

Bachelor of DATA SCIENCE (DS)

4-Year Recommended Course Sequence with *Calculus Entry*

Click on the Course Name to access the course in the Undergraduate Catalog 24-25

Fall Semester 1	Spring Semester 2	Fall Semester 3	Spring Semester 4	Fall Semester 5	Spring Semester 6	Fall Semester 7	Spring Semester 8
ESC 120 [2] Intro to Engineering Design	CIS 260 [4] Intro to Programming (ESC 151 or CIS 151)	CIS 265 [4] Data Structures and Algorithms (CIS 260 and MTH 181)	CIS 340 [3] Systems Programming (CIS 265)	CIS 430 [3] Database Concepts (CIS 265)	STA 400 [3] Data Visualization (STA 323 or STA 347)	DSA 493 [2] Senior Design I (Gen Ed / Comp & DSA 330)	DSA 494 [2] Senior Design II (Gen Ed / Comp & DSA 330)
CIS 151 [3] Invitation to Computing	PHY 241 [5] University Physics I (MTH 181) OR BIO 266/267 [4] Human Anatomy & Physiology I /Lab OR CHM 261/266 [4] General Chemistry I & Lab	MTH 283 [2] Multivariable Calculus for Engineers OR MTH 281 [4] Multivariable Calculus (MTH 182 - C or better)	PHY 242 [5] University Physics II (PHY 241 & MTH 282) OR BIO 268/269 [4] Human Anatomy & Physiology II /Lab (BIO 266) OR CHM 262/267 [4] General Chemistry II & Lab (CHM 261)	CIS 390 [3] Introduction to Algorithms (CIS 265 and MTH 220 and MTH 181)	CIS 467 [3] Artificial Intelligence (DSA 230)	CIS 475 [3] Computer Security (CIS 340)	DS Major Elective [3]
ENG 100 [3] Intensive Writing or ENG 101 [3] College Writing I	ESC 102 [3] Technical Writing (Preferred) OR ENG 102 [3] College Writing II	DSA 230 [3] Intro to Data Science I (CIS 260)	STA 347 [3] Applied Statistics (STA 323)	STA 431 [3] Categorical Data Analysis (MTH/STA 347 - B or better)	DSA 460 [3] Data Mining (CIS 265)	DSA 469 [3] Big Data Processing Systems	DS Major Elective [3]
MTH 181 [4] Calculus I	MTH 182 [4] Calculus II (MTH 181)	MTH 220 [3] Discrete Math (MTH 182 - C or better)	ESC 350 [3] Linear Algebra for Engineers OR MTH 288 [3] Linear Algebra (MTH 182 and ESC 152)	DSA 330 [3] Intro to Data Science II (DSA 230 & STA 323)	ESC 282 [3] SS Engineering Economy (MTH 182)	DS Major Elective [3]	DS Major Elective [3]
★ ESC 100 [1] New Student Orientation	**ESC 130 [1] Engineering Co-op Orientation	STA 323 [3] Statistical Methods (MTH 182 - C or better)	General Ed. Elective [3]	PHL 216 [3] A&H Data Ethics	General Ed. Elective [3]	General Ed. Elective [3]	General Ed. Elective [3]
13 Total Credit Hours	16 – 17 Total Credit Hours	15-17 Total Credit Hours	16-17 Total Credit Hours	15 Total Credit Hours	15 Total Credit Hours	14 Total Credit Hours	14 Total Credit Hours

Total Credits for DS Degree: 130 including ESC 130 Engineering Co-op Orientation

(Prerequisites) • (*Pre/co-requisite) • [# of Course Credits] • DSA XXX = Only Offered That Fall/Spring Semester

- Required DS Courses **Highly recommended, yet optional.
- Required Science Courses
- Required English Courses (ESC 102 is preferred. However, can be substituted with ENG 102.)
- Required Writing Across the Curriculum (WAC) Courses
- Required CIS 300-400 Level Electives
- Required Math Courses
- [General Ed. Electives \(2 A&Hs, 2 SSs, 1 ALAAME, & 2 DIVs\)](#)

★ Must take ESC 100 (Exception of ASC 101 upon WCE Advisor Approval or special ASC 101 section)

↓ [Scroll Down to View the Precalculus Entry 4-Year Plan Degree Chart](#) ↓

Bachelor of DATA SCIENCE (DS)

4-Year Recommended Course Sequence with *Precalculus Entry*

[CLICK HERE](#) to access Course Catalog Descriptions

Fall Semester 1	Spring Semester 2	Summer Semester #1	Fall Semester 3	Spring Semester 4	Summer Semester #2	Fall Semester 5	Spring Semester 6	Fall Semester 8	Spring Semester 9
ESC 120 [2] Intro to Engineering Design	CIS 260 [4] Intro to Programming (ESC 151 or CIS 151)		CIS 265 [4] Data Structures and Algorithms (CIS 260 and MTH 181)	CIS 340 [3] Systems Programming (CIS 265)		CIS 430 [3] Database Concepts (CIS 265)	STA 400 [3] Data Visualization (STA 323 or STA 347)	DSA 493 [2] <u>Senior Design I</u> (Gen Ed Comp, DSA330)	DSA 494 [2] <u>Senior Design II</u> (Gen Ed Eng /Comp & DSA)
CIS 151 [3] Invitation to Computing	PHY 241 [5] University Physics I (MTH 281) OR BIO 266/267 [4] Human Anatomy & Physiology Lab I /Lab OR CHM 261/266 [4] General Chemistry I & Lab	OPSTEM MTH 180 SUMMER CALCULUS I [4] (Average B- or better in MTH 167&168)	DSA 230 [3] Intro to Data Science I (CIS 260)	PHY 242 [5] University Physics II (PHY 241 & MTH 282) OR BIO 268/269 [4] Human Anatomy & Physiology Lab I /Lab (BIO 266) OR CHM 262/267 [4] General Chemistry II & Lab (CHM 261)	MTH 220 [3] Discrete Math (MTH 182 - C or better)	CIS 390 [3] Introduction to Algorithms (CIS 265 and MTH 220 and MTH 181)	CIS 467 [3] Artificial Intelligence (DSA 230)	CIS 475 [3] Computer Security (CIS 340)	DS Major Elective [3]
ENG 100 [3] Intensive Writing or ENG 101 [3] College Writing I	ESC 102 [3] Technical Writing (Preferred) OR ENG 102 [3] College Writing II		PHL 216 [3] <i>A&H</i> <u>Data Ethics</u>	STA 323 [3] Statistical Methods (MTH 182 -C or better)		STA 347 [3] Applied Statistics (STA 323)	DSA 460 [3] Data Mining (CIS 265)	DSA 469 [3] Big Data Processing Systems	DS Major Elective [3]
MTH 165 [3] Intensive Precalc I OR MTH 167 [3] Precalculus I	MTH 168 [3] Precalculus II (MTH 165 or MTH 167)		MTH 182 [4] Calculus II (MTH 181)	MTH 288 [3] Linear Algebra (MTH 182)		DSA 330 [3] Intro to Data Science II (DSA 230 & STA 323)	STA 431 [3] Categorical Data Analysis (MTH/STA 347 - B or better)	DS Major Elective [3]	DS Major Elective [3]
★ ESC 100 [1] New Student Orientation	**ESC 130 [1] Engineering Co-op Orientation		General Ed. Elective [3]	MTH 283 [2] Multivariable Calculus for Engineers OR MTH 281 [4] Multivariable Calculus (MTH 182 -C or better)		General Ed. Elective [3]	ESC 282 [3] SS Engineering Economy (MTH 182)	General Ed. Elective [3]	General Ed. Elective [3]
13 Total Credit Hours	16 – 17 Total Credit Hours	4 Total Credit Hrs	15-17 Total Credit Hours	16-17 Total Credit Hours	3 Total Credit Hours	15 Total Credit Hours	15 Total Credit Hours	14 Total Credit Hours	14 Total Credit Hours
Total Credits for DS Degree: 130 including ESC 130 Engineering Co-op Orientation									

(Prerequisites) • (*Pre/co-requisite) • [# of Course Credits] • DSA XXX = Only Offered That Fall/Spring Semester

- Required DS Courses **Highly recommended, yet optional.
- Required Science Courses
- Required English Courses (ESC 102 is preferred. However, can be substituted with ENG 102.)
- Required Writing Across the Curriculum (WAC) Courses
- Required CIS 300-400 Level Electives
- Required Math Courses
- General Ed. Electives (2 A&Hs, 2 SSs, 1 ALAAME, & 2 DIVs)

★ Must take ESC 100 (Exception of ASC 101 upon WCE Advisor Approval or special ASC 101 section)

↓ [Scroll Down to View the Precalculus Entry 5-Year Plan Degree Chart](#) ↓

Bachelor of DATA SCIENCE (DS)

5-Year Recommended Course Sequence with *Precalculus Entry*

[CLICK HERE](#) to access Course Catalog Descriptions

Fall Semester 1	Spring Semester 2	Summer Semester #1	Fall Semester 3	Spring Semester 4	Fall Semester 5	Spring Semester 6	Fall Semester 7	Spring Semester 8
ESC 120 [2] Intro to Engineering Design	CIS 260 [4] Intro to Programming (ESC 151 or CIS 151)		CIS 265 [4] Data Structures and Algorithms (CIS 260 and MTH 181)	CIS 340 [3] Systems Programming (CIS 265)	CIS 430 [3] Database Concepts (CIS 265)	STA 400 [3] Data Visualization (STA 323 or STA 347)	DSA 493 [2] Senior Design I (Gen Ed Comp, DSA330)	DSA 494 [2] Senior Design II (Gen Ed Eng /Comp & DSA)
ENG 100 [3] Intensive Writing or ENG 101 [3] College Writing I	ESC 102 [3] Technical Writing (Preferred) or ENG 102 [3] College Writing II		PHY 241 [5] University Physics I (MTH 281) OR BIO 266/267 [4] Human Anatomy & Physiology Lab I /Lab OR CHM 261/266 [4] General Chemistry I & Lab	PHY 242 [5] University Physics II (PHY 241 & MTH 282) OR BIO 268/269 [4] Human Anatomy & Physiology Lab I /Lab (BIO 266) OR CHM 262/267 [4] General Chemistry II & Lab (CHM 261)	CIS 390 [3] Introduction to Algorithms (CIS 265 and MTH 220 and MTH 181)	CIS 467 [3] Artificial Intelligence (DSA 230)	CIS 475 [3] Computer Security (CIS 340)	DS Major Elective [3]
MTH 165 [3] Intensive Precalc I OR MTH 167 [3] Precalculus I	MTH 168 [3] Precalculus II (MTH 165 or MTH 167)	OPSTEM MTH 180 SUMMER CALCULUS I [4] (Average B- or better in MTH 167&168)	MTH 182 [4] Calculus II (MTH 181)	STA 323 [3] Statistical Methods (MTH 182 -C or better)	STA 347 [3] Applied Statistics (STA 323)	PHL 216 [3] A&H Data Ethics	DSA 469 [3] Big Data Processing Systems	DS Major Elective [3]
CIS 151 [3] Invitation to Computing	General Ed. Elective [3]		MTH 283 [2] Multivariable Calculus for Engineers OR MTH 281 [4] Multivariable Calculus (MTH 182 -C or better)	MTH 220 [3] Discrete Math (MTH 182 -C or better)	MTH 288 [3] Linear Algebra (MTH 182)	STA 431 [3] Categorical Data Analysis (MTH/STA 347 - B or better)	DSA 460 [3] Data Mining (CIS 265)	DS Major Elective [3]
★ ESC 100 [1] New Student Orientation				DSA 230 [3] Intro to Data Science I (CIS 260)	DSA 330 [3] Intro to Data Science II (DSA 230 & STA 323)	General Ed. Elective [3]	DS Major Elective [3]	ESC 282 [3] SS Engineering Economy (MTH 182)
							General Ed. Elective [3]	General Ed. Elective [3]
12 Total Credit Hours	13 Total Credit Hours	4 Total Credit Hours	14-15 Total Credit Hours	12 Total Credit Hours	16 Total Credit Hours	15 Total Credit Hours	17 Total Credit Hours	17 Total Credit Hours
Total Credits for DS Degree: 130 including ESC 130 Engineering Co-op Orientation								

(Prerequisites) • (*Pre/co-requisite) • [# of Course Credits] • DSA XXX = Only Offered That Fall/Spring Semester

- Required DS Courses **Highly recommended, yet optional.
- Required Science Courses
- Required English Courses (ESC 102 is preferred. However, can be substituted with ENG 102.)
- Required Writing Across the Curriculum (WAC) Courses
- Required CIS 300-400 Level Electives
- Required Math Courses
- [General Ed. Electives \(2 A&Hs, 2 SSs, 1 ALAAME, & 2 DIVs\)](#)

★ Must take ESC 100 (Exception of ASC 101 upon WCE Advisor Approval or special ASC 101 section)

↓ **Be Sure to Select a Course Listed Below that Qualifies for Two (2) General Ed. Electives** ↓

Updated Fall 2023

To eliminate one (1) of your General Education Requirements,
consider taking a course that qualifies as two (2) General Ed. Electives

Recommended Courses that Qualify as Two (2) General Ed. Electives

Course	Social Sciences (SS)	Arts & Humanities (AH)	Non-Western Social Sciences (ALAAME & NW-SS)
ANT 153 – Intro to African Cultures	X		X
ANT 275 – Ancient Mysteries	X		X
COM 201 – Com & Relationships / East Asian	X		X
COM 233 – Bollywood & Beyond	X		X
HIS 103 – Ancient World His to 1300 C.E.	X		X
HIS 104 – Modern World History	X		X
SOC 210 – Dev. Societies in Changing World	X		X
UST 206 – Megacities of Asia	X		X
UST 222 – World Population and Society	X		X
ANT 103 – Rise/Fall of Civilizations		X	X
ANT 171 – Native Civilization of Americas		X	X
ARB 274 – Introduction to Middle East		X	X
ART 281 – Asian Art		X	X
ART 286 – African Art		X	X
ENG 204 – World Literature		X	X
HIS 165 – Intro to Latin American History		X	X
HIS 175 – Intro to African History		X	X
HIS 185 – Survey of Middle Eastern History		X	X
HIS 195 – Intro to East Asian History		X	X
MUS 263 – Black Music of Two Worlds		X	X
PHL 255 – Non-Western Philosophy		X	X
PHL 262 – Medieval Philosophy		X	X
REL 101 – Understanding Religion		X	X
REL 268 – Religion & Culture in Africa		X	X
WLC 265 – Francophone Lit in Translation		X	X

Popular Introductory General Ed.
Courses for Engineering Students

SOCIAL SCIENCES (SS)

[PSY 220 – Child Development](#) (SS)

[UST 200 – Intro to Urban Studies](#) (SS)

[COM 233 – Bollywood & Beyond](#) (SS & ALAAME)

ARTS & HUMANITIES (AH)

[MUS 161 – Roots of Rock & Soul](#) (AH)

[UST 201 – Building Cleveland](#) (AH)

[REL 101 – Understanding Religion](#) (AH & ALAAME)

[MUS 263 – Black Music of Two Worlds](#) (AH & ALAAME)

[ANT 171 – Native Civilization of America](#) (AH & ALAAME)

US DIVERSITY (US DIV)

[ANT 100 – Human Diversity](#) (US DIV)

[SOC 201 – Race/Class/Gender](#) (US DIV)

AFRICAN-AMERICAN (AFRICAN-AMER.)

[SWK 150 – The Black Experience](#) (African- Amer.)

[UST 202 – Cleveland: The Afr-Amer Exp.](#) (African-Amer.)