



# Engineering B.S.E.

Data Reports | 2018-2021

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## I. Program Outcomes

#	Program Outcome
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3	An ability to communicate effectively with a range of audiences.
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
8	An ability to apply Christian principles of stewardship

## II. Artifact Descriptions and Program Alignment

1. **Artifact: EGR 330 Control Systems Mini Project**  
Students design a control system using theory and computer tools, develop a test plan, then build and test their design.  
Student Outcome 1.1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. **Artifact: EGR 499 Senior Project Report.**  
Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design.  
Student Outcome 1.2: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
3. **Artifact: CMPE 340 Digital Systems Mini Project**  
This mini project is to design and implement a vending machine mechanism using a digital circuit with integrated logic chips. The project is a perfect combination of mathematical theory and hands on implementation.  
Student Outcome 1.3: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
4. **Artifact: ME 381 Principles of Design Exam**  
Students must solve complex problems involving the analysis and design of machine components based on the stresses and strains induced by static, dynamic and thermal loads, while also avoiding failure due to impact, fatigue, wear, and surface damage.  
Student Outcome 1.4: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
5. **Artifact: EGR 498 Design Process Paper**  
Students must describe the design process, and identify key issues in a variety of scenarios.  
Student Outcome 2.1: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
6. **Artifact: EGR 499 Senior Project Report**  
Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design.

Student Outcome 2.2: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

7. Artifact: EGR 101 Stewardship Essay

Students express your understanding of Christian stewardship and its relationship to the field of engineering. This includes a discussion of personal stewardship in addition to corporate stewardship over global resources, for example. They also relate why they chose engineering as their major, and how stewardship and engineering relate to evangelism, missions, and scientifically informed apologetics.

Student Outcome 3.1: An ability to communicate effectively with a range of audiences.

8. Artifact: EGR 461 Economics Paper

Students research topics involving an economic impact and write a formal paper.

Student Outcome 3.2: An ability to communicate effectively with a range of audiences.

9. Artifact: EGR 499 Senior Project Oral Presentation

Students present their senior projects to the department in the Engineering Seminar, which involves all students and faculty in the school. They are assessed on the quality of their presentation.

Student Outcome 3.3: An ability to communicate effectively with a range of audiences.

10. Artifact: EGR 499 Senior Project Report

Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design. Student Outcome 3.4: An ability to communicate effectively with a range of audiences.

11. Artifact: EGR 101 Stewardship Essay

Student Outcome 4.1: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

12. Artifact: EGR 461 Economics Paper

Students research topics involving an economic impact and write a formal paper.

Student Outcome 4.2: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

13. Artifact: EGR 498 Ethics Quiz

Students study the NSPE code of ethics, identify key parts of the code, and discuss how they would handle a variety of scenarios, and how the NSPE code would advise their actions.

Student Outcome 4.3: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

14. Artifact: EGR 499 Senior Project Report

Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design.

Student Outcome 5: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

15. Artifact: EGR 252 MATLAB Programming Project

The Scheduling for Library Help Desk project is to develop the modular program using MATLAB computer language to schedule student workers duty for reference help desk at ORU library. Students develop experience in specifying and designing a solution to an engineering problem during the course EGR 252—Engineering Computational Methods using the software tool Matlab.

Student Outcome 6.1: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

16. Artifact: ME 381 Principles of Design Lab

Students must formulate, design and conduct experiments to explore and quantify the parameters associated with a high-quality interference fit between mechanical components.

Student Outcome 6.2: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

17. Artifact: ME 444 Experimental Methods Experiment

There are eight labs over the course that incorporate all of the elements as described in student outcome 6.3 and where each requires a complete lab report.

Student Outcome 6.3: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

18. Artifact: EGR 499 Senior Design Project Report  
Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design.  
Student Outcome 6.4: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
  
19. Artifact: EGR 101 Stewardship Essay  
Students express your understanding of Christian stewardship and its relationship to the field of engineering. This includes a discussion of personal stewardship in addition to corporate stewardship over global resources, for example. They also relate why they chose engineering as their major, and how stewardship and engineering relate to evangelism, missions, and scientifically informed apologetics.  
Student Outcome 7.1: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
  
20. Artifact: EGR 461 Economics Paper  
Students research topics involving an economic impact and write a formal paper.  
Student Outcome 7.2: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
  
21. Artifact: EGR 498 Senior Project Research Paper  
A paper written by each design team that includes the background research for their project. Students must include at least one patent.  
Student Outcome 7.3: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
  
22. Artifact: EGR 499 Senior Project Report  
Final report on senior projects. Students must address engineering standards, realistic design constraints, teaming, testing and project management in addition to reporting on their design.  
Student Outcome 7.4: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
  
23. Artifact: EGR 101 Stewardship Essay  
Students express your understanding of Christian stewardship and its relationship to the field of engineering. This includes a discussion of personal stewardship in addition to corporate stewardship over global resources, for example. They also relate why they chose engineering as their major, and how stewardship and engineering relate to evangelism, missions, and scientifically informed apologetics.  
Student Outcome 8.1: An ability to apply Christian principles of stewardship.

24. Artifact: EGR 461 Economics Paper

Students research topics involving an economic impact and write a formal paper.

Student Outcome 8.2: An ability to apply Christian principles of stewardship.

## III. Primary Evidence

### A. Program Outcomes – by criterion levels

Outcome	2018-19	2019-20	2020-2021
1.1.1	-	-	3.55
1.1.2	-	-	3.70
1.1.3	-	-	3.30
1.1.4	-	-	3.35
1.1.5	-	-	3.40
1.2	3.33	3.5	-
1.3.1	4.00	3.58	-
1.3.2	3.86	3.67	-
1.3.3	3.43	3.92	-
1.4.1	2.85	3.92	-
1.4.2	-	-	-
1.4.3	2.62	4.00	-
2.1	3.58	2.82	3.33
2.2.1	3.22	3.60	-
2.2.2	3.00	4.00	-
2.2.3	4.00	3.90	-
2.2.4	3.22	4.00	-
2.2.5	3.78	4.00	-
2.2.6	3.22	3.70	-
3.1.1	3.94	3.19	4.00
3.1.2	2.65	3.90	3.57
3.1.3	3.96	2.81	3.43
3.2.1	4.00	4.00	3.84
3.2.2	3.05	3.53	3.68
3.2.3	4.00	4.00	3.89
3.3.1	3.65	3.90	-
3.3.2	3.42	3.60	-
3.3.3	3.85	4.00	-
3.3.4	3.73	3.70	-
3.4.1	3.67	3.90	-
3.4.2	3.56	4.00	-
3.4.3	3.44	4.00	-
3.4.4	3.00	3.90	-
3.4.5	4.00	3.50	-
3.4.6	-	3.70	-
4.1	2.83	3.17	3.02
4.2.1	3.05	2.87	3.37
4.2.2	3.62	3.41	3.81



Outcome	2018-19	2019-20	2020-2021
4.3.1	3.82	3.71	3.72
4.3.2	3.53	3.90	3.61
4.3.3	3.12	3.48	2.83
5	3.44	4.00	-
6.1	3.64	2.20	2.88
6.2.1	3.53	4.00	-
6.2.2	3.27	4.00	-
6.2.3	3.07	4.00	-
6.2.4	3.27	4.00	-
6.3.1	1.90	1.40	-
6.3.2	1.80	1.30	-
6.3.3	1.80	1.30	-
6.4.1	3.13	3.00	-
6.4.2	3.38	3.37	-
6.4.3	3.63	3.74	-
6.4.4	3.25	3.68	-
7.1	3.35	2.52	3.27
7.2	3.24	3.19	3.21
7.3	3.10	3.80	3.17
7.4	3.33	4.00	-
8.1.1	3.44	3.67	3.7
8.1.2	3.25	2.48	3.2
8.2.1	3.95	3.97	3.89
8.2.2	3.52	3.94	3.58

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

## B. Artifact Outcomes

Artifact Outcomes	2018 - 2019		2019 - 2020		2020 - 2021	
	n	score	n	score	n	score
WPA-EGR-101 Introduction to Engineering Stewardship Essay	18	3.40	25	2.99	20	3.56
WPA-EGR-222 Exam	13	2.71	-	-	-	-
WPA-EGR-340 Digital Systems Mini Project	-	-	-	-	-	-
WPA-EGR-Control Systems Exam	19	3.62	21	3.57	-	-
WPA-EGR-Design Process Paper	3	3.67	7	3.00	-	-
WPA-EGR-Economics Paper	12	3.31	14	3.54	2	3.69
WPA-EGR-EE 311 Network Analysis II Exam	13	2.73	-	-	-	-
WPA-EGR-EE 321 Electronics I Lab Experiment Design	11	3.64	9	3.49	-	-
WPA-EGR-Engineering Computational Methods C Programming Final Project	33	3.32	13	2.77	-	-
WPA-EGR-Engineering Management & Economy	13	3.62	18	3.64	-	-
WPA-EGR-Ethics Quiz	15	3.51	19	3.74	-	-
WPA-EGR-Finite Element Analysis Using ANSYS	15	3.07	19	2.95	-	-
WPA-EGR-Master Rubric	-	-	-	-	6	3.78
WPA-EGR-MEC 225 Circuits and Electronics Exam	10	3.60	-	-	-	-
WPA-EGR-Mechanics I: Statics Final Examination (EGR 221)	12	3.08	12	3.08	-	-
WPA-EGR-Network Analysis I Exam	13	3.72	-	-	-	-
WPA-EGR-Research Paper	5	2.40	9	3.78	-	-
WPA-EGR-Senior Design and Research	7	3.86	13	2.85	-	-
WPA-EGR-Senior Project Oral Presentation	6	3.38	-	-	11	3.82
WPA-EGR-Senior Project Report	3	3.36	-	-	11	3.62

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

## C. Criterion Outcomes

Criterion Outcomes	2018 - 2019		2019 - 2020		2020 - 2021	
	n	score	n	score	n	score
EGR-1-A-Application of Engineering Concepts	8	3.38	-	-	36	3.36
EGR-1-B-Application of Finite State Machine and Implication Chart Method	7	3.71	-	-	6	3.67
EGR-1-B-Assumptions	-	-	17	3.82	-	-
EGR-1-C-Application of Karnaugh Map	7	3.86	-	-	6	3.83
EGR-1-C-Diagrams and Curves	-	-	17	3.53	-	-
EGR-1-D-Assumptions	31	3.35	4	3.25	6	4.00
EGR-1-D-Formulas	-	-	17	3.65	-	-
EGR-1-E-Diagrams and Curves	31	3.45	4	3.50	6	4.00
EGR-1-E-Information	-	-	17	3.59	-	-
EGR-1-F-Formulas	33	3.64	4	3.50	6	4.00
EGR-1-G-Information	39	3.41	7	3.29	6	4.00
EGR-1-H-Problem Formation	46	2.96	-	-	6	4.00
EGR-1-I-Schematic Diagrams and Waveforms	36	3.44	-	-	6	4.00
EGR-1-I-Solutions	-	-	17	3.65	-	-
EGR-1-J-Solutions	45	3.16	2	3.50	6	4.00
EGR-1-J-Theories	-	-	17	3.47	-	-
EGR-1-K-Theories	32	3.28	2	3.00	6	4.00
EGR-1-L-Solutions	-	-	2	3.50	-	-
EGR-1-L-Theories and Assumptions	23	3.78	-	-	6	4.00
EGR-1-M-Assumptions	-	-	9	3.44	6	4.00
EGR-1-M-Theories	-	-	2	3.50	-	-
EGR-1-N-Diagrams	-	-	9	2.67	6	4.00

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

EGR-1-O-Formulas	21	3.62	9	3.33	6	4.00
EGR-1-P-Assumptions	-	-	3	3.67	-	-
EGR-1-P-Information	28	3.50	6	3.67	6	4.00
EGR-1-Q-Diagrams	-	-	3	2.00	-	-
EGR-1-Q-Problem Formulation: Ball Bearing Analysis	-	-	14	4.00	-	-
EGR-1-Q-Solutions	22	3.00	3	2.67	6	4.00
EGR-1-R-Formulas	-	-	3	3.00	-	-
EGR-1-R-Problem Formulation: Gear Force Analysis	-	-	14	2.86	-	-
EGR-1-S-Information	-	-	3	3.67	-	-
EGR-1-S-Problem Formulation: Journal Bearing Analysis	-	-	14	3.79	-	-
EGR-1-U-Solutions	-	-	9	2.56	-	-
EGR-2-A-Consideration of Alternatives	8	3.13	-	-	36	3.81
EGR-2-B-Depth and Breadth of Project Content	8	3.25	-	-	36	3.56
EGR-2-C-Design Problem Statement	8	3.13	-	-	36	3.75
EGR-2-D-Engineering Standards	8	3.25	-	-	36	2.97
EGR-2-E-Realistic Constraints	8	4.00	-	-	36	3.67
EGR-2-F-Response to Customer Needs	8	4.00	-	-	36	3.97
EGR-2-G-Description of Design Process	10	3.80	20	2.90	6	4.00
EGR-3-A-Content	51	3.12	57	2.98	58	3.40
EGR-3-C-Format	51	4.00	57	3.47	58	3.43
EGR-3-D-Organization	51	3.92	57	3.91	58	3.50
EGR-3-E-Organization of Ideas	22	3.91	-	-	35	3.97
EGR-3-F-Slide Quality	22	3.45	-	-	35	3.63
EGR-3-G-Speaking and Audience Engagement	22	3.73	-	-	35	3.89
EGR-3-H-Spelling and Grammar	51	2.94	57	3.28	59	3.78
EGR-3-I-Style and Vocabulary	8	3.63	-	-	36	3.86
EGR-3-J-Technical Content	22	3.68	-	-	35	3.91
EGR-4-A-Disclosure	15	3.40	19	3.89	6	3.67

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

EGR-4-B-Identification and Description of Conflict of Interest	15	3.87	19	3.84	6	3.67
EGR-4-C-Responsibilities of Engineers	15	3.27	19	3.47	8	3.88
EGR-4-D-Broader Impact	25	3.44	32	3.41	8	3.88
EGR-4-E-Content	-	-	-	-	6	3.67
EGR-5-A-Teaming	8	3.38	-	-	36	3.69
EGR-6-A-Data Analysis and Interpretation	11	3.18	9	3.33	6	3.83
EGR-6-B-Equipment Selection	11	4.00	9	3.89	6	3.33
EGR-6-C-Experiment Procedures and Data Measurement	11	3.45	9	3.56	6	3.33
EGR-6-D-Test Program with All Possible Inputs	-	-	4	2.25	-	-
EGR-6-D-Theoretical Value Calculation	11	3.82	9	3.44	6	3.83
EGR-6-E-Clear Research Question	-	-	6	4.00	-	-
EGR-6-E-Theory	11	3.73	9	3.22	6	3.67
EGR-6-F-Design of Experiment	-	-	6	4.00	-	-
EGR-6-F-Test Program with All Possible Inputs	-	-	9	3.00	6	3.67
EGR-6-G-Clear Research Question	-	-	-	-	6	3.83
EGR-6-G-Conduct Experiment	-	-	6	4.00	-	-
EGR-6-H-Analyze Data	-	-	6	4.00	-	-
EGR-6-H-Design of Experiment	-	-	-	-	6	3.33
EGR-6-I-Conduct Experiment	-	-	-	-	6	3.33
EGR-6-J-Analyze Data	-	-	-	-	6	3.67
EGR-7-A-Research	51	3.27	57	2.77	58	3.36
EGR-7-B-Use of Online and Print media and Published Patents	5	2.40	9	3.78	6	3.50
EGR-8-A-Biblical References for Stewardship	43	3.30	57	3.35	28	3.32
EGR-8-B-Stewardship	43	3.77	57	3.74	28	3.71
EGR-a-12-Vectors	10	2.20	-	-	-	-
EGR-a-15-Vectors	3	3.00	-	-	-	-
EGR-j-1-Contemporary Issues	25	3.32	32	3.44	-	-
EGR-k-10-Software Use	15	3.07	19	2.95	-	-

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

EGR-k-3-Demonstration	33	3.45	-	-	-	-
EGR-k-5-Efficiency	15	3.27	-	-	-	-
EGR-k-7-Specifications	33	3.21	-	-	-	-
EGR-k-8-Readability	15	3.67	-	-	-	-
EGR-k-9-Reusability	33	3.36	-	-	-	-

Scale			
4.00	90%+	3.00	60%
3.66	80%	2.00	35%
3.33	70%	1.00	15%

## D. University Whole Person Outcomes

ORU Whole Person Outcomes		2018 - 2019		2019 - 2020		2020 - 2021	
		n	score	n	score	n	score
1A	Biblical Literacy	116	3.84	8	3.92	58	3.91
1B	Spiritual Formation	41	3.96	43	3.81	137	3.69
2A	Critical Thinking, Creativity & Aesthetic Appreciation	216	3.13	108	3.02	81	3.44
2B	Global & Historical Perspectives	78	3.63	2	4.00	1	3.00
2C	Information Literacy	109	3.23	171	3.13	172	3.35
2D	Knowledge of the Physical & Natural World	N/A	N/A	N/A	N/A	N/A	N/A
3A	Healthy Lifestyle	36	2.44	90	2.36	70	2.47
3B	Physically Disciplined Lifestyle	105	3.61	172	3.54	164	3.47
4A	Ethical Reasoning & Behavior	266	3.63	183	3.48	191	3.64
4B	Intercultural Knowledge & Engagement	20	3.15	15	3.48	26	3.71
4C	Written & Oral Communication	212	3.38	214	3.29	216	3.25
4D	Leadership Capacity	136	3.57	228	3.72	196	3.64