will be no additional research associated with this qualification.

Library Evaluation (to be completed by Librarian)

Category_I_Library_Assessment_WRE_Grad_Certificate.pdf

Administrative Template (Library Use Only)**Summary of Recommendations**

The monographic collection appears to be adequate to support the proposed program. The library general collection houses over 7,000 books related to the subjects: water resources, water engineering, engineering – water, water resources engineering, ecological engineering, biological engineering, hydrology, water quality, and water resources science. The library also provides access to over 8,000 ebooks and over 400 ejournals related to the same subjects. OSULP subscribes to streaming video resources, including Kanopy's smart PDA program, which provides researchers access to 30,000 films.

The journal collection is currently adequate to support the proposed program. The library provides access to over 400 ejournals related to the subjects: water resources, water engineering, engineering – water, water resources engineering, ecological engineering, biological engineering, hydrology, water quality, and water resources science.

There are two high impact journal subscription for the program that may be relevant. However, OSULP provides access to Interlibrary Loan services that may fulfill access needs. Future subscription purchases can be considered if deemed necessary for the program.

Print and Electronic Monographs

Library evaluations of proposed programs have traditionally included the analysis of OSULP's print monograph collection. However, as this is an online certificate program, the print monograph collection may not be as relevant as resources that are available electronically. For print materials that are relevant, students and faculty may request those materials through OSULP's scan and deliver and mailing services.

Media

N/A

Serials/Journals

OSULP maintains an adequate collection of journals appropriate for this proposed program. There is concern that with regular price increases to our licenses and a flat budget that access may be eroded over time. The OSULP already have sacrificed timely access to some titles in favor of an embargo period to cut costs (we do not have immediate full-text access to the most current 12–18-months). A list of key journals for this program was developed using the "Engineering - Water Resource" subject category in the Journal Citation Report (JCR). This produced a list of 103 journals (see Appendix A). The list includes those titles that we have current access to, those with embargoes, and those not owned by the OSULP.

OSU Libraries has current subscriptions to 54 of these titles, and 9 are fully open access (62%), and we have delayed (1-2 year embargo) access to an additional 3 titles. Fifteen additional journals allow for expedited access via our Article Delivery Service. Of the high-impact journals (impact factor ≥ 5), the library has current access to all but 8 of the 17 journals. There are 2 highly relevant journals that are recommended for new subscriptions. If current access is needed beyond the expedited service of the Article Delivery Service, 6 additional journals are recommended and will need to be funded (see appendix A).

In addition to the recommended new subscriptions, the library will monitor usage of inter-library loan (ILL) for titles under embargo and those with no access to determine whether usage justifies the acquisition of additional journals. Many of the high impact journals in this area are published by Elsevier (see Appendix A). Last year, the library paused negotiations with Elsevier and is

currently in the process of re-entering negotiations for current access to content. During this pause the library invested in an Article Delivery Service that allows pay-per-view access to all Elsevier content. This service is expedited, and usually delivers the requested article within an hour. Interlibrary loan services are also available. These services should allow for adequate access to cover most major journals for this research area. The library assumes the cost for all articles requested via interlibrary loan and those purchased through the Article Delivery Service.

Recommended New Journals

Wiley Water Interdisciplinary Reviews (Wiley), 2049-1948: \$2,006

Exposure and Health (Springer), 2451-9685: \$1,002

If current access (beyond expedited access) is required:

Water Research (Elsevier), 1879-2448: \$15,772

Desalination (Elsevier), 1873-4464: \$12,679

Journal of Water Process Engineering (Elsevier), 2214-7144: \$1,148

Journal of Hydrology (Elsevier), 1879-2707: \$17,768

Catena (Elsevier), 1872-6887: \$4,930

International Journal of Risk Reduction (Elsevier), 2212-4209: \$1,470

Recommended New Databases

After comparing our holdings to regional peer institutions Utah State University and Washington State University, as well as Arizona State University, Purdue University, and Texas AM University, we determined that OSULP subscribes to the same databases. No additional databases are needed at this time.

Recommended Book/Ebook Expenditures

The growing availability of e-books makes it possible to expedite access to more information from various locations. Students are able to access the books from their computer or mobile device at any time. The library currently has over 8,000 ebooks in Water Resource Engineering.

OSU is well served by the OSULP investment in the Orbis/Cascades Alliance, whose combined collection is substantial. Students and faculty can order from the collections of all the libraries in the Orbis Cascade Alliance through the Summit catalog. University of Oregon, Portland State University, University of Washington and Washington State University are some of the larger research libraries represented in the Summit catalog. Books requested through Summit are delivered to students within three to five to seven working days.

Indexes and Databases

The core indexes to the relevant information for this program are listed in the attachment. OSULP maintains access to all as these are core to many of OSU's primary research areas. In addition, OSULP maintains linking to Google Scholar which enables students and instructors to both discover relevant literature and to connect to its full-text (where OSULP has a subscription).

Library Services

Library faculty help students develop information literacy skills—the ability to locate, evaluate, and use information effectively—and help students understand their lifelong roles and responsibilities as both consumers and creators in the information ecosystem. More information on library instruction is available at <https://library.oregonstate.edu/instruction-services>.

The Library Liaison for Biological and Ecological Engineering is Adam Lindsley. Liaisons are library faculty members that monitor the strategic directions and priorities of college and programs, and are a conduit to the expertise and services of the OSU Libraries. That expertise is shared through research guides such as this one for BEE, one on one consultations and workshops, created especially for Graduate Students, such as those listed here.

Ecampus programs are also supported by the Ecampus librarian, Zach Welhouse, who supports instructors and students in the use of library resources and services, including custom research guides and webinars on demand. See the Ecampus Library Services guide at <https://guides.library.oregonstate.edu/c.php?g=285892p=1906544> for more information.

The OSULP Collection Council maintains the libraries' collections. Providing access to items not owned by OSULP is the domain of the Interlibrary Loan and Summit staff both at OSULP and at lending libraries. Print articles located in the OSU Libraries collections may be requested via the Scan and Deliver service, which provides PDFs of the requested articles. Additional services for students include the physical attributes of the libraries including excellent computer facilities, study areas for individual and group work, and practice rooms for students.

Faculty CVs

I will provide individual CVs if requested by Faculty Senate Curriculum Council

Acknowledge

Enter faculty below: (click the green plus button to add faculty members)

Faculty Name	Academic Home	Highest Degree	Position Title	Area of Expertise/ Interest	Role Within Program
Adam Ward	Biological & Ecological Engineering	PhD	Department Head	Water Resources Engineering	Instructor
Desiree Tullos	Biological & Ecological Engineering	PhD	Professor	River Restoration	Instructor
Mary Santelmann	Geosciences	PhD	Professor	Water Policy	Instructor
Stephen Good	Biological & Ecological Engineering	PhD	Associate Professor	Ecohydrology	Instructor
Tala Navid-Daneshmand	Chemical, Biological, and Environmental Engineering	PhD	Associate Professor	Environmental Engineering	Instructor
Dorthe Wildenschild	Chemical, Biological, and Environmental Engineering	PhD	Professor	Environmental Engineering	Instructor

Budget Information

Budget Worksheet and Narrative

Budget Authorization WRE Grad Cert Marcum Fall 2023.pdf

WRE_Budget_Narrative.docx

WaterResourcesEngineering.xlsx

Supporting Documentation

2023-06-01_Signed_MOU CoEng Water Resources Engineering grad cert final 5-30-23.pdf

Reviewer Comments

Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele) (Fri, 15 Sep 2023 21:05:31 GMT): Rollback: Made updates per email communication. Please review and resubmit when you are ready.

Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele) (Fri, 15 Sep 2023 22:00:22 GMT): Unit has an MOU to deliver the program via Ecampus. Core courses to be taught via Ecampus in development.

Adam Ward (Biological Ecological Engineering, Department Head) (adam.ward) (Fri, 03 Nov 2023 19:40:33 GMT): Approve

Kathryn Howard (Ecampus, Program Intake Coordinator) (kathryn.howard) (Thu, 07 Dec 2023 17:28:48 GMT): Approve for Ecampus.

Jeff Reimer (Applied Economics, Professor) (jeff.reimer) (Tue, 19 Dec 2023 02:43:14 GMT): Support

Tjodie Richardson (Applied Economics, Head Advisor) (tjrichardson) (Tue, 19 Dec 2023 16:38:56 GMT): No objections.

Adam Kent (College of Earth, Ocean, Atmospheric Sciences, Professor) (adam.kent) (Tue, 19 Dec 2023 18:44:48 GMT): No objections

Stefan Seiter (Crop Soil Sciences, Senior Instructor I) (stefan.seiter) (Wed, 20 Dec 2023 01:21:54 GMT): No concerns

Joseph Fradella III (School of Civil Construction Engineering, Senior Instructor I) (joe.fradella) (Wed, 20 Dec 2023 18:36:51 GMT): no objections

John Bailey (Forest Engineering, Resources Management, Professor) (john.bailey) (Thu, 21 Dec 2023 22:21:31 GMT): Please consider adding BEE/FE 545 to the engineering electives... a good class offered every other year.

Mark Needham (Forest Ecosystems Society, Professor) (mark.needham) (Fri, 22 Dec 2023 00:37:39 GMT): No concerns as the liaison for Forest Ecosystems & Society - Graduate (FES).

Thomas Chastain (Crop Soil Science, Professor) (thomas.chastain) (Sat, 23 Dec 2023 02:48:32 GMT): CSS supports

Amy Riley (College of Forestry, Director of Student Success) (amy.riley) (Wed, 27 Dec 2023 19:06:01 GMT): No concerns

Jack Istok (School of Civil Construction Engineering, School Head) (jack.istok) (Fri, 29 Dec 2023 17:01:41 GMT): Ok for cce

Stephen Good (Biological Ecological Engineering, Assistant Professor, and Director - Water Resources Program) (stephen.good) (Wed, 03 Jan 2024 01:01:25 GMT): No concerns from WRGP.

Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz) (Wed, 03 Jan 2024 16:21:52 GMT): Rollback: You need to re-write both of your learning outcomes. We need more measurable and specific bloom's verbs than understand. I will send you an email with the bloom's handout. Also, curriculum mapping is not a way to assess learning. You need to identify student work products in the core sequence that you can use to measure student learning.

Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz) (Thu, 25 Jan 2024 17:39:10 GMT): Rollback: For the demonstrate mastery of subject material GLO, the program has listed "Achievement by 75% of students of a B grade or better in each course" as the benchmark. Using course grades is not a direct measure of student learning. Need to use grades from the items listed as measures. Course grades have other things like attendance and participation factored into them.

Kristin Nagy Catz (OSU Director of Assessment) (kristin.nagycatz) (Thu, 25 Jan 2024 17:51:50 GMT): Rollback: Same reason as previously stated. See email.

Steph Bernell (Graduate School, Associate Dean) (steph.bernell) (Thu, 01 Feb 2024 01:44:45 GMT): please make sure to work with Kristin Nagy Katz on Learning Outcome Assessment.

Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele) (Wed, 14 Feb 2024 22:49:51 GMT): Notified originator and asked him to reply to John Bailey's comment regarding BEE/FE 545.

Frank Chaplen (Biological Ecological Engineering, Associate Professor) (frank.chaplen) (Thu, 15 Feb 2024 00:54:30 GMT): Response to John Bailey's liaison - The subject matter of BEE/FE 545 is appropriate for inclusion. However, at this time BEE has no plans to develop an ECampus version of this course, and to our knowledge it is not currently offered by FE in that modality (based on searching ECampus course offerings). We would welcome the FE faculty to develop and offer this course and would readily include it as soon as it is offered in an ECampus modality.

Jeffrey Luck (School of Social Behavioral Health Sciences, Associate Professor, and Budgets Fiscal Planning Committee Chair) (jeff.luck) (Thu, 29 Feb 2024 00:15:47 GMT): Proposal discussed and approved by BFPC on 20 Feb. Budget proposal was very thorough.

Janice Nave-Abele (Curriculum Management, Curriculum Coordinator) (janice.nave-abele) (Fri, 08 Mar 2024 17:39:04 GMT): Kristin Nagy Catz approved proposal and accepted PLOs on January 11, 2024 (see step 11 in Approval Path).

Cassandra Siler (Chemistry, Instructor) (cassandra.siler) (Tue, 12 Mar 2024 20:05:50 GMT): I approve. I would like to note that course re-development through E-Campus is encouraged every 3-5 years. While E-Campus supports this monetarily, you should plan out when this will happen and on faculty time required to do so. The proposed budget is maybe too short of a timeline to need to have this included, but you should have that on your radar.

Key: 851