

Bachelor Of Science in Data Science and Engineering

Minors, Double Majors, and Academic Tracks

College of Engineering and Advanced Computing



Double Major



Minor

Track

Notes

Bachelor of Science in Data Science and Engineering

Double Major in DSE (24 Credit Hours)

Required Courses (12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
AI 347	Intro to Machine Learning	3
DSE 300	Data Preparation & Feature Design	3
DSE 320	Data Mining	3
DSE 352	Big Data & Data Warehousing	3

Optional Courses (select 12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 451	Secure Software Engineering	3
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3
CSE 454	Ethical Hacking and Systems Defense	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3
DSE 451	Advanced Databases	3



Minor in DSE (15 Credit Hours)

Required Courses (12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
AI 347	Intro to Machine Learning	3
DSE 300	Data Preparation & Feature Design	3
DSE 320	Data Mining	3
DSE 352	Big Data & Data Warehousing	3

Optional Courses (select 12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 451	Secure Software Engineering	3
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3
CSE 454	Ethical Hacking and Systems Defense	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3

Course Code	Course Title / Requirement	Credit Hours
DSE 451	Advanced Databases	3

Students from other colleges must also complete the following pre-requisite courses or their equivalent where needed.

- STA 212 Probability and Statistics
- MAT 212 Linear Algebra
- DSE 200 DSE 200
- SE 215 Data Structures
- SE 252 Database Systems

Bachelor of Science in Cybersecurity

Double Major in CS (24 Credit Hours)

Required Courses (18 CRHs)

Course Code	Course Title / Requirement	Credit Hours
CSE 350	Cryptography & Data Privacy	3
CSE 360	Digital Forensics	3
CSE 370	Database Security	3
CSE 380	Operating System Security	3
CSE 452	Network Security	3
CSE 454	Ethical Hacking and Systems Defense	3

Optional Courses (select 6 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 453	Security Risk Management & Control	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 451	Secure Software Engineering	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3

Course Code	Course Title / Requirement	Credit Hours
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3
AI 451	AI Tools and applications Required Courses	3

Minor in CS (15 Credit Hours)

Required Courses (9 CRHs)

Course Code	Course Title / Requirement	Credit Hours
CSE 350	Cryptography and Data Privacy	3
CSE 452	Network Security	3
CSE 454	Ethical Hacking and Systems Defense	3

Optional Courses (select 6 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3

Course Code	Course Title / Requirement	Credit Hours
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 453	Security Risk Management & Control	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 451	Secure Software Engineering	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3
AI 451	AI Tools and applications	3

Students from other colleges must also complete the following pre-requisite courses or their equivalent where needed.

- SE 239 Network Programming
- CSE 250 Introduction to Cybersecurity
- SE 314 Operating Systems

Bachelor of Science in Artificial Intelligence

Double Major in AI (24 Credit Hours)

Required Courses (15 CRHs)

Course Code	Course Title / Requirement	Credit Hours
AI 317	Computer Vision	3
AI 347	Intro to Machine Learning	3
AI 455	Generative AI	3
AI 447	Deep Learning AI 444 Artificial Intelligence	3

Optional Courses (select 9 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
CSE 451	Secure Software Engineering	3
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3
CSE 454	Ethical Hacking and Systems Defense	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3

Course Code	Course Title / Requirement	Credit Hours
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3
AI 451	AI Tools and applications Required Courses	3

Minor in AI (15 Credit Hours)

Required Courses (9 CRHs)

AI 347	Introduction to ML	3
AI 451	AI Tools and applications	3
AI 444	Artificial Intelligence	3

Optional Courses (select 6 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
AI 455	Generative AI	3
CSE 451	Secure Software Engineering	3

Course Code	Course Title / Requirement	Credit Hours
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3
CSE 454	Ethical Hacking and Systems Defense	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3

Students from other colleges must also complete the following pre-requisite courses or their equivalent where needed.

- SE100 Programming for Engineers
- SE100 L Programming for Engineers Lab
- STA 212 Probability and Statistics
- MAT 212 Linear Algebra
- AI 250 Introduction to AI
- SE 301 Analysis of Algorithms

Bachelor of Software Engineering

Double Major in SE (24 Credit Hours)

Required Courses (12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 310	Software Design & Architecture	3
SE 316	Application Development	3
SE 322	IoT Application Development	3
SE 412	Software Testing & Quality Assurance	3

Optional Courses (select 12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 451	Secure Software Engineering	3
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3

Course Code	Course Title / Requirement	Credit Hours
CSE 454	Ethical Hacking and Systems Defense	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 451	Secure Software Engineering	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3
AI 451	AI Tools and applications	3

○ Minor in SE (15 Credit Hours)

Required Courses (12 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 310	Software Design & Architecture	3
SE 316	Application Development	3
SE 322	IoT Application Development	3
SE 412	Software Testing & Quality Assurance	3

Optional Courses (select 3 CRHs)

Course Code	Course Title / Requirement	Credit Hours
SE 435	Undergraduate Research in Software Engineering	3

Course Code	Course Title / Requirement	Credit Hours
SE 440	Special Topics in Software Engineering	3
SE 441	Telecommunications Software Design	3
SE 442	Social Networks for Software Engineers	3
SE 443	Cloud Computing for Software Engineers	3
AI 444	Artificial Intelligence	3
CSE 445	Information and Software Security	3
SE 448	Blockchain Development	3
DSE 449	Data Analytics	3
AI 447	Deep Learning	3
CSE 451	Secure Software Engineering	3
CSE 452	Network Security	3
CSE 453	Security Risk Management & Control	3
CSE 454	Ethical Hacking and Systems Defense	3
AI 455	Generative AI	3
SE 461	Game Engine Architecture & Implementation	3
SE 462	Fundamentals of Game Design	3
SE 463	Game Mechanics, Prototyping, and Production	3
SE 464	Innovative Topics in Immersive Game Development	3
CSE 444	Web and mobile security	3
CSE 451	Secure Software Engineering	3
CSE 472	Penetration Testing	3
CSE 410	Security Architecture	3
DSE 451	Advanced Databases	3
AI 480	Natural Language Processing	3
DSE 452	Data Engineering and Pipelines	3
DSE 423	Cloud Computing in Data Science	3
SE 400	Theory of Computation	3
DSE 401	Optimization Techniques for ML	3
AI 462	Product Management for AI	3
AI 460	Agent Based Systems	3
AI 472	Expert Systems	3
AI 483	AI in Robotics	3
AI 475	Game Theory	3
SE 423	Software Construction & Processes	3
AI 451	AI Tools and applications	3

Students from other colleges must also complete the following pre-requisite courses or their equivalent where needed.

SE100	Programming for Engineers
SE100 L	Programming for Engineers Lab
SE 120	Object Oriented Programming
SE 120 L	Object Oriented Programming Lab
SE 201	Introduction to Software Engineering
SE 225	Software Requirements

Bachelor of Architecture

Minor in Architecture Not available

 **Double Major in Architecture** Not available

Bachelor of Architectural Engineering

 **Double Major in Architectural Engineering**

Total: 38 Credit Hours

Required Courses (17 CRHs)

Course Code	Course Title / Requirement	Credit Hours
ARE 309	Project Management and Economics	3
ARE 313	Electrical Installations, Lighting Systems, and Applications	3
ARE 321	Structural Mechanics	4
ARE 332	Building Services Engineering	4
ARE 405	Structural Analysis	3

Students from other departments must also complete the following pre-requisite courses or their equivalent, where needed.

Course Code	Course Title / Requirement	Credit Hours
ARC 101	Architectural Design I	4
ARE 120	Drafting and Drawing	3
ARC 202	Architectural Design II	4
ARE 231	Building Materials and Construction Technology	4
ARE 232	Building Construction	3
ARE 297	Architecture and Buildings	3

○ **Minor** Not available

Bachelor of Electrical Engineering

● Double Major in Electrical Engineering

Total: 30 Credit Hours

Required Courses (30 CRHs)

Course Code	Course Title / Requirement	Credit Hours
EE 301	Signals and Systems	3
EE 302	Communications Theory	3
EE 302 L	Communications Theory Lab	1
EE 303	Introduction to Electronics	3
EE 303 L	Introduction to Electronics Lab	1
EE 304	Microelectronics	3
EE 304 L	Microelectronics Lab	1
EE 306	Control and Feedback System Design	3
EE 306 L	Control and Feedback System Design Lab	1
EE 308	Electrical Energy Conversion	3
EE 308 L	Electrical Energy Conversion Lab	1
EE 405	Electric Power Systems	3
EE 413	Digital Communications	3
EE 413 L	Digital Communications Lab	1

○ **Minor in Electrical Engineering** **Total: 15 Credit Hours**

Required Courses (15 CRHs)

Course Code	Course Title / Requirement	Credit Hours
EE 301	Signals and Systems	3
EE 303	Introduction to Electronics	3
EE 303 L	Introduction to Electronics Lab	1
EE 306	Control and Feedback System Design	3
EE 306 L	Control and Feedback System Design Lab	1
EE 308	Electrical Energy Conversion	3
EE 308 L	Electrical Energy Conversion Lab	1

Students from other colleges or programs are responsible for completing all stated prerequisites or approved equivalents. Additional prerequisites may apply for students from other colleges, in accordance with University and College regulations.

○ Minor in Robotics and Autonomous Systems (15 Credit Hours)

Required Courses (9 CRHs)

Course Code	Course Title / Requirement
EE 414	Foundations of Robotics
EE 442	Intelligent Electrical Systems
AI 483	AI in Robotics

Optional Courses: Select any two courses (6 CRHs) from the following list:

Course Code	Course Title / Requirement
EE 410	Cyber Physical Systems
EE 415	Industrial Robotics
EE 416	UAVs and Drones
EE 417	Digital Signal Processing
EE 418	Digital Image Processing
EE 440	Machine Learning
EE 402	Introduction to Wireless Networks
AI 317	Computer Vision
AI 347	Introduction to Machine Learning
AI 360	Agent Based Systems
AI 444	Artificial Intelligence
AI 475	Game Theory
AI 472	Expert Systems
AI 455	Generative AI
AI 480	Natural Language Processing
SE 441	Telecommunications Software Design
SE 443	Cloud Computing for Software Engineers
SE 461	Game Engine Architecture & Implementation
ME 406	Mechatronics
BME 423	Biomedical Mechatronic Systems
BME 421	Advanced Biomedical Instrumentation

Course Code	Course Title / Requirement
BME 432	Biomedical Data Analytics
IE 403	Design of Experiments
IE 420	Reliability and Maintenance Engineering
IE 460	Industrial Internet of Things

Additional 400-level courses with substantial robotics, autonomy, perception, intelligent systems, embedded systems, or multi-agent content may be approved by the Department Chair.

Students from other colleges or programs are responsible for completing all stated prerequisites or approved equivalents. Additional prerequisites may apply for students from other colleges, in accordance with University and College regulations.

Bachelor of Biomedical Engineering

Minor in Biomedical Engineering Requirements

Not available



Double Major in Biomedical Engineering Requirements

Not available

Bachelor of Industrial Engineering

Double Major in IE

Total: 24 Credit Hours

Required Courses (9 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 301	Operations Research I	3
IE 304	Production and Service Systems Planning I	3
IE 401	Network Models and Project Management	3

Optional Courses (select 15 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 307	Work System Analysis & Design	3
IE 307 L	Work System Analysis & Design Lab	1
IE 315	Engineering Economy and Cost Analysis	3
IE 330	Simulation	3
IE 330 L	Simulation Lab	1
IE 406	Quality Engineering	3
IE 302	Operations Research II	3
IE 305	Production and Service Systems Planning II	3

Minor in IE

Total: 15 Credit Hours

Required Courses (6 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 301	Operations Research I	3

Course Code	Course Title / Requirement	Credit Hours
IE 304	Production and Service Systems Planning I	3

Optional Courses (select 9 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 307	Work System Analysis & Design	3
IE 307 L	Work System Analysis & Design Lab	1
IE 315	Engineering Economy and Cost Analysis	3
IE 330	Simulation	3
IE 330 L	Simulation Lab	1
IE 406	Quality Engineering	3
IE 302	Operations Research II	3
IE 305	Production and Service Systems Planning II	3

○ Minor in Innovation and Entrepreneurship (15 Credit Hours)

Required Courses (6 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 315	Engineering Economy and Cost	3
EE 481	Innovations and Entrepreneurship in Engineering	3
OR	BME 422 Medical Device Innovation and Entrepreneurship	
OR	ME 419 Product Design and Development	

Optional Courses (select 9 CRHs)

Course Code	Course Title / Requirement	Credit Hours
IE 401	Network Models and Project Management	3
IE 404	Quantitative Methods for Engineering Decision Making	3
IE 406	Quality Engineering	3
IE 450	Management for Engineers	3
IE 460	Industrial Internet of Things	3
EE 410	Cyber Physical Systems	3
MGT 375	Introduction to Entrepreneurship	3

Students from other colleges must also complete the following pre-requisite courses or their equivalent where needed.

- STA 212 Probability and Statistics
- MAT 212 Linear Algebra

Bachelor of Mechanical Engineering

Double Major in ME

Total: 25 Credit Hours

Students must take ALL the following courses (14 credit hours):

Course Code	Course Title / Requirement	Credit Hours
ME 310	Mechanical Component Design	3
ME 310 L	Mechanical Component Design Lab	1
ME 311	Applied Mechanics II: Dynamics	3
ME 312	Mechanics of Materials II	3
ME 312 L	Mechanics of Materials II Lab	1
ME 315	Machine Design	3

Select ANY courses from the following list (11 credit hours)

Course Code	Course Title / Requirement	Credit Hours
ME 306	Instrumentation and Control Engineering	3
ME 306 L	Instrumentation and Control Engineering Lab	1
ME 316	Engineering Thermodynamics	3
ME 317	Heat and Mass Transfer	3
ME 317 L	Heat and Mass Transfer	1
ME 403	Finite Element Methods	3
ME 403 L	Finite Element Methods	1
ME 407	Heating, Ventilation, and Air-Conditioning	3

Minor in ME

Total: 15 Credit Hours

Students must take ALL the following courses (7 credit hours):

Course Code	Course Title / Requirement
ME 311	Applied Mechanics II: Dynamics
ME 312	Mechanics of Materials II
ME 312 L	Mechanics of Materials II Lab

Select ANY courses from the following list (8 credit hours)

Course Code	Course Title / Requirement
ME 315	Machine Design
ME 316	Engineering Thermodynamics
ME 316 L	Engineering Thermodynamics Lab
ME 317	Heat and Mass Transfer
ME 317 L	Heat and Mass Transfer Lab
ME 310	Mechanical Component Design
ME 310 L	Mechanical Component Design Lab
ME 407	Heating, Ventilation, and Air-Conditioning

Students from other colleges or programs are responsible for completing all stated prerequisites or approved equivalents. Additional prerequisites may apply for students from other colleges, in accordance with University and College regulations.