MINES | Design Engineering

Undergraduate Program Flowchart in **ENGINEERING, DESIGN, & SOCIETY**

Recommended Sequence of Required Courses for the Bachelor of Science in Design Engineering:
(2023-2024)

1st Term 15.0 CH

- 3.0 CH **EDNS 191** Intro to Integrative Design* — Fall, Spr
- 4.0 CH **MATH 111** Calculus I — Fall, Spr
- 4.0 CH **CHGN 121** Prin. of Chem I — Fall, Spr
- 3.0 CH **CSCI 128** Comp Sci for STEM — Fall, Spr
- 1.0 CH **CSM 101** Freshman Success Seminar — Fall, Spr

2nd Term 15.0 CH

- 4.0 CH **EDNS 192** Design and Human Values* — Fall, Spr
- 4.0 CH **MATH 112** Calculus II — Fall, Spr
- 4.0 CH **PHGN 100** Physics I — Fall, Spr
- 3.0 CH **EDNS 200** Intro to Design Engineering — Fall, Spr
- 1.0 CH **CSM 102** Success & Wellness — Fall, Spr

3rd Term 18.0 CH

- 3.0 CH **EDNS 291** Design Unleashed — Fall
- 4.0 CH **MATH 213** Calculus III — Fall, Spr
- 4.0 CH **PHGN 200** Physics II — Fall, Spr
- 3.0 CH **Distributed Science** — Fall, Spr
- 3.0 CH **CAS** Culture & Society Mid-Level Elective — Fall, Spr
- 1.0 CH **CSM 202** Intro to Student Well-Being — Fall, Spr

4th Term 15.0 CH

- 3.0 CH **EDNS 292** Design for a Globalized World — Spr
- 3.0 CH **MATH 225** Differential Equations — Fall, Spr
- 3.0 CH **Thermo** Engineering Fundamentals — Fall, Spr
- 3.0 CH **CEEN 241** Statics — Fall, Spr
- 3.0 CH **Engineering Elective** — Fall, Spr

5th Term 18.0 CH

- 3.0 CH **EDNS 391** Design & Modeling of Integrated Sys. — Fall
- 3.0 CH **Materials** Engineering Fundamentals — Fall, Spr
- 3.0 CH **EEGN 281** Intro to Electrical Circuits — Fall, Spr
- 3.0 CH **EBGN 321** Engineering Economics — Fall, Spr
- 3.0 CH **Engineering Elective** — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr

6th Term 18.0 CH

- 3.0 CH **EDNS 392** Design Engineering Applications — Spr
- 3.0 CH **Fluid Mechanics** Engineering Fundamentals — Fall, Spr
- 3.0 CH **Engineering Elective** — Fall, Spr
- 3.0 CH **Engineering Elective** — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr
- 3.0 CH **Free Elective** — Fall, Spr

7th Term 18.0 CH

- 3.0 CH **EDNS 491** Capstone Design I — Fall, Spr
- 3.0 CH **Engineering Elective** — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr
- 3.0 CH **CAS** Culture & Society Mid-Level Elective — Fall, Spr
- 3.0 CH **Free Elective** — Fall, Spr

8th Term 15.0 CH

- 3.0 CH **EDNS 492** CapstoneDesign II — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr
- 3.0 CH **Focus Area Elective** — Fall, Spr
- 3.0 CH **CAS** Culture & Society 400 Level Elective — Fall, Spr
- 3.0 CH **Free Elective** — Fall, Spr

Total Credit Hours = 132.0

Prerequisite courses required a passing grade of C- or better
**EDNS151 + HASS 100 = EDNS 191 + EDNS 192*

Course code → Course title →
3.0 CH **EDNS 191** Intro to Integrative Design — Fall
← Course credits
← Semesters offered
→ Prerequisite
⇢ Co-requisite

Design Core | Mines Core | Dist. Science | CAS Electives | Eng. Fund. | Eng. Elec. | Focus Area Elec. | Free Elec.

MINES | Design Engineering

Undergraduate Program Flowchart in
ENGINEERING, DESIGN, & SOCIETY

Bachelor of Science in Design Engineering Electives (2023-2024)

DISTRIBUTED SCIENCES

(Must take ONE course to fulfill degree)

CBEN 110 Fundamentals of Biology I - 3.0 CH

CHGN 122 Principles of Chemistry IIodynamics - 4.0 CH
(prereqs: CHGN 121)

CHGN 125 Molecular Engr. & Materials Chemistry - 4.0 CH
(prereqs: CHGN 121)

GEGN 101 Earth and Enviornmental Systems - 4.0 CH

Math 201 Intro to Statistics - 3.0 CH
(prereqs: Math 112)

ENGINEERING FUNDAMENTALS

(Must take ONE course from each category to fulfill degree)

Thermo:

CBEN 210 Intro to Thermodynamics - 3.0 CH
(prereqs: CHGN 121, CHGN 122, Math 111)
(coreqs: Math 112, PHGN 100)

CHGN 209 Intro. to Chemical Thermodynamics - 3.0 CH
(prereqs: CHGN 121, CHGN 122, Math 112, PHGN 100)

MEGN 361 Thermodynamics I - 3.0 CH
(prereqs: Math 213)

Statics:

CEEN 241 Statics - 3.0 CH
(prereqs: Math 112)

Electrical Circuits:

EENG 281 Intro to Electrical Circuits - 3.0 CH
(prereqs: PHGN 200)

EENG 282 Electrical Circuits - 4.0 CH
(prereqs: PHGN 200)

Materials:

CEEN 311 Mechanics of Materials - 3.0 CH
(prereqs: CEEN 241)

MEGN 212 Intro. to Solid Mechanics - 3.0 CH
(prereqs: CEEN 241)

MTGN 202 Engineered Materials - 3.0 CH
(prereqs: CHGN 122 or 125, Math 112, PHGN 100)

Fluid Mechanics:

CEEN 310 Fluid Mechanics for Civil and EnvE - 3.0 CH
(prereqs: PHGN 100, CEEN 241)

MEGN 351 Fluid Mechanics - 3.0 CH
(prereqs: CEEN 241)

CAS Electives

(Must take TWO courses at Mid-level or above and ONE course at 400-level to fulfill degree)

HASSXXX All HASS courses are eligible for Humanities and Social Sciences (H&SS) credit

LIFLXXX All LIFL courses are eligible for Humanities and Social Sciences (H&SS) credit

HNRSXXX All HNRS courses are eligible for Humanities and Social Sciences (H&SS) credit

EBGN 301 Intermediate Microeconomics - 3.0 CH

EBGN 302 Intermediate Macroeconomics - 3.0 CH

EBGN 310 Environmental and Resource Economics - 3.0 CH

EBGN 320 Economics and Technology - 3.0 CH

EBGN 330 Energy Economics - 3.0 CH

EBGN 340 Energy and Environmental Policy - 3.0 CH

EBGN 401 Advanced Topics in Economics - 3.0 CH

EBGN 430 Advanced Energy Economics - 3.0 CH

EBGN 434 Property Rights and Natural Resources - 3.0 CH

EBGN 437 Regional Economics - 3.0 CH

EBGN 441 International Economics - 3.0 CH

EBGN 443 Public Economics - 3.0 CH

EBGN 470 Environmental Economics - 3.0 CH

EDNS 315 Engineering for Social and Environmental Responsibility - 3.0 CH

EDNS 375 Engineering Cultures - 3.0 CH

EDNS 430 Corporate Social Responsibility - 3.0 CH

EDNS 475 Engineering Cultures in the Developing World - 3.0 CH

EDNS 477 Engineering and Sustainable Community Development - 3.0 CH

EDNS 478 Engineering and Social Justice - 3.0 CH

EDNS 479 Community-Based Research - 3.0 CH

EDNS 480 Anthropology of Development - 3.0 CH

MNGN 335 Communitites and Natural Resource Development - 3.0 CH

PEGN 430 Environmental Law and Sustainability - 3.0 CH

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Undergraduate Program Flowchart in
ENGINEERING, DESIGN, & SOCIETY

Bachelor of Science in Design Engineering Electives (2023-2024)

ENGINEERING ELECTIVES

(Must take a TOTAL of 15 CH to fulfill degree)

Chemical Engineering:
CBEN 308 Heat Transfer - 3.0 CH
CBEN 310 Intro to Biomedical Engineering - 3.0 CH
CBEN 312 Unit Operations Lab - 3.0 CH
CBEN 313 Unit Operations Lab - 3.0 CH
CBEN 314 Chemical Engineering Heat and Mass Transfer - 4.0 CH
CBEN 315 Introduction to Electrochemical Engineering - 3.0 CH
CBEN 357 Chemical Engineering Thermodynamics - 3.0 CH
CBEN 358 Chemical Engineering Thermodynamics Lab - 1.0 CH
CBEN 360 Bioprocess Engineering - 3.0 CH
CBEN 365 Introduction to Chemical Engineering Practice - 3.0 CH
CBEN 372 Introduction to Bioenergy - 3.0 CH
CBEN 375 Chemical Engineering Separations - 3.0 CH
CBEN 401 Process Optimization - 3.0 CH
CBEN 403 Process Dynamics and Control - 3.0 CH
CBEN 408 Natural Gas Processing - 3.0 CH
CBEN 409 Petroleum Processes - 3.0 CH
CBEN 415 Polymer Science and Technology - 3.0 CH
CBEN 416 Polymer Engineering and Technology - 3.0 CH
CBEN 418 Kinetics and Reaction Engineering - 3.0 CH
CBEN 420 Mathematical Methods in Chemical Engineering - 3.0 CH
CBEN 422 Chemical Engineering Flow Assurance - 3.0 CH
CBEN 426 Advanced Functional Porous Materials - 3.0 CH
CBEN 430 Transport Phenomena - 3.0 CH
CBEN 432 Transport Phenomena in Biological Systems - 3.0 CH
CBEN 435 Interdisciplinary Microelectronics - 3.0 CH
CBEN 440 Molecular Perspectives in Chemical Engineering - 3.0 CH
CBEN 454 Applied Bioinformatics - 3.0 CH
CBEN 460 Biochemical Process Engineering - 3.0 CH
CBEN 461 Biochemical Process Engineering Lab - 1.0 CH
CBEN 469 Fuel Cell Science and Technology - 3.0 CH
CBEN 470 Introduction to Microfluidics - 3.0 CH
CBEN 472 Introduction to Energy Technologies - 3.0 CH
CBEN 480 Natural Gas Hydrates - 3.0 CH

Civil & Environmental Engineering:
CEEN 301 Fundamentals of Environmentals Engineering: Water - 3.0 CH
CEEN 302 Fundamentals of EnvE: Air and Waste Management - 3.0 CH
CEEN 303 Environmental Engineering Lab - 3.0 CH
CEEN 312 Soil Mechanics - 3.0 CH
CEEN 312L Soil Mechanics Lab - 1.0 CH
CEEN 314 Structural Theory - 3.0 CH
CEEN 315 Civil and Environmental Engineering Tools - 1.5 CH
CEEN 330 Engineering Field Session, Environmental - 3.0 CH
CEEN 331 Engineering Field Session, Civil - 3.0 CH
CEEN 350 Civil and Construction Engineering Materials - 3.0 CH
CEEN 360 Introduction to Construction Engineering - 3.0 CH
CEEN 381 Hydrology and Water Resources Engineering - 3.0 CH
CEEN 401 Life Cycle Assessment - 3.0 CH
CEEN 405 Numerical Methods for Engineers - 3.0 CH
CEEN 406 Finite Element Methods for Engineers - 3.0 CH
CEEN 410 Advanced Soil Mechanics - 3.0 CH
CEEN 411 Unsaturated Soil Mechanics - 3.0 CH
CEEN 415 Foundation Engineering - 3.0 CH
CEEN 419 Risk Assessment in Geotechnical Engineering - 3.0 CH
CEEN 421 Highway and Traffic Engineering - 3.0 CH
CEEN 423 Surveying for Engineering and Infrastructure Design - 3.0 CH
CEEN 425 Centitious Materials for Construction - 3.0 CH
CEEN 426 Durability of Concrete - 3.0 CH
CEEN 430 Advanced Structural Analysis - 3.0 CH
CEEN 433 Matrix Structual Analysis - 3.0 CH
CEEN 441 Introduction to the Seismic Design of Structures - 3.0 CH
CEEN 442 Timber and Masonry Design - 3.0 CH
CEEN 443 Design of Steel Structures - 3.0 CH
CEEN 445 Design of Reinforced Concrete Structures - 3.0 CH
CEEN 446 Structural Loads - 3.0 CH
CEEN 461 Fundamentals of Ecology - 3.0 CH
CEEN 470 Water and Wastewater Treatment Processes - 3.0 CH
CEEN 471 Water and Wastewater Treatment Sys. Design - 3.0 CH
CEEN 472 Onsite Water Reclamation and Reuse - 3.0 CH
CEEN 473 Hydraulic Problems - 3.0 CH
CEEN 475 Site Remediation Engineering - 3.0 CH
CEEN 477 Sustainable Engineering Design - 3.0 CH
CEEN 479 Air Pollution - 3.0 CH
CEEN 480 Chemical Fate and Transport in the Environment - 3.0 CH
CEEN 482 Hydrology and Water Resources Lab - 3.0 CH

Computer Science:
CSCI 303 Introcution to Data Science - 3.0 CH
CSCI 306 Software Engineering - 3.0 CH
CSCI 341 Computer Organization - 3.0 CH
CSCI 370 Advanced Software Engineering - 4.5 CH
CSCI 400 Principles of Programming Languages - 3.0 CH
CSCI 403 Data Base Management - 3.0 CH
CSCI 404 Artificial Intelligence - 3.0 CH
CSCI 410 Elements of Computing Systems - 3.0 CH
CSCI 422 User Interfaces - 3.0 CH
CSCI 423 Computer Simulation - 3.0 CH
CSCI 425 Compiler Design - 3.0 CH
CSCI 436 Human-Robot Interaction - 3.0 CH
CSCI 437 Introduction to Computer Vision - 3.0 CH
CSCI 440 Parallel Computing for Scientists and Engineers - 3.0 CH
CSCI 442 Operating Systems - 3.0 CH
CSCI 443 Advanced Programming Concepts Using Java - 3.0 CH
CSCI 448 Mobile Application Development - 3.0 CH
CSCI 455 Game Theory and Networks - 3.0 CH
CSCI 470 Introduction to Machine Learning - 3.0 CH
CSCI 471 Computer Networks I - 3.0 CH
CSCI 473 Human-Centered Robotics - 3.0 CH
CSCI 475 Information Security and Privacy - 3.0 CH
CSCI 477 Elements of Games and Game Development - 3.0 CH
CSCI 478 Introducton to Bioinformatics - 3.0 CH

Electrical Engineering & Electronics:
EENG 307 Introduction to Feedback Control Systems - 3.0 CH
EENG 310 Information Systems Science I - 4.0 CH
EENG 311 Information Systems Science II - 3.0 CH
EENG 350 Systems Exploration and Engineering Design Lab - 2.0 CH
EENG 383 Embedded Systems - 4.0 CH
EENG 385 Electronic Devices and Circuits - 4.0 CH
EENG 386 Fundamentals of Engineering Electromagnetics - 3.0 CH
EENG 389 Fundamentals of Electric Machinery - 4.0 CH
EENG 390 Energy, Electricity, Renewable Engy and Elect Pwr Grid - 3.0 CH
EENG 411 Digital Signal Processing - 3.0 CH
EENG 413 Analog and Digital Communications Systems - 4.0 CH
EENG 415 Data Science for Electrical Engineering - 3.0 CH
EENG 417 Modern Control Design - 3.0 CH
EENG 423 Introduction to VLSI Design - 3.0 CH
EENG 425 Introduction to Antennas - 3.0 CH
EENG 427 Wireless Communications - 3.0 CH
EENG 428 Computational Electromagnetics - 3.0 CH
EENG 429 Active RF & Microwave Devices - 3.0 CH
EENG 430 Passive RF & Microwave Devices - 3.0 CH
EENG 437 Introduction to Computer Vision - 3.0 CH
EENG 470 Introduction to High Power Electronics - 3.0 CH
EENG 475 Interconnection of Renewable Engy, Int Pwr Sys and Pwr Qual - 3.0 CH
EENG 480 Power Systems Analysis - 3.0 CH
EENG 481 Analysis and Design of Advanced Energy Systems - 3.0 CH
EENG 486 Electromagnetic Fields and Waves - 3.0 CH
EENG 489 Computational Methods in Energy Sys and Power Electronics - 3.0 CH
PHGN 317 Semiconductor Circuits - Digital - 3.0 CH

Engineering, Design, & Society:
EDNS 401 Projects for People - 3.0 CH

Geological Engineering:
GEGN 307 Petrology - 3.0 CH
GEGN 316 Field Geology - 6.0 CH
GEGN 342 Engineering Geomorphology - 3.0 CH
GEGN 466 Groundwater Engineering - 3.0 CH
GEGN 467 Groundwater Engineering - 4.0 CH
GEGN 468 Engineering Geology and Geotechnics - 4.0 CH
GEGN 469 Engineering Geology Design - 3.0 CH
GEGN 470 Ground-Water Engineering Design - 3.0 CH
GEGN 475 Applications of Geogrphic Information Systems - 3.0 CH
GEGN 483 Mathematical Modeling of Groundwater Systems - 3.0 CH

Geology:
GEOL 308 Introductory Applied Structural Geology - 3.0 CH
GEOL 310 Earth Materials - 3.0 CH
GEOL 311 Mining Geology - 3.0 CH
GEOL 315 Sedimentology and Stratigraphy - 3.0 CH
GEOL 321 Mineralogy and Mineral Characterization - 3.0 CH
GEOL 470 Applications of Satellite Remote Sensing - 3.0 CH

MINES | Design Engineering

Undergraduate Program Flowchart in
ENGINEERING, DESIGN, & SOCIETY

Bachelor of Science in Design Engineering Electives (2023-2024)

ENGINEERING ELECTIVES

(Must take a TOTAL of 15 CH to fulfill degree)

Mechanical Engineering:

MEGN 315 Dynamics - 3.0 CH
MEGN 324 Introduction to Finite Element Analysis - 3.0 CH
MEGN 381 Manufacturing Processes - 3.0 CH
MEGN 391 Automotive Design: SAE Collegiate Design Series - 3.0 CH
MEGN 412 Advanced Mechancis of Materials - 3.0 CH
MEGN 414 Mechanices of Composite Materials - 3.0 CH
MEGN 416 Engineering Vibration - 3.0 CH
MEGN 417 Vehicle Dynamics & Powertrain Systems - 3.0 CH
MEGN 430 Musculoskeletal Biomechanics - 3.0 CH
MEGN 435 Modeling and Simulation of Human Movement - 3.0 CH
MEGN 436 Computational Biomechanics - 3.0 CH
MEGN 441 Introduction to Robotics - 3.0 CH
MEGN 451 Fluid Mechanics II - Aerodynamics - 3.0 CH
MEGN 461 Thermodynamics II - 3.0 CH
MEGN 466 Introduction to Internal Combustion Engines - 3.0 CH
MEGN 467 Principles of Building Science - 3.0 CH
MEGN 469 Fuel Cell Science and Technology - 3.0 CH
MEGN 471 Heat Transfer - 3.0 CH
MEGN 481 Machine Design - 3.0 CH

Metallurgical and Materials Engineering:

MTGN 334 Chemical Processing of Materials - 3.0 CH
MTGN 314 Properties and Processing of Ceramics - 2.0 CH
MTGN 314L Properties and Processing of Ceramics Lab - 1.0 CH
MTGN 315 Electrical Properties and Application of Materials - 3.0 CH
MTGN 334L Chemical Processing of Materials Lab - 1.0 CH
MTGN 348 Microstructural Development - 3.0 CH
MTGN 348L Microstructural Development Lab - 1.0 CH
MTGN 350 Statistical Process Control and Design of Experiments - 3.0 CH
MTGN 352 Metallurgical and Materials Kinetics - 3.0 CH
MTGN 414 Advanced Processing and Sintering of Ceramics - 3.0 CH
MTGN 419 Non-Crystalline Materials - 3.0 CH
MTGN 429 Metallurgical Environment - 3.0 CH
MTGN 430 Physical Chemistry of Iron and Steelmaking - 3.0 CH
MTGN 431 Hydro- and Electro-Metallurgy - 3.0 CH
MTGN 442 Engineering Alloys - 3.0 CH
MTGN 445 Mechanical Properties of Materials - 3.0 CH
MTGN 445L Mechanical Properties of Materials Lab - 1.0 CH
MTGN 451 Corrosion Engineering - 3.0 CH
MTGN 456 Electron Microscopy - 2.0 CH
MTGN 456L Electron Microscopy Lab - 1.0 CH
MTGN 461 Transport Phenomena and Reactor Design - 3.0 CH
MTGN 465 Mechanical Properties of Ceramics - 3.0 CH
MTGN 467 Materials Design: Synthesis, Charact., and Selection - 2.0 CH
MTGN 468 Materials Design: Synthesis, Charact., and Selection - 2.0 CH
MTGN 469 Fuel Cell Science and Technology - 3.0 CH
MTGN 472 Biomaterials I - 3.0 CH
MTGN 473 Computational Materials - 3.0 CH
MTGN 475 Metallurgy of Welding - 2.0 CH
MTGN 475L Metallurgy of Welding Lab - 1.0 CH

Mining:

MNGN 310 Earth Materials - 3.0 CH
MNGN 311 Mining Geology - 3.0 CH
MNGN 312 Surface Mine Design - 3.0 CH
MNGN 314 Underground Mine Design - 3.0 CH
MNGN 316 Coal Mining Methods - 3.0 CH
MNGN 317 Dynamics for Mining Engineers - 1.0 CH
MNGN 321 Introduction to Rock Mechanics - 3.0 CH
MNGN 333 Explosives Engineering I - 3.0 CH
MNGN 350 Introduction to Geothermal Energy - 3.0 CH
MNGN 406 Design and Support of Underground Excavations - 3.0 CH
MNGN 408 Underground Design and Construction - 2.0 CH
MNGN 414 Mine Plant Design - 3.0 CH
MNGN 418 Advanced Rock Mechanics - 3.0 CH
MNGN 422 Flotation - 2.0 CH
MNGN 424 Mine Ventilation - 3.0 CH
MNGN 431 Mining and Metallurgical Environment - 3.0 CH
MNGN 433 Mine Systems Analysis I - 3.0 CH
MNGN 436 Underground Coal Mine Design - 3.0 CH
MNGN 461 Transport Phenomena and Reactor Design - 3.0 CH

Petroleum Engineering:

PEGN 305 Computational Methods in Petroleum Engineering - 2.0 CH
PEGN 308 Reservoir Rock Properties - 3.0 CH
PEGN 311 Drilling Engineering - 3.0 CH
PEGN 312 Properties of Petroleum Engineering Fluids - 3.0 CH
PEGN 411 Mechanics of Petroleum Production - 3.0 CH
PEGN 414 Well Testing and Analysis - 3.0 CH
PEGN 419 Well Log Analysis and Formation Evaluation - 3.0 CH
PEGN 423 Petroleum Reservoir Engineering I - 3.0 CH
PEGN 424 Petroleum Reservoir Engineering II - 3.0 CH
PEGN 426 Formation Damage and Stimulation - 3.0 CH
PEGN 438 Petroleum Data Analytics - 3.0 CH
PEGN 460 Flowe in Pipe Networks - 3.0 CH
PEGN 461 Surface Facilities Design and Operation - 3.0 CH
PEGN 490 Reservoir Geomechanics - 3.0 CH

FOCUS AREA ELECTIVES

(Must take a TOTAL of 18 CH to fulfill degree)

Individualized: Speak to your advisor about Focus Area elective plans