

**Articulation Agreement  
between  
Normandale Community College, Bloomington, Minnesota  
and  
The Institute of Technology, The University of Minnesota,  
Minneapolis, Minnesota**

**Statement of Purpose**

This agreement has been entered into by Normandale Community College and The Institute of Technology, University of Minnesota, for the benefit of students and prospective students at the two institutions. The purpose of this agreement is to ensure programs of high academic quality, to encourage student achievement, and to facilitate credit transfer and a smooth transition from one related degree program to another. The attached appendices (A-J) describe the required programs of study at Normandale Community College, for admission eligibility to The Institute of Technology, The University of Minnesota, in engineering programs. This agreement identifies all required and equivalent courses at each institution.

**Terms and Conditions of Credit Transfer**

Students who complete the Associate of Science in Engineering Foundations at Normandale Community College may apply a minimum of 64 semester credits towards a degree in engineering in the Institute of Technology at the University of Minnesota, Minneapolis, Minnesota. This coursework includes science and mathematics requirements common to all engineering degrees. In addition, this AS in Engineering Foundations degree at Normandale includes the Minnesota Transfer Curriculum. Students from Normandale with this degree are exempt from additional lower-division general education courses unless the four-year degree requires additional program-specific lower division general education courses.

**Articulation Implementation and Agreement Review**

The Chief Academic Officer or designee of the collaborating institutions, shall be responsible for implementing this agreement, for identifying and incorporating any changes into subsequent agreements, and for conducting a periodic review of this agreement. The appendices may be updated as necessary, without re-negotiation of the articulation agreement in its entirety. This agreement becomes effective on October 1, 2001 and remains in effect unless terminated or amended by either party with prior written notice.

**Normandale Community College**

\_\_\_\_\_/S/\_\_\_\_\_  
Thomas Horak, President                      9/13/01  
Date

\_\_\_\_\_/S/\_\_\_\_\_  
David Mathieu, Vice President  
For Academic and Student Affairs                      9/13/01  
Date

\_\_\_\_\_/S/\_\_\_\_\_  
Julie Guelich, Dean of Natural  
Sciences and Mathematics                      9/13/01  
Date

**The Institute of Technology**

**The University of Minnesota**

\_\_\_\_\_/S/\_\_\_\_\_  
Peter Hudleston, Associate Dean  
Student Affairs                      10/17/01  
Date

\_\_\_\_\_/S/\_\_\_\_\_  
Benjamin Sharpe, Director  
Admissions                      10/17/01  
Date

## Appendix A: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Aerospace Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Aerospace Engineering and Mechanics (B.A.E.M) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I	4
PHYS 2250: Modern Physics	3	PHYS 2303: Physics III	4
ENGR 2235: Statics	3	AEM 2011: Statics	3
ENGR 2236: Dynamics	3	AEM 2012: Dynamics	3
CSCI 1111 or 1113 or 1203: C or C++ or Java	3 (or 4)	CSCI 1113: Introduction to C/C++ Programming for Scientists and Engineers	4
<b>TOTAL</b>	47 or 48		42

In addition to the above pre-maj or requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits.

**Total Credits: 65-67**

## Appendix B: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Biomedical Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Biomedical Engineering (B.Bm.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
CHEM 2061: Organic Chemistry I	5	CHEM 2301: Organic Chemistry I	3
MATH 2400: Probability and Statistics for Engineering and Science	4	STAT 3021: Introduction to Probability and Statistics	3
BIOL 1105: General Biology	4	BIOL 1009: General Biology	4
CSCI 1111 or 1113 or 1203: C or C++ or Java	3 (or 4)	CSCI 1113: Introduction to C/C++ Programming for Scientists and Engineers	4
<b>TOTAL</b>	56 or 57		46

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 74-76**

## Appendix C: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Biosystems and Agricultural Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Biosystems and Agricultural Engineering (B.B.A.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
MATH 2400: Probability and Statistics for Engineering and Science	4	STAT 3021: Introduction to Probability and Statistics	3
ENGR 2235: Statics	3	AEM 2011: Statics	3
ENGR 2236: Dynamics	3	AEM 2012: Dynamics	3
BIOL 1105: General Biology	4	BIOL 1009: General Biology	4
CSCI 1111 or 1113 or 1203: C or C++ or Java	3 (or 4)	CSCI 1113: Introduction to C/C++ Programming for Scientists and Engineers	4
<b>TOTAL</b>	57 or 58		49

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements..

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 75-77**

## Appendix D: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Chemical Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Chemical Engineering (B.Ch.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits,	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
CHEM 2061: Organic Chemistry I	5	CHEM 2301: Organic Chemistry I	3
CHEM 2062: Organic Chemistry II	5	CHEM 2302: Organic Chemistry II CHEM 2311: Organic Lab	3 4
CSCI 1111 or 1113 or 1203: C or C++ or Java	3 (or 4)	CSCI 1107: Fortran Programming for Scientists and Engineers	3
<b>TOTAL</b>	53 or 54		45

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Total Credits: 71-73

Minimum of 18-19 credits

## Appendix E: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Civil Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Civil Engineering (B.C.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits,	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I		CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
ENGR 2235: Statics	3	AEM 2011: Statics	3
ENGR 2236: Dynamics	3	AEM 2012: Dynamics	3
MATH 2400: Probability and Statistics for Engineering and Science	4	STAT 3021: Introduction to Probability and Statistics	3
GEOL 1101: Physical Geology	4	GEO 1001: The Dynamic Earth: An Introduction to Geology	4
<b>TOTAL</b>	<b>54</b>		<b>45</b>

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 72-73**

## Appendix F: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Computer Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Computer Engineering (B.Comp.Eng.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I Engineering Science Elective	4
ENGR 2240: Circuits I	4	EE 2001/2002: Introduction to Electronic and Electrical Circuits (including lab)	4
ENGR 2241: Circuits II	4	EE 2011: Linear Systems and Circuits	
CSCI 2001: Structure of Computer Programming I	4	CSCI 1901: Structure of Computer Programming I	4
CSCI 2002: Structure of Computer Programming II	4	CSCI 1902: Structure of Computer Programming II	4
CSCI 2011: Discrete Structures of Computer Science	4	CSCI 2011: Discrete Structures of Computer Science	4
<b>TOTAL</b>	<b>55</b>		<b>47</b>

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 73-74**

**Appendix G: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Electrical Engineering**

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Electrical Engineering (B.E.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I Engineering Science Elective	4
CSCI 1113: Introduction to Object-Oriented Programming in C++	3	CSCI 1113: Introduction to C/C++ Programming for Scientists and Engineers	4
ENGR 2240: Circuits I	4	EE 2001/2002: Introduction to Electronic and Electrical Circuits (including lab)	4
ENGR 2241: Circuits II	4	EE 2011: Linear Systems and Circuits	3
PHYS 2250: Modern Physics or CHEM 1062: Principles of Chemistry II	3 or 5	PHYS 2303: Physics III or CHEM 1022: Chemical Principles II	4 or 4
<b>TOTAL</b>	49 or 51		43

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

- Goal 1: Communication
- Goal 5: History and the Social and Behavioral Sciences
- Goal 6: The Humanities and Fine Arts
- Goal 7: Human Diversity
- Goal 8: Global Perspective
- Goal 9: Ethical and Civic Responsibility
- Goal 10: People and the Environment
- TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 67-70**

**Appendix H: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Geological Engineering**

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Geological Engineering (B.Geo.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits,	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I		CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
ENGR 2235: Statics	3	AEM 2011: Statics	3
ENGR 2236: Dynamics	3	AEM 2012: Dynamics	3
MATH 2400: Probability and Statistics for Engineering and Science	4	STAT 3021: Introduction to Probability and Statistics	3
GEOL 1101: Physical Geology	4	GEO 1001: The Dynamic Earth: An Introduction to Geology	4
<b>TOTAL</b>	54		45

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 72-73**

## Appendix I: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Materials Science and Engineering

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Materials Science and Engineering (B.Mat.S.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I		CHEM 1021: Chemical Principles I	4
CHEM 1062: Principles of Chemistry II	5	CHEM 1022: Chemical Principles II	4
CHEM 2061: Organic Chemistry I	5	CHEM 2301: Organic Chemistry I	3
ENGR 2235: Statics	3	AEM 2011: Statics	3
PHYS 2250: Modern Physics	3	PHYS 2303: Physics III	4
<b>TOTAL</b>	<b>51</b>		<b>42</b>

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

Goal 1: Communication

Goal 5: History and the Social and Behavioral Sciences

Goal 6: The Humanities and Fine Arts

Goal 7: Human Diversity

Goal 8: Global Perspective

Goal 9: Ethical and Civic Responsibility

Goal 10: People and the Environment

TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 69-70**

**Appendix J: Associate of Science in Engineering Foundations as Preparation for a Baccalaureate Degree in Mechanical Engineering**

Listed below are the courses offered at Normandale Community College that apply to the Bachelor of Mechanical Engineering (B.M.E.) degree at the Institute of Technology, University of Minnesota.

Normandale Community College Courses to Complete	Credits <sup>1</sup>	IT Requirements Satisfied by Normandale Courses	Credits
PHYS 1121: General Physics I	5	PHYS 1301: Introductory Physics I	4
PHYS 1122: General Physics II	5	PHYS 1302: Introductory Physics II	4
MATH 1510: Calculus I	5	MATH 1271: Calculus I	4
MATH 1520: Calculus II	5	MATH 1272: Calculus II	4
MATH 2510: Multivariable Calculus	5	MATH 2263: Multivariable Calculus	4
MATH 2520: Linear Algebra and Differential Equations	5	MATH 2243: Linear Algebra and Differential Equations	4
CHEM 1061: Principles of Chemistry I	5	CHEM 1021: Chemical Principles I	4
ENGR 2235: Statics	3	AEM 2011: Statics	3
ENGR 2236: Dynamics	3	AEM 2012: Dynamics	3
CSCI 1111 or 1113: C or C++	3 (or 4)	CSCI 1113: Introduction to C/C++ Programming for Scientists and Engineers	4
<b>TOTAL</b>	<b>44 or 45</b>		<b>38</b>

In addition to the above pre-major requirements, Normandale students will satisfy Minnesota Transfer Curriculum requirements.

- Goal 1: Communication
- Goal 5: History and the Social and Behavioral Sciences
- Goal 6: The Humanities and Fine Arts
- Goal 7: Human Diversity
- Goal 8: Global Perspective
- Goal 9: Ethical and Civic Responsibility
- Goal 10: People and the Environment
- TOTAL MNTC Credits

Minimum of 18-19 credits

**Total Credits: 64**

