

ARTICULATION AGREEMENT

BETWEEN

LAKE SUPERIOR COLLEGE

AND

UNIVERSITY OF MINNESOTA, DULUTH

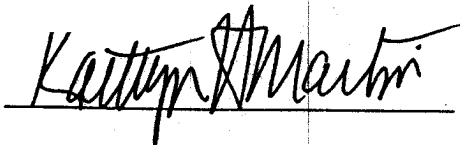
This agreement provides an articulation plan to create a career path for pre-engineering graduates of Lake Superior College to the engineering degree programs at the University of Minnesota, Duluth.

The plan for completion of the degree programs in Chemical Engineering, Industrial Engineering, and Electrical and Computer Engineering is laid out in detail in the attachments.

The effective date of this agreement is September 1, 1999. To ensure the success of the students and the currency of the requirements, this agreement will be reviewed annually.

University of Minnesota, Duluth

Lake Superior College



Kathryn A. Martin  
Chancellor

Kathleen Nelson  
President

\_\_\_\_\_ 3 Aug 1999 \_\_\_\_\_  
Date

\_\_\_\_\_ Aug. 20, 1999 \_\_\_\_\_  
Date

## 2+2 Program in Chemical Engineering

Listed below are the courses offered at Lake Superior College that apply to the Bachelor of Science degree in Chemical Engineering at the University of Minnesota Duluth. After successful completion of the listed LSC courses and the Minnesota Transfer Curriculum, students may complete the B. S. in Chemical Engineering with an additional two years of full-time study at UMD.

Lake Superior College Courses to Complete	cr.	UMD Requirements Satisfied by Lake Superior Courses	cr.
Engl 1106 Freshman Composition	3	Comp 1120 College Writing	3
Engr Engineering Problem Solving	3	CS 1135 Intro to Prog. In FORTRAN	2
Chem 1210 General Chemistry I	5	Chem 1151 General Chemistry I	5
Chem 1211 General Chemistry II	5	Chem 1152 General Chemistry II	5
Chem 2110 Organic Chemistry I	5	Chem 2521 Organic Chemistry I	4
Chem 2111 Organic Chemistry II	5	Adv. Chem Elective (Chem 2522)	4
Engr Statics	3	Engr 2015 Statics	2
Math 2204 Calculus I	5	Math 1296 Calculus I	5
Math 2205 Calculus II	5	Math 1297 Calculus II	5
Phys 2201 General Physics I	5	Phys 1201 Mechanics	4
Phys 2202 General Physics II	5	Phys 1202 Heat and Electricity	4
Liberal Ed. Electives (MN Transfer Curriculum)*	15	Liberal Education Electives	15

\*ChE program requires one elective each from Categories 6,7, & 8, two courses from Category 9

### ***Courses to Complete at UMD***

ChE 1011 Intro to Chemical Engineering	3	ChE 3211 Chemical Engineering Lab I	2
ChE 2011 Design of Eng. Experiments	3	ChE 3231 Prop. of Engineering Materials	3
ChE 2111 Material and Energy Balances	3	ChE 4111 Separations	3
ChE 2121 Chem. Eng. Thermodynamics	3	ChE 4211 Chemical Engineering Lab II	2
Chem 2222 Quantitative Analysis	4	ChE 4301 Chem. Reaction Engineering	3
Comp 3130 Advanced Writing: Engineering	3	ChE 4401 Process Control	3
Engr 2016 Mechanics of Materials	3	ChE 4501 Chem Engineering Design I	4
Engr 3201 Electrical Power	3	ChE 4502 Chem. Engineering Design II	4
Math 3280 Diff. Equat. w/ Linear Algebra	4	ChE electives I & II	6
ChE 3111 Fluid Mechanics	3	Chem 4641 Physical Chemistry I	4
ChE 3112 Heat and Mass Transfer	3	Adv. Lib. Ed. (Approved by Chem Eng. Dept.)	

### **Bachelor of Science In Chemical Engineering**

Chemical engineers develop new methods for the commercial production and control of such vital products as chemicals, minerals, and fossil fuels as well as the control of polluting and toxic substances. These professionals use their knowledge of materials, chemical reactions, and industrial processes to develop industrial and consumer products. Chemical engineers are experts on separation processes such as distillation, absorption, evaporation, and filtration. Chemical engineers build rewarding careers in industries, government agencies, and universities.

## Transfer Program in Electrical & Computer Engineering

Listed below are the courses offered at Lake Superior College that apply to the Bachelor of Science degree in Electrical & Computer Engineering at the University of Minnesota Duluth. After successful completion of the listed L-SC courses, students may complete the B. S. in E. C. E. with additional full-time study at UMD.

Lake Superior College Courses to Complete	cr.	UMD Requirements Satisfied by LSC Courses	cr.
Engl 1106 Freshman Composition	3	Comp 1120 College Writing	4
Chem 1210 General Chemistry I*	5	Chem 2172 General Chemistry*	4
Chem 1211 General Chemistry II*	5		
CIS 1620 C Programming Language	4	CS 1511 Computer Science 1	5
CIS 2621 C++ Programming Language	4	CS 1521 Computer Science 11	5
Econ 1160 Princ. of Economics: Micro	3	Econ 1023 Princ. of Economics: Micro	3
Math 2204 Calculus I	5	Math 1296 Calculus 1	5
Math 2205 Calculus II	5	Math 1297 Calculus 11	5
Math 2206 Multivariable Calculus	4	Math 3298 Calculus 111	4
Phys 2201 General Physics I	5	Phys 1201 Mechanics	4
Phys 2202 General Physics II	5	Phys 1204 Elec., Magnet., and Optics	5
Liberal Education Electives	12		

### *Courses to Completed at UMD*

ECE 1001 Introduction to ECE	2	ECE 3341 Digital Computer Circuits	4
ECE 1315 Digital System Design	4	ECE 3445 Electromagnetic Fields	3
ECE 2006 Electrical Circuit Analysis	4	ECE 4305 Computer Architecture	4
ECE 2325 Microcomputer System Design	4	ECE4899 Senior Project I	1
ECE 3611 Intro to Solid State Semicon.	3	ECE 4999 Senior Project II	3
Math 3280 Diff. Equations & Linear Algebra	4	ECE Technical Electives	6
Comp 3130 Adv. Writing Engineering	3	Stat 3611 Introduction to Statistics	4
CS 2111 Intro to Programming in C++	3	Engineering Breadth Course	
CS 2511 Software Development	4	ECE majors must complete 16 credits in liberal education categories 6-9.	
CS 5631 Operating Sys	4	Remaining Liberal Education	
ECE 2107 Circuits H	4		
ECE 2111 Linear Systems 4c Signal Anal.	4		
ECE 2212 Electronics I	4	*Students may prefer to take the one-semester Chem 2172 course at UMD	
ECE 3151 Control System	3		
BCE 3235 Electronics 11	4		

### **Bachelor of Science in Electrical & Computer Engineering**

This program of study combines topics from traditional electrical engineering with current topics that focus on computer design and analysis. Electrical and Computer Engineering is concerned with the theory, design and application of electrical phenomena and digital computers, including electronic circuits, signal analysis, system design and computer architecture. Minors in both mathematics and computer science are automatically satisfied with this major.

Lake Superior College  
University of Minnesota, Duluth

2 + 2 Program in Industrial Engineering

Listed below are the courses offered at Lake Superior College that apply to the Bachelor of Science in Industrial Engineering at the University of Minnesota, Duluth. After successful completion of the listed LSC courses, students may complete the B.S. in Industrial Engineering with an additional two years of full-time study at UMD.

Lake Superior College Courses to Complete	cr	UMD Requirements satisfied by LSC courses	cr
Engl 1106 Freshman Composition	3	Comp 1120 College Writing	3
Chem 1210 General Chemistry I	5	Chem 1151 General Chemistry I	5
CIS 1620 C Programming Language	4	CS 1151 Computer Science I	5
Econ 1160 Micro or 1150 Macro Economics	3	Econ 1023 Micro or 1022 Macro Economics	3
Engr 1430 Engineering CAD I	4	IE 1105 Intro to Engineering Design	3
Math 2204 Calculus I	5	Math 1296 Calculus I	5
Math 2205 Calculus II	5	Math 1297 Calculus II	5
Phys 2201 General Physics I	5	Phys 1201 Mechanics	4
Phys 2202 General Physics II	5	Phys 1202 Heat and Electricity	4
Liberal Education courses (IE requires one Liberal, Education course each from Cat. 7, 8 & two from Cat. 9)	12		

***Courses to be Completed at UMD:***

Engr 2015 Statics	3	E 3205 Project Management	3
Engr 2016 Mechanics of Materials	3	IE 3245 Manufacturing Processes II	4
Engr 2026 Dynamics	3	IE 3255 Statistical Quality Control	3
Engr 3201 Electrical Power	3	IE 3265 Production & Operation Mgmt	4
IE 1205 Intro to Manufacturing Engineering	3	IE 4115 Facility Planning and Simulation	4
IE 2105 Intro to Materials, Science	3	IE 4135 Automation & Robotics	3
Comp 3130 Advanced Writing: Engineering or Comp 313U Advanced Writing: Science	3	IE 4145 CAD/CAM	4
Math 3280 Differential Eq w/ Linear Algebra	4	IE 4175 Machine Design	3
Stat 3611 Intro Probability and Statistics	4	IE 4255 Design of Industrial Systems	3
IE 3105 Human Factors ~	4	IE 4235 Manufacturing Systems Integration	4
IE 3115 Operations Research	4	IE Approved Technical Electives	2
IE 3125 Engineering Economic Analysis	3	Approved advanced humanity or social science elective	3
IE 3135 Manufacturing Processes I	4		

***Bachelor of Science in Industrial Engineering:***

Industrial Engineering is concerned with the engineering of a product from its original conception through its design, manufacture, delivery, service, and support. Industrial engineers consider the economic, technical, and human factors in production and address the production issues of operations, management, safety, and quality control. Career fields are wide and varied, from ranging from design engineers to hospital administration.