CONCENTRATIONS WITHIN THE BSEChE PROGRAM
June 2020

All concentrations consist of 12 credits and must include at least one 300 or 400 level course. Only engineering and general electives can be used as part of a concentration. Up to three research credits in a related area can count toward a concentration with Britannia Smith’s approval. Contact her for approval of any other courses. Courses taken for a concentration cannot be taken Pass/Fail. Concentrations are not available to students pursuing dual degrees or SUGS masters in the same area. Student must earn a C- or better in all courses counting towards a concentration and must earn a 2.0 or above overall concentration GPA.

Conc. In BioPharmaceutical Engineering
12 credits total, including at least 1 course each from categories A, B, & C:

Category A: BioPharm Science and Engineering
- CHE 517/PharmSci 717 Biopharm engineering (3 cr.)
- CHE/Pharm 519 Modern pharmaceutical engr (3 cr.)
- PIBS 601 Principles of pharmacology (3 cr.)
- CHE 497 Solids handling (3 cr.)
- CHE 496/696 Introduction to Synthetic Biology (3 cr.)
- CHE 696 Principles & Predictions of Drug Distribution (3 cr.)
- CHE 574 Engr principles in drug delivery and targeting (3 cr.)
- Biochem 415/515 Introductory biochemistry (3 cr.), or Chem 351 (4 cr.), MCDB 310 (3 cr.)
- BME 410 Design & applcns of biomaterials (3 cr.)
- Pharm Sci 608 Pharmacokinetic concepts & applns (4 cr.)
- PIBS 621 Translational pharmacology (2 cr.)

Category B: Applied Statistics and Math
- CHE 431 Engineering stats & problem solving (3 cr.)
- Stat 412 Intro to probability and statistics (3 cr.)
- Stat 470 Intro to design of experiments (4 cr. w/ Instructor permission)
- Stat 570 Design of experiments (3 cr.)
- Math 419 Linear spaces and matrix theory (3 cr.)
- Math 217 Linear Algebra (4 cr alternative-Math 419)
- IOE 460 Decision analysis (3 cr.)

Category C: Regulatory Science
- CHE/Pharm 597 Regulatory sci. for sci and engrs (2 cr.)
- BME/CHE 588 Globl qual syst & regulatory innovat (2 cr.)
- BL 319 Intellectual property law (3 cr.)

Other Relevant Courses
- BME 500 BME Seminar (1 cr.)
- CHE 407 Chem Process Safety Risk Manag. (2 cr.)
- IOE 436 Human Factors (3 cr.)
- IOE 813 Provid. better hlthcare thru syst engr (2 cr.)
- Psych 449 Decision processes (3 cr.)

Concentration in Electrical Engineering
NOTE: EECS students are given priority in enrollment.

Required Courses – 4 credits:
- EECS 215 Intro to electronic circuits (4 cr. preferred) or EECS 314 Electrical circuits, systems, & appl'n's (4 cr.)

Technical Electives - 8 credits.
- Process Controls:
  - EECS 216 Intro to Signals & Systems (4cr.)
  - EECS 460 Control Systems Analysis & Design (4cr.)
  - EECS 461 Embedded Control Systems (4cr.)

- Electronic Devices:
  - EECS 320 Intro to semiconductor devices (4 cr.)
  - EECS 414 Introduction to MEMS (4 cr.)
  - EECS 421 Properties of transistors (4 cr.)
  - EECS 423 Solid-state device laboratory (4 cr.)
  - EECS 429 Semiconductor optoelectronic devices (4 cr.)

Concentration in Energy Systems Engineering

Technical Electives - 9 credits. Select from:
- AERO 533/ Combustion processes
- ENSCEN 533 (3 cr., requires AEROSP 225)
- CEE 567/ Energy infrastructure systems (3 cr.)
- ESEng 567
- CHE 496 Hydrogen tech: prod’n & storage (3 cr.)
- CHE 496 Fuel processors & fuel cells (3 cr.)
- CHE 496 Solar Energy Conversion (3 cr.)
- ME 432 Combustion (3 cr., req’s ME 336, 320)
- ME 433/ Adv. energy solutions (3 cr., req. ME 235)
- AUTO 533
- ME 438 Internal combustion engines (4 cr.)
- ME 538 Advanced IC Engines (3 cr.)
- ME 539 Heat transfer physics (3 cr., req. ME 235 and ME 335)
- ME 571/ Energy generation & storage using
  - ESEng 505 modern materials (3 cr.)
  - NERS 250/ Fundamentals of nuclear energy &
  - ENSCEN 211 Radiological sciences (4 cr.)

Policy/law course – 3 credits. Select from:
- ESENG 501 Seminars on energy systems, tech., and policy (3 cr.)
- NRE 475 / EHS 588/ Environ 475
- NRE/BE 527 Energy markets and politics (3 cr.)
- PubPol 250 Soc. systems, energy, & pub policy (3 cr.)
- PubPol 468/ Environ 468
- PubPol 481 Science, tech., & pub policy (3 cr.)
- PubPol 519/EAS Sustainable Energy Systems (3 cr.)
- 574/RCNSCI 419

Concentration in Environmental Engineering

Technical elective - 9 credits. Select from:
(sustainability-focused courses are underlined)
- CEE 265 Sustainable engineering principles (3 cr.)
- CEE 365 Enviro engr principles (4 cr.)
- CEE 366 Enviro engr lab (2 cr. reqs CEE 270 and 365)
- CEE 428 Groundwater hydrology (3 cr., requires CEE 265 and CEE 325 or equivalent)
- CEE 465 Environ process engr (3 cr., requires CEE 325 and CEE 365)
- CEE 480 Design of enviro. engr systems (3 cr.)
- CEE 481 Aquatic chemistry (3 cr.)
- CEE 482 Enviro microbiology (3 cr., requires CEE 325 and 365)
- CEE 501-7 Wind energy development, engr. & construction
- CEE 501-14 Greenhouse gas control (3 cr.)
- CEE 526 Design of hydraulic systems (3 cr., requires CEE 325 or equivalent)
- CEE 563 Air quality engineering fundamentals (3 cr.)
- CEE 586 Industrial ecology (3 - 4 cr., sr. std.)
- CEE 589/ Risk and benefit analysis in enviro engr (3 cr., sr. std.)
- NRE 595
- CEE 686 Case studies in environ sustainability (2-3 cr., sr std)
- CEE 686-001 Enviro finance (3 cr.)
Concentration in the Life Sciences

Required Course:
- MCD 310 Intro biochem (3 cr.) or Bio 351 (4 cr.) or Bio 415/515 (3 cr.)

Technical Electives - 8 or 9 credits, for 12 credits total:
- Biology 205 Developmental biology (3 cr.)
- Biology 207 Intro microbiology (4 cr.)
- Biology 208 Embryology (3 cr.)
- Biology 222 Intro to neurobiology (3 cr.)
- Biology 225 Principles of animal physiology (3 cr.)
- Biology 301 Genetics (3 cr.)
- ChE 418 Quantitative cell biology (3 cr.)
- ChE 419 Quantitative physiology (4 cr.)
- ChE 476 Biofluid mechanics (4 cr.)
- CBE 479/476 Biopharm engineering (3 cr.)

Concentration in the Mechanical Engineering

Required Courses:
- ME 211 Intro to solid mechanics (4 cr.)
- ME 240 Intro to dynamics and vibrations (4 cr.)

Technical Electives - 4 credits. Select from:
- ME 311 Strength of materials (3 cr.)
- ME 350 Design and manufacturing II (4 cr. requires ME 211, 240 and 250)
- ME 382 Mechanical Behavior of Materials (4 cr. requires ME 211)
- ME 400 Mechanical engr analysis (3 cr.)
- ME 401 Statistical quality control & design (3 cr.)
- ME 420 Fluid mechanics II (3 cr., requires ME 320)
- ME 432 Combustion (3 cr., reqs ME 336 & 320)
- ME 440 Intermediate dynamics & vibrations (4 cr.)
- ME 476 Biofluid Mechanics (4 cr. requires ME 320)

Concentration in Nuclear Engineering

Required Courses:
- NERS 250 Fundamentals of NERS (4 cr.)
- NERS 311 Elements of NERS I (3 cr.)
- NERS 312 Elements of NERS II (3 cr.)

At least 2 additional credits, which require the above 3 courses. Choose from:
- NERS 421 Nuclear engineering materials (3 cr.)
- NERS 425 Applications of radiation (4 cr.)
- NERS 441 Nuclear reactor theory I (4 cr. reqs NERS 312 and Math 454)

Conc. in Petroleum and Gas Exploration

To include 3 lecture courses, composed of at least 3 credits of 300 level or higher EARTH courses and 3 credits of 300 level or higher CEE courses. Only one of Earth 116 or Earth 119 can count toward the concentration.

Earth 116/  Introductory geology (5 cr.)
Earth 118  Introductory geology laboratory (1 cr.)
Earth 119  Introductory geology lecture (4 cr.)
Earth 284  Environmental geology (4 cr.)
Earth 305  Earth’s surface & sediments (4 cr., requires intro geology course)
Earth 310  Geochemistry of the solid earth (4 cr. requires intro geology course)
Earth 314  Global & applied geophysics (4 cr.)
Earth 351  Earth structure (4 cr.)
Earth 380  Mineral resources, econ, & the environment (4 cr.)
Earth 422  Principles of geochemistry, econ & the environment (4 cr.)
Earth 467  Stratigraphy & basis analysis (4 cr. requires introductory geology course)
Earth 477  Hydrogeology (4 cr.)
CEE 345  Geotechnical engineering (4 cr.)
CEE 428/  Groundwater hydrology (3 cr.)
Enscen 428
CEE 446  Engr geology & site characterization (3 cr., requires CEE 345)
CEE 522  Sediment transport (3 cr.)
CEE 527  Coastal hydraulics (3 cr.)
CEE 528/  Flow and transport in porous media (3 cr., requires CEE 428 or equivalent)
CE 535  Excavation and tunneling (3 cr.)

Check web for updates at: www.engl.unl.edu/che/undergraduate/program