# UNIVERSITY OF Nebraska Lincoln

*Pioneering new frontiers.*

Bachelor of Science in

# Computer Science

Advising Brochure
## 2015 − 2016

Department of

## Computer Science & Engineering
## College of Arts & Sciences

**256 Avery Hall**

*advising@cse.unl.edu*
*http://cse.unl.edu/advising*

**The B.S. Degree in Computer Science is accredited by
the Computing Accreditation Commission of ABET.**
*http://www.abet.org*

rev: June 9, 2015

# Computer Science Major Requirements
## 72-73 Hours of CSCE, MATH, and Natural Science Courses

**Computer Science & Engineering Courses:** (45-46 hours)

- max 6 hrs P/NP for CSCE with permission (3 for MATH if minor)
- min 13 hrs of CSCE/RAIK/MATH @ 400 level
- min grade of C for CSCE/RAIK/minors
- for our graduate program: + prereq; ! deficiency

|   | Course | Title | Raikes RAIK | Raikes Hrs | Hrs |
|---|--------|-------|------|-----|-----|
|   | CSCE 10 | CSE Freshman Seminar |  | 0 | 0 |
| + | CSCE 155 | Introduction to Comp Sci I | 183H | 4 | 3 |
| + | CSCE 156 | Introduction to Comp sci II | 184H | 4 | 4 |
| + | CSCE 230 | Computer Organization |  | 4 | 4 |
| + | CSCE 235 | Introduction to Discrete Struct | (283H) | 0 | 3 |
|   | CSCE 251 | Unix Programming |  | 1 | 1 |
| + | CSCE 310 | Data Structures & Algos | 283H | 3 | 3 |
| ! | CSCE 322 | Programming Lang Concepts |  | 3 | 3 |
|   | CSCE 361 | Intro to Software Engineering | 383H | 3 | 3 |
|   | CSCE 486 | CS Professional Development | 381H | 3 | 3 |
|   | CSCE 487 | CS Senior Design Project | 402H | 3 | 3 |
| ! | CSCE 351/451 | OS Kernels or OS Principles |  | 3 | 3 |
|   | CSCE 423/428 | Des & An Algos or Automata |  | 3 | 3 |
|   | CSCE 3/4 ___ | *Technical Elective - lecture* | 411H | 3 | 3 |
|   | CSCE 3/4 ___ | *Technical Elective - lecture* | 475H | 3 | 3 |
|   | CSCE 3/4 ___ | *Technical Elective* | 301H | 3 | 3 |
|   |  | (Raikes only *Technical Elective*) | 401H | 3 | 0 |
|   |  |  |  | 46 | 45 |

**Mathematics Courses:**

|   |   |   |   |
|---|---|---|---|
| + | MATH 106 | Calculus I | 5 |
| + | MATH 107 | Calculus II | 4 |
| ! | MATH 314 | Linear Alg (Matrix Theory) | 3 |
| ! | STAT 380 | Statistics & Applications | 3 |

Add MATH 208 Calculus III (4 hr) for Math Minor! — 15

**Natural Science Courses:** 12

Most are 4 hours so need at least 3 courses. Must include at least one lab (**bold face**). Choose from the following (or more advanced):

- CHEM **109** & **110** or **113** & 114 and **221**, 261/**262**, 263/**264**
- PHYS 211/**221**, 212/**222**, 213/**223**          ASTR 204/**224**
- LIFE 120/**120L**, 121/**121L**          BIOS 206/**205**, **207**
- GEOL **101**, **103**, **210**, **211**, **310**, **340**
- METR **100**, 205, **223**, 311, 312, **323**, **341**
- GEOG **155**, 181
- ANTH 242/**242L**

# CSCE Technical Electives

**Informatics Focus:**

| | | |
|---|---|---|
| 411 | Data Modeling for Sys Dev | ? |
| 411H | (Raikes Data Mod for Sys Dev) | s |
| 413 | Database Systems | f |
| 464 | Internet Systems & Programming | s |
| 470 | Computer Graphics | f(not 17) |
| 471 | Bioinformatics | so |
| 472 | Digital Image Processing | f(not 15) |
| 473 | Computer Vision | so |
| 474 | Data Mining | se |

**Artificial Intelligence Focus:**

| | | |
|---|---|---|
| 421 | Foundations of Constraint Sat Theory | fo |
| 475 | Multiagent Systems | fe |
| 475H | (Raikes Multiagent Systems) | s |
| 476 | Artificial Intelligence | s |
| 478 | Machine Learning | fe |

**Networking & High-End Computing Focus:**

| | | |
|---|---|---|
| 351 | Operating System Kernels | f |
| 430 | Computer Architecture (grad school def.) | s |
| 432 | High Performance Proc. Archs | ? |
| 434 | VLSI Design | s18... |
| 435 | Cluster & Grid Computing | fo |
| 436 | Advanced Embedded Systems | fo |
| 437 | File & Storage Systems | ? |
| 438 | Sensor Networks | f18 |
| 439 | Robotics | fo |
| 451 | Operating System Principles | s |
| 455 | Distributed Operating Systems | so |
| 456 | Parallel Algorithms & Programming | fe |
| 457 | Systems Administration | fo |
| 462 | Communication Networks | s |
| 463 | Data & Network Security | se(not 16) |
| 465 | Wireless Communication Networks | ? |

**Foundations Focus:**

| | | |
|---|---|---|
| 421 | Foundations of Constraint Sat Theory | fo |
| 423 | Design & Analysis of Algorithms | s+fo |
| 424 | Computational Complexity Theory | se |
| 428 | Automata, Computation & Formal Languages | f+so |
| 440 | Numerical Analysis | f |
| 477 | Cryptography & Computer Security | f |

**Software Engineering Focus:**

| | | |
|---|---|---|
| 378 | Human Computer Interaction | s |
| 425 | Compiler Construction | f |
| 461 | Software Engineering II | ? |
| 464 | Internet Systems & Programming | f+s15 |
| 493 | ILab Project (or 301/2,401/2 DS) | f/s |

**Additional Choices:**

| | | |
|---|---|---|
| 399H | Honors Thesis | fssu |
| 491 & 498 | Internship & Computer Problems | fssu |

# Recent CSCE 496 Special Topics Electives

| Title | Focus Area |
|---|---|
| Adv Topics in Software Engr (fe) | Software Engr |
| AI and Heuristics in Software Engr (s16) | Software Engr |
| Computational Methods in Bioinfo (f) | Informatics |
| Coordination in Global Software Dev (so) | Software Engr |
| Genetically Engineered Sys (f) | Networking & High End |
| Human-Robot Interaction (f) | Networking & High End |
| Multiway Data Analysis (se) | Informatics |
| Queuing Models (f17) | Foundations |
| Self-Managing Comp Sys (f18) | Networking & High End |

# Math Courses as Technical Electives

Math will accept one of the following CSCE courses as a Math major elective: CSCE 421, 423, 424, 428, 463. Since CS majors must take CSCE 423 or 428, this double-dipping for double majors is automatic.

Similarly, one (non-crosslisted) math course from the following list can be used as a technical elective for Computer Science, thus potentially double-dipping for a double major. Crosslisted courses may always double dip.

| | | |
|---|---|---|
| MATH 428 | Principles of Operations Research | s |
| MATH 432 | Linear Optimization | ? |
| MATH 433 | Nonlinear Optimization | se |
| MATH 439 | Math Models in Biology | s |
| MATH 450 | Combinatorics | fo |
| MATH 452 | Graph Theory | fe |
| MATH/CSCE 440 | Numerical Analysis | f |
| MATH/CSCE 441 | Approximation of Functions | ? |
| MATH/CSCE 447 | Numerical Analysis II | se |

# Recent Changes in the Program

ACE has been in effect since 2009. Beginning in 2012 the number of hours for the degree dropped from 125 to 120. Also, the College Distribution (CD) Requirement dropped the second course in History/Humanities.

Beginning in 2013, a restriction was placed on the choices for technical electives: At least 6 of the hours now need to be in lecture-based courses. This limits the number of internship, indedendent study, and Design Studio courses that can apply to just 3 hours.

In 2014 a zero credit hour CSCE 10 Orientation course was added to the requirements.

# Computer Science Major Requirements
## Major, Minor, plus 27-43 Hours of ACE and CDR Courses

**I. Major Area of Study:** 72-73 hours

| | |
|---|---|
| Computer Science | 45-46 |
| (Earn an optional **Focus** with all 3 technical electives in one area) | |
| Mathematics | 15 |
| Natural Science | 12 |

**II. Minor Area of Study:** Suggest MATH 208

| | |
|---|---|
| to complete the Mathematics minor! | 4-18 |

**III. ACE Student Learning Outcomes:** 6-18 hours

Max of 9 hrs in any one depart for ACE 4-10    **Raikes**

| | | | |
|---|---|---|---|
| 1. | Written Communication | – | 3 |
| 2. | Oral Communication | – | 3 |
| 3. | Math & Computation (all in major) | – | – |
| 4. | Natural Sciences (all in major) | – | – |
| 5. | Humanities/History | 3 | 3 |
| 6. | Social Sciences | – | 3 |
| 7. | Fine Arts | – | 3 |
| 8. | Ethics (all in major) | – | – |
| 9. | Human Diversity | 3 | 3 |
| 10. | Integrated Knowledge (all in major) | – | – |

See *http://ace.unl.edu/* for details and listings.

**IV. College Distribution Requirements:** 9-25 hours

(In addition to and distinct from ACE)

| | | |
|---|---|---|
| A. | Written Communication (another ACE 1) | 3 |
| B. | Math and Science (all in major) | – |
| C. | Humanities/History (CLAS,ENGL,HIST,PHIL,RELG) | 3 |
| D. | Social Sciences (ANTH,COMM,GEOG,POLS,PSYC,SOCI) | 3 |
| E. | Foreign Language $101_5, 102_5, 201_3, 202_3$ (need 6 hrs 200 level, 4 years HS, or ESL) | 0-16 |
| F. | Additional CD not from CSCE | – |

**V. Electives:** 0-17 hours      0-17

**Total hours for the degree:**      120

# Example Eight Semester Schedule - 120 hrs

| Fall 1 | | | | Spring 1 | | | |
|---|---|---|---|---|---|---|---|
| CSCE | 10 | CS Sem | 0 | CSCE | 156 | CS II | 4 |
| CSCE | 155 | CS I | 3 | CSCE | 235 | Discrete | 3 |
| MATH | 106 | Calc I | 5 | CSCE | 251 | Unix | 1 |
| | | ACE 1 | 3 | MATH | 107 | Calc II | 4 |
| Lang | 201 | Language | 3 | Lang | 202 | Language | 3 |
| | | | 14 | | | | 15 |

| Fall 2 | | | | Spring 2 | | | |
|---|---|---|---|---|---|---|---|
| CSCE | 310 | Algos | 3 | CSCE | 230 | Comp Org | 4 |
| Elect | | MATH 208? | 4 | CSCE | 361 | Soft Engr | 3 |
| NatSci | | (with lab) | 4 | MATH | 314 | Lin Alg | 3 |
| | | ACE 2 | 3 | NatSci | | (with lab) | 4 |
| | | CDR A | 3 | | | | 14 |
| | | | 17 | | | | |

| Fall 3 | | | | Spring 3 | | | |
|---|---|---|---|---|---|---|---|
| CSCE | 322 | Lang Conc | 3 | CSCE | 3/4XX | elective | 3 |
| STAT | 380 | Stats | 3 | CSCE | 3/4XX | elective | 3 |
| NatSci | | | 4 | | | CDR C | 3 |
| | | ACE 5 | 3 | | | CDR D | 3 |
| | | ACE 6 | 3 | | | ACE 7 | 3 |
| | | | 16 | | | | 15 |

| Fall 4 | | | | Spring 4 | | | |
|---|---|---|---|---|---|---|---|
| CSCE | 351 | or 428 | 3 | CSCE | 423 | or 451 | 3 |
| CSCE | 3/4XX | elective | 3 | CSCE | 487 | CS Sen Des | 3 |
| CSCE | 486 | CS Prof | 3 | | | ACE 9 | 3 |
| Elect | | | 3 | Elect | | | 3 |
| Elect | | | 3 | Elect | | | 2 |
| | | | 15 | | | | 14 |

**Departmental Advising:**

*http://cse.unl.edu/undergraduate-advising-center*

Charles Riedesel (Chief Advisor) 259 Avery, 472-3486, *chuckr@unl.edu*

Chris Bourke (Advisor) 363 Avery, 472-5008, *cbourke@cse.unl.edu*

Jeff Ifland (Advisor) 259 Avery Hallway, *jifland@cse.unl.edu*

Mohammad Hasan (Advisor) 123E Avery, *hasan@unl.edu*

Jenna Huttenmaier (Admin Coordinator) 269 Avery,
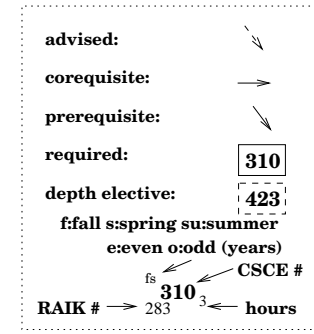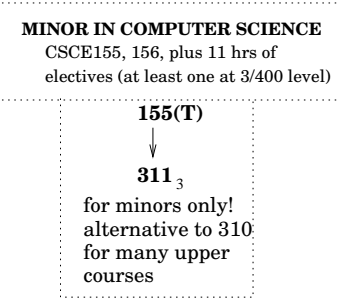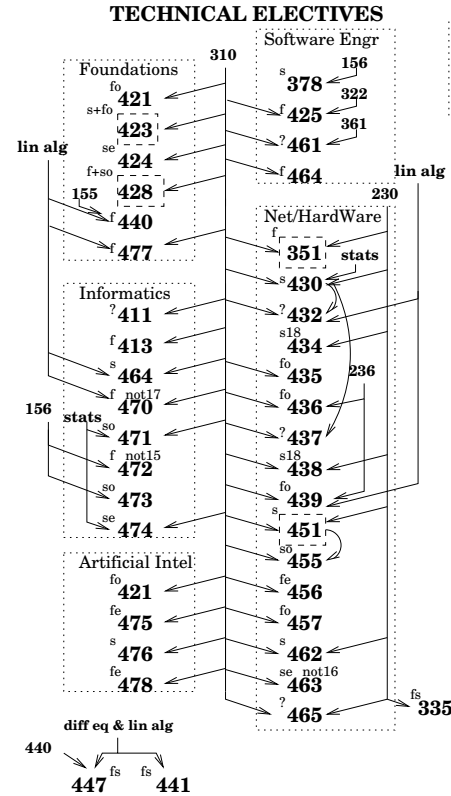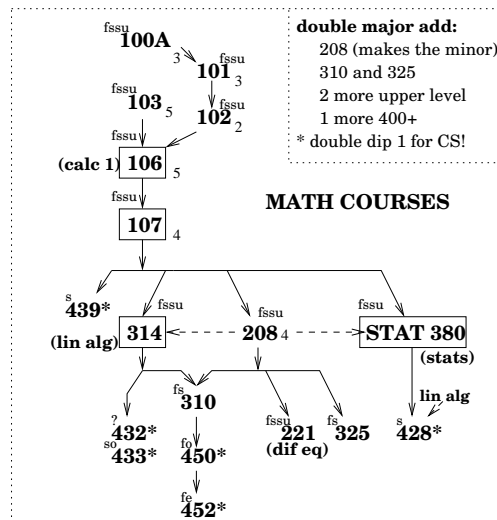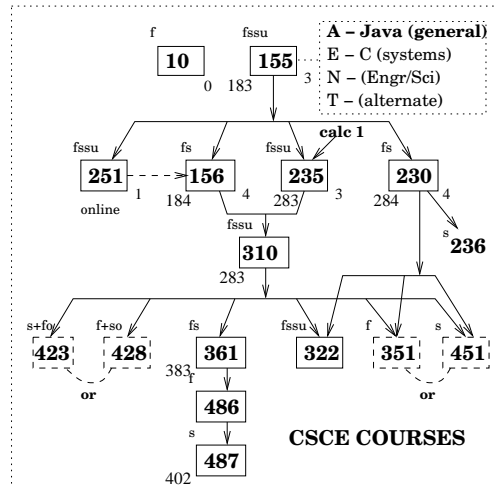*jenna.huttenmaier@unl.edu*

Ryan Patrick (Advisor) 365 Avery, 472-5089, *rypat@unl.edu*

**General College Advising:**

*Arts & Sciences Advising Center*, 107 Oldfather Hall 472-4190,
*http://cas.unl.edu/advisingcenter.html*

## TECHNICAL ELECTIVES

**CSCE COURSES**

A – Java (general)
E – C (systems)
N – (Engr/Sci)
T – (alternate)

f **10** 0    fssu **155** 183 3

calc 1

fssu **251** online 1    fs **156** 184    fssu **235** 283 3    fs **230** 284 4

s **236**

fssu **310** 283

s+fo **423**    f+so **428**    or    fs **361** 383 f    fssu **322**    f **351**    s **451**    or

**486**

s **487** 402

### Foundations
fo **421**
s+fo **423**
se **424**
f+so **428**
f **440**
f **477**

### Software Engr
310    s **378** 156
f **425** 322
? **461** 361
f **464**

lin alg    155    230    lin alg

### Informatics
? **411**
f **413**
s **464**
f not17 **470**
stats so **471**
f not15 **472**
so **473**
se **474**
156

### Net/HardWare
f **351** stats
s **430**
? **432**
s18 **434**
fo **435**
fo **436**
? **437**
s18 **438**
fo **439**
s **451**
so **455**
236

### Artificial Intel
fo **421**
fe **475**
s **476**
fe **478**
fe **456**
fo **457**
s **462**
se not16 **463**
? **465**
fs **335**

**diff eq & lin alg**
440    fs **447**    fs **441**

## MATH COURSES

fssu **100A** 3
fssu **101** 3
fssu **103** 5    fssu **102** 2
fssu (calc 1) **106** 5
fssu **107** 4

s **439*** (lin alg)    fssu **314**    fssu **208** 4    fssu **STAT 380** (stats)

**double major add:**
208 (makes the minor)
310 and 325
2 more upper level
1 more 400+
* double dip 1 for CS!

? **432***    fs **310**    fssu **221** (dif eq)    fs **325**    lin alg s **428***
so **433***    fo **450***
fe **452***

## MINOR IN COMPUTER SCIENCE
CSCE155, 156, plus 11 hrs of electives (at least one at 3/400 level)

**155(T)**

**311** 3
for minors only!
alternative to 310
for many upper
courses

**advised:**
**corequisite:**
**prerequisite:**
**required:**    **310**
**depth elective:**    **423**
**f:fall s:spring su:summer**
**e:even o:odd (years)**
fs **CSCE #**
RAIK # → 283 **310** 3 ← hours

## COMPUTER SCIENCE PROGRAM
### Computer Science & Engineering and Supporting Courses

See http://www.math.unl.edu/resources/undergraduate/mpe/ for Math Placement Exam

**rev 6/5/2015**