

Truman State University

**PHYSICS/ENGINEERING  
DUAL DEGREE GUIDE**

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January 27, 2011

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Disclaimer: This document is not an official document of Truman State University. Students are strongly advised to check with the Registrar's office regarding the current official policies.

## Overview

The objective of the Physics/Engineering Dual Degree option at Truman is to provide students interested in a career in engineering opportunities to strengthen their physics and liberal arts education. The Physics/Engineering Dual Degree program accomplishes this objective by using the flexibility of the Learning Plan of the Bachelor of Arts (BA) in physics degree and a waiver of the residency requirement at Truman. A student is allowed to transfer back to Truman courses from the Engineering school to satisfy the Learning Plan and the advanced physics elective courses in order to satisfy the Truman degree requirements for a BA in physics. At the successful completion of the Physics/Engineering Dual Degree program a student receives two degrees, a BA in physics from Truman and a BS in Engineering from another university. A student in the Physics/Engineering Dual Degree program is free to pursue his/her Engineering degree at any accredited Engineering college.

## BA in Physics

The BA in physics at Truman is designed to provide students with a general understanding of the fundamental laws of physics, to provide the skills necessary to plan an experiment, to make precise measurements, analyze the results, and communicate findings. It helps the student understand the role of physics in shaping the present world and recognize its potential to benefit mankind through the application of fundamental knowledge. The BA provides more breadth and flexibility in course choices and career directions.

At the core of the BA degree is a 15-credit hours Learning Plan consisting of courses directed towards a career choice. Since we do not offer enough Engineering courses at Truman to satisfy the 15 credit hours of the Learning Plan in Engineering, the Physics/Engineering Dual Degree program allows students to transfer back from an engineering school the engineering credits necessary to fulfill the Learning Plan requirements. Furthermore, since the completion of the engineering degree necessitates students to spend their senior year at an engineering school, the residency requirement for graduation from Truman has been waived. Additionally, to provide flexibility in transfer to Engineering school, provision has been made to allow students to substitute advanced Engineering courses with significant physics content, as judged by the Physics faculty at Truman, for the six-credit hours physics elective component of the BA degree.

## Transfer to Engineering school

In the Physics/Engineering Dual Degree program a student is not restricted to any particular engineering school. After selecting the Engineering school and the Engineering major, the student applies to the Engineering school in Fall semester of the junior year for admission starting in either Summer or the Fall of the following year.

Typically, students in the Physics/Engineering Dual Degree program work with the Degree Worksheet for the BA in physics at Truman and plan out their courses at Truman, preferably by the end of their Freshman year. In their sophomore year, students research possible Engineering schools and programs, and write to the admission and transfer coordinators of these Engineering schools to obtain necessary information regarding the transfer.

In the Fall semester of their Junior year at Truman students apply to the engineering school by directly contacting the admissions office of the engineering school. It is important for students to directly contact the admission and transfer coordinators at the particular engineering college they are planning to attend. Since the requirements for different engineering programs vary considerably from school to school, it is critical that a student is clear on the particular requirements for the application process and the major they wish to pursue at the engineering school. The current and reliable information on transferring to a particular engineering school can be obtained by contacting the Admissions office and the engineering departments of the corresponding school. Note that some engineering programs may require a student to arrive on the campus in the summer before they enroll in the Junior Engineering classes in the Fall semester.

## Why Physics/Engineering Dual Degree?

There are many advantages of a BA in physics for an engineer. With a BA in physics from Truman, students get a strong background in physics and a broad liberal arts background, while the engineering degree provides the depth and focus of an engineering discipline and the expertise to be a professional in the technical world. Such a dual complementary and synergistic background gives the student flexibility and breadth, the ability to communicate well, and the capability to work independently and in challenging environments. This is highly sought by employers.

## Timeline

**Freshman year:** Plan out course work for three years at Truman.

**Sophomore year:** Research Engineering schools and Engineering programs.

**Fall semester of Junior year:** Apply for admission by directly contacting the Engineering school.

**Fall and Spring semesters of Junior year:** Check for various requirements for Truman.

- Fill out 3+2 Physics/Engineering Dual Degree BA Worksheet to ensure completion of all requirements for the BA in Physics degree from Truman. This includes the allowed 15 hours of the Learning Plan and 6 hours of the physics substitution to be transferred from the Engineering school. Note: It is a student's responsibility to make sure that the plan is sound. Students should consult their academic advisor for guidance in the planning.
- Minor Worksheet if Applicable
- General Honors Worksheet if Applicable
- Assessment Requirements
  - TESTS : Collegiate Assessment of Academic Proficiency  
MFAT (Physics)
  - SURVEYS: CSEQ done in JINS

- PORTFOLIO - Portfolio collected in Junior/Senior Seminar
- Submit the Learning Plan and Physics Elective Substitution Form.
- Ensure all other graduation requirements have been met:
  - 2.0 MINIMUM CUMULATIVE GPA
  - 2.0 MINIMUM GPA FOR COURSES AT TRUMAN
  - 2.0 MINIMUM IN PHYSICS COURSES
  - MINIMUM 45 CREDIT HOURS AT TRUMAN
  - MINIMUM 15 CREDIT HOURS IN PHYSICS AT TRUMAN
  - 40 HOURS OF 300 + LEVEL COURSES
  - MINIMUM 120 UNDERGRADUATE HOURS

**Fall semester of first year at Engineering school:**

- Submit the Learning Plan and Physics Elective Substitution Form to the Engineering Coordinator at Truman. This form is available from the website:  
<http://physics.truman.edu>.  
Anticipated courses from the Spring semester of the first year at Engineering school can be used if needed.
- Submit Bachelor Degree Application Form to Registrar at Truman

**Spring semester of first year at Engineering school:**

- Submit Bachelor Degree Application Form to Registrar at Truman if not done already
- Complete the Clearance Materials sent by the Registrar at Truman
- Pay any fees to Truman

## Contact

Dr. Ian Lindevald  
 Chair, Department of Physics  
 Truman State University  
[lindy@truman.edu](mailto:lindy@truman.edu)

Dr. Mohammad Samiullah  
 Engineering Program Coordinator  
 Truman State University  
[msamiull@truman.edu](mailto:msamiull@truman.edu)

**More Info:**

<http://physics.truman.edu>

# BA in physics within the Physics/Engineering Dual Degree Program

	Hours
<b>Liberal Studies Program</b>	<b>31 - 57</b>
<b>Missouri Statute Requirement</b>	<b>1 - 3</b>
<b>Required Support</b>	<b>20</b>
MATH 198 Analytical Geometry & Calculus <i>I</i> *	5
MATH 263 Analytical Geometry & Calculus <i>II</i>	5
MATH 264 Analytical Geometry & Calculus <i>III</i>	3
MATH 365 Ordinary Differential Equations	3
CHEM 130 General Principles I*	4
* May be used to fulfill LSP requirements [Choose Stat 290]	
<b>Bachelor of Arts Requirements</b>	<b>0-6</b>
Intermediate Proficiency in ONE foreign language	
<b>Major Requirements</b>	<b>26</b>
PHYS 195 Physics with Calculus <i>I</i>	5
PHYS 196 Physics with Calculus <i>II</i>	5
PHYS 250 Modern Physics <i>I</i>	3
PHYS 551 Modern Physics <i>II</i>	3
PHYS 275 Vibrations and Waves	3
PHYS 382 Mathematical Physics	3
PHYS 388 Advanced Laboratory	3
** PHYS 445 - Advanced Physics Seminar Credits or	
** PHYS 491 - Senior Research <i>II</i> - Capstone Course	1
<b>Physics Electives</b>	<b>6</b>
Upper level approved engineering courses at an engineering school can be substituted for the following physics electives taught at Truman.	
PHYS 320 - Electronics Credits: 3 hours	
PHYS 380 - Optics Credits: 3 hours	
PHYS 386 - Classical Mechanics Credits: 3 hours	
PHYS 441 - Physics Research I Credits: 1-3 hours	
PHYS 442 - Physics Research II Credits: 1-3 hours	
PHYS 443 - Physics Research III Credits: 1-3 hours	
PHYS 482 - Electricity and Magnetism Credits: 3 hours	
PHYS 486 - Thermodynamics and Statistical Mechanics Credits: 3 hours	
PHYS 490 - Senior Research I Credits: 3 hours and	
**PHYS 491 - Senior Research II Credits: 1 hour ;	
PHYS 518 - Advanced Topics (Topic) Credits: 1-5 hours	
PHYS 580 - Quantum Mechanics Credits: 3 hours	
**not elective if used above to satisfy Major requirement	
<b>Learning Plan</b>	<b>15</b>
Following class(es) at Truman alongwith engineering classes at an engineering school can be selected as part of a student's learning plan. The courses in this list will not double count with the courses selected for substitution of the physics electives.	
PHYS 208 Design and Drafting (2 Credit Hours)	
<b>OTHER ELECTIVES TO TOTAL</b>	<b>120</b>

# Learning Plan Form

SEMESTER AND YEAR OF GRADUATION

Year  
May, August or December

## TRUMAN STATE UNIVERSITY

### 3+2 DUAL DEGREE BA IN PHYSICS

#### LEARNING PLAN AND PHYSICS ELECTIVE SUBSTITUTION FORM

**INSTRUCTIONS:** Please fill out items 1 – 6, and submit to The Engineering Program Coordinator, c/o Dr. Mohammad Samiullah, Department of Physics, Truman State University, 100 E. Normal Street, Kirksville, MO 63501. For help call (660)785-4070 or e-mail [msamiull@truman.edu](mailto:msamiull@truman.edu).

1. NAME OF APPLICANT: \_\_\_\_\_  
 2. ADDRESS: \_\_\_\_\_  
 3. PHONE: \_\_\_\_\_ 4. E-MAIL: \_\_\_\_\_

5. LIST OF ENGINEERING COURSES FOR LEARNING PLAN. GIVE THE NUMBER, NAME, AND UNIVERSITY WHERE TAKEN. ATTACH A BRIEF DESCRIPTION OF EACH IN ADDITIONAL SHEETS.

COURSE NO	COURSE NAME	UNIVERSITY WHERE TAKEN

6. LIST OF ENGINEERING COURSES SUBSTITUTING PHYSICS ELECTIVE. (ATTACH A BRIEF DESCRIPTION OR A COPY OF THE SYLLABUS.)

- i. \_\_\_\_\_  
 ii. \_\_\_\_\_  
 iii. \_\_\_\_\_

**APPLICANT: PLEASE DO NOT WRITE IN THE FORM BELOW. OFFICIAL USE ONLY**

7. LEARNING PLANNING COMMITTEE MEMBERS (NAME AND TITLE) (TO BE FILLED OUT BY THE ENGINEERING PROGRAM COORDINATOR):

- i. \_\_\_\_\_  
 ii. \_\_\_\_\_  
 iii. \_\_\_\_\_

8. APPROVAL DATE: \_\_\_\_\_

**9. APPROVAL SIGNATURES**

APPROVED  NOT APPROVED (i) \_\_\_\_\_  
*(COMMITTEE MEMBER SIGNATURE)*

APPROVED  NOT APPROVED (ii) \_\_\_\_\_  
*(COMMITTEE MEMBER SIGNATURE)*

APPROVED  NOT APPROVED (iii) \_\_\_\_\_  
*(COMMITTEE MEMBER SIGNATURE)*

APPROVED  NOT APPROVED \_\_\_\_\_  
*CHAIR, DEPARTMENT OF PHYSICS*

APPROVED  NOT APPROVED \_\_\_\_\_  
*DEAN, SCHOOL OF SCIENCE AND MATHEMATICS*

APPROVED  NOT APPROVED \_\_\_\_\_  
*PROVOST/VPAA*

**PROVOST: UPON APPROVAL PLEASE FORWARD THIS FORM TO THE REGISTRAR.**  
 (This form updated on 10/30/2010)



# Sample Degree Worksheet

## TRUMAN STATE UNIVERSITY 3+2 Dual Degree B.A. PHYSICS DEGREE WORKSHEET 2005-2007 CATALOG REQUIREMENTS

NAME: \_\_\_\_\_ ID# \_\_\_\_\_ DATE: \_\_\_\_\_

*Each course may be used only once on this worksheet, with the following exceptions: (1) a course used to fulfill any requirement in a student's degree program may also be used to fulfill the Intercultural Perspective, Missouri Statute, and/or Writing Enhanced requirement, if also approved for that area, and (2) some required support courses may also be used to fulfill additional requirements, as indicated on this worksheet with an asterisk (\*).*

Contact: Engineering Program Coordinator: Dr. Mohammad Samiullah, (660)785-4070, msamiull@truman.edu

### LIBERAL STUDIES PROGRAM

#### Essential Skills

ENG 190 Writing as Critical Thinking

Sem	Cr	Grade
	3	

COMM 170 Public Speaking

Sem	Cr	Grade
	3	

MATH 186 Elementary Functions

Sem	Cr	Grade
	3	

**OR** MATH 156 College Algebra

Sem	Cr	Grade
	3	

**AND** MATH 157 Plane Trigonometry

Sem	Cr	Grade
	2	

*Satisfactory completion of a higher level Mathematics course in the Mathematical Mode of Inquiry fulfills this requirement.*

STAT 190 Basic Statistics

Sem	Cr	Grade
	3	

**OR** STAT 290 Statistics

Personal Well Being

Sem	Cr	Grade

#### Modes of Inquiry

*Complete seven of the following eight Modes of Inquiry. Courses used to fulfill the Modes of Inquiry must be among those listed in the Liberal Studies Program pages of the 2003-2005 General Catalog.*

Aesthetic: Fine Arts

Sem	Cr	Grade
	3	

Aesthetic: Literature

Sem	Cr	Grade
	3	

Historical

Sem	Cr	Grade
	3	

Mathematical

MATH 198 Analytic Geometry & Calculus I\*

Sem	Cr	Grade
	5	

Philosophical/Religious

Sem	Cr	Grade
	3	

Scientific: Life Science

Sem	Cr	Grade
	4	

*Modes of Inquiry continued in next column*

Scientific: Physical Science

CHEM 120 General Chemistry I\*

Sem	Cr	Grade
	5	

Social Scientific

Sem	Cr	Grade
	3	

#### Interconnecting Perspectives

Truman Week Program

Sem	Cr	Grade
	1	

JINS (Interdisciplinary WE Junior Seminar)

Sem	Cr	Grade
	3	

Intercultural Perspective

Sem	Cr	Grade

Elementary Foreign Language

*Successfully complete the first year of a single foreign language, or demonstrate elementary proficiency as determined by a proficiency examination, or successfully complete an intermediate or higher level foreign language course.*

Sem	Cr	Grade

### DEGREE REQUIREMENTS

Missouri Statute Course

Sem	Cr	Grade

Two Writing-Enhanced Courses

*In addition to the JINS course listed above.*

PHYS 388 Advanced Laboratory

Sem	Cr	Grade
	3	

*In addition, Physics majors must also fulfill the following minimum requirements for graduation:*

- A 2.0 Truman grade point average.
- A 2.0 major gpa
- A 2.00 cumulative gpa
- 40 hours of 300-400 level courses.
- 63 hours of liberal arts and sciences coursework.
- 124 total hours of undergraduate coursework
- Assessment, residency, and all other requirements as outlined in the *General Catalog*, including a score at the 20th percentile or higher on the MFAT Senior Exam.

**REQUIRED SUPPORT**

	Sem	Cr	Grade
MATH 198 Analytic Geometry & Calculus I*			
MATH 263 Analytic Geometry & Calculus II		5	
MATH 264 Analytic Geometry & Calculus III		3	
MATH 365 Ordinary Differential Equations		3	
CHEM 120 General Chemistry I*			
CHEM 121 General Chemistry II		4	

**Choose at least 6 hours from below**

- PHYS 246 Astronomy I
- PHYS 320 Electronics
- PHYS 380 Optics
- PHYS 386 Classical Mechanics
- PHYS 441 Physics Research I
- PHYS 442 Physics Research II
- PHYS 443 Physics Research III
- PHYS 482 Electricity and Magnetism
- PHYS 486 Thermo & Stat Mech
- PHYS 490 Senior Research I
- AND PHYS 491 Senior Research II
- PHYS 518 Advanced Topics
- PHYS 580 Quantum Mechanics
- Approved Engineering Course+:
- Approved Engineering Course+:

	Sem	Cr	Grade
		4	
		3	
		3	
		3	
		3	
		3	
		3	
		3	

**BA REQUIREMENTS**

Complete the second year of a single foreign language, or demonstrate intermediate proficiency as determined by a proficiency examination, or successfully complete a higher level foreign language course.

	Sem	Cr	Grade

(+ Or include courses for substitution for physics elective in the Learning Plan and Physics Elective Substitution Form for approval by the Learning Committee.)

**MAJOR REQUIREMENTS**

PHYS 145 Physics Seminar		1	
PHYS 195 Physics with Calculus I		5	
PHYS 196 Physics with Calculus II		5	
PHYS 250 Modern Physics I		3	
PHYS 251 Modern Physics II		3	
PHYS 275 Vibrations and Waves		3	
PHYS 345 Junior Seminar		1	
PHYS 382 Mathematical Physics		3	
PHYS 388 Advanced Laboratory		3	
PHYS 445 Advanced Physics Seminar			
OR PHYS 491 Senior Research II		1	

**Learning Plan (15 hours)  
(USE 3+2 LEARNING PLAN FORM)**

The learning plan must consist of at least 15 hours of engineering courses that are not counted elsewhere. The learning plan is to be submitted to the Truman engineering program coordinator in the physics discipline. Upon receiving the learning plan containing specific courses, the Truman engineering coordinator will form a committee of three Truman physics faculty which will rule on the adequacy of the learning plan, and issue a duly signed copy of the Learning Plan Approval Form to the student. The learning plan for 3+2 dual degree BA does not need to be pre-approved before transferring to the engineering school. It needs to be approved anytime before graduation application. Student must fill out the 3+2 Dual Degree BA in Physics Learning Plan and Physics Elective Substitution Form ("3+2 Learning Plan") available from his/her advisor and submit to the Engineering Program Coordinator in the physics discipline. FOR GRADUATION, A STUDENT WILL, IN ADDITION, SUBMIT A BACHELOR DEGREE APPLICATION AND THIS WORKSHEET TO THE REGISTRAR.

(continued in next column)

**ELECTIVES FOR TOTAL CREDITS TO ADD UP TO 120**

	Sem	Cr	Grade

	Sem	Cr	Grade

## **Agreement with Rolla**

Truman State University has agreements with Missouri University of Science and Technology, Rolla, for transfer of certain courses from Truman to Rolla. The following two slides contain a summary of the equivalent courses and requirements for various departments at Rolla, which can also be found at the website:

[http://futurestudents.mst.edu/admissions/transfer/course\\_guides/index.html](http://futurestudents.mst.edu/admissions/transfer/course_guides/index.html)

# Missouri S&T — Truman State University

## General Engineering Transfer Guide - Effective Fall 2009 - Spring 2011

The following Truman State University course work will apply to Missouri S&T engineering degree requirements as outlined below.								
Truman State University				Missouri S&T				
TSU #	Title	Hours		S&T #	Title	Hours		
<b>Engineering Degree Requirements: Take all Courses</b>								
<b>General Pre-Engineering Curriculum</b>	Math prerequisites. While they are not part of Missouri S&T engineering degree requirements, algebra and trigonometry skills are critical to success in calculus. Students should follow math placement testing and advising recommendations at their schools.							
	MATH 198	Analytic Geometry and Calculus I	5		MATH 014	Calculus for Engineers I	4	
	MATH 263	Analytic Geometry and Calculus II	5		MATH 015	Calculus for Engineers II	4	
	MATH 264	Analytic Geometry and Calculus III	3		MATH 022	Calculus with Analytic Geometry III	4	
	MATH 365	Ordinary Differential Equations	3		MATH 204	Elementary Differential Equations	3	
	PHYS 195	Physics with Calculus	5		PHYS 023	Engineering Physics I	4	
	PHYS 196	Physics with Calculus II	5		PHYS 024	Engineering Physics II	4	
	CHEM 120	General Chemistry I	4		CHEM 001, 002	General Chemistry I and Lab	4	
	PHYS 208	Design and Drafting	2		IDE 020	Engineering Design with Computer App.	3	
	ENG 190	Writing as Critical Thinking	3		ENG 020	Exposition and Argumentation	3	
	See Degree Requirements below and Notes on back.						Second Communication Requirement*	3
	ECON 201 or ECON 200	Principles of Microeconomics or Principles of Macroeconomics	3		ECON 121 or ECON 122	Principles of Microeconomics or Principles of Macroeconomics	3	
	HIST 104 or HIST 106 or HIST 133 or POL 161	US History I, 1607-1877 or US History II, 1877-present or World Civilization since 1700 or American National Government	3		HIS 175 or HIS 176 or HIS 112 or PS 090	American History to 1877 or American History since 1877 or Modern Western Civilization or American Government	3	
	Free Electives: See Other Required Courses* on back. Electives should be selected in consultation with your advisor. Free electives may not include remedial/deficiency courses, algebra, trigonometry, pre-calculus, or extra credits in required courses.						Free Electives: See Other Required Courses* on back.	
	Total Hours			41	Total Hours			42
<b>Humanities and Social Sciences Electives: Select 2 Additional Courses from the Academic Areas Below*</b>								
See your advisor and Missouri S&T Approved List of Humanities and Social Sciences for more options or email <a href="mailto:transfercredit@mst.edu">transfercredit@mst.edu</a> for approval.								
Students may also transfer one upper-level humanities/social sciences elective to Missouri S&T.								
<b>Humanities and Social Sciences Electives</b>	HIST 104	US History I, 1607-1877	3		HIS 175	American History to 1877	3	
	HIST 106	US History II, 1877-present	3		HIS 176	American History since 1877	3	
	POL 161	American National Government	3		PS 090	American Government	3	
	ART 203	Intro to the Visual Arts	3		ART 080	Art Appreciation	3	
	MUSI 204	Music Appreciation	3		MUS 050	Music Understanding and Appreciation	3	
	DRAM 275	Theatre Appreciation	3		THE 090	Theatre Appreciation	3	
	PSYC 166	General Psychology	3		PSY 050	General Psychology	3	
	SS 190	Intro to Sociology	3		SOC 081	General Sociology	3	
	PHRE 187	Logic	3		PHIL 005	Intro to Philosophy	3	
						Literature Elective		
						Foreign Language		
						Speech and Media Studies		
						Economics		
Total Hours			6-8	Total Hours			6-8	
<b>Additional Degree Requirements*</b>								
The following additional courses will satisfy Missouri S&T engineering degree requirements for some, but not all, engineering degrees. Check individual Missouri S&T degree requirements on back for your major.								
<b>Additional Courses (See Back Page for Individual Engineering Major Requirements)</b>	ENG 314	English Composition II	3		ENG 060	Writing and Research	3	
	ENG 212	Technical Writing	3		ENG 160	Technical Writing	3	
	COMM 170	Fundamentals of Speech	3		SPMS 085	Principles of Speech	3	
	MATH 357	Linear Algebra	3		MATH 208	Linear Algebra I	3	
	STAT 290	Statistics	3		STAT 215	Engineering Statistics	3	
	CHEM 121	General Chemistry II	4		CHEM 003, 008	General Chemistry II and Qualitative Analysis	5	
	CHEM 329, 330	Organic Chemistry I and Lab	4		CHEM 221, 226	Organic Chemistry I and Lab	5	
	CHEM 331, 332	Organic Chemistry II and Lab	4		CHEM 223, 228	Organic Chemistry II and Lab	5	
	CS 195	Fortran Programming	3		CS 073, 077	Basic Scientific Programming (FORTRAN)	3	
	CS 180	Foundations of Computer Science	3		CS 53, 54	Intro to Programming and Lab (C++)	4	
	CS 185	Intro to Computer Science II	3		CS 153	Data Structures	3	
	BIOL 100	Biology with Lab	4		BIO 110	General Biology	4	
	PHYS 383	Fundamentals of Electrical Circuits	3		EE 281 (151)**	Circuit Analysis I (Circuits I)*	3	
	PHYS 387	Statics	3		IDE 050	Engineering Mechanics-Statics	3	
	PHYS 381	Engineering Thermodynamics and Thermal Analysis	4		ME 227 (ME 219)	Thermal Analysis (Thermodynamics)	3	
<b>Maximum Degree Requirements to be Transferred to Missouri S&amp;T Degree***</b>								
<b>68***</b>								

A grade of "C" or better is required in calculus and physics, as well as other courses depending on academic major.

\*See notes for individual majors on second page.

\*\*A passing grade on the Missouri S&T EE Advancement Exam I is required to receive credit for EE 151.

\*\*\*Students must receive special permission from Missouri S&T to apply more than 68 credit hours (using Missouri S&T credit-hour totals) toward Missouri S&T degree. Students are not required to complete all courses on this guide before transferring to Missouri S&T.

This transfer guide is published under the joint agreement of Truman State University and Missouri University of Science and Technology and is in effect for the 2009/2010 academic year. Further information or updates are available from Missouri S&T Transfer Admissions at [admissions.mst.edu/transfer](http://admissions.mst.edu/transfer), [transfer@mst.edu](mailto:transfer@mst.edu), or 800-522-0938.

Requirements and Notes for Missouri S&T Engineering Majors								
The courses listed for each major are required for the Missouri S&T degree and may be taken before transfer to Missouri S&T if they are offered by the transfer school. They are not prerequisites for transfer to Missouri S&T.								
Engineering Department	2nd Communication Course	Statistics/ Linear Algebra	Circuits	Statics and Dynamics	2nd Chemistry Course	Computer Science	Humanities/ Social Sciences	Other Required Courses
<b>Aerospace Engineering</b>	ENG 060 or ENG 160 or SPMS 085	MATH 208 satisfies advanced math/ comp sci elective	EE 281 or 151	IDE 50. AE/ME 160. Dept may substitute IDE 150 for AE/ME 160 if 3D topics are covered.	none	CS 73/77, CS 74/78, or CS 53/54	Literature required.	ME 219. IDE 110. Up to 6 hours of free electives.
<b>Architectural Engineering</b>	None required. ENG 060, ENG 160, or SPMS 085 will count as GENG Ed electives	STAT 213	EE 281 or 151	IDE 50. IDE 150.	none	none	HIS 112 is preferred, but HIS 175 or 176 are also acceptable.	ME 227. IDE 110. IDE 120. Up to 3 hours of free electives.
<b>Ceramic Engineering</b>	None required. ENG 060, ENG 160, or SPMS 085 will count as GENG Ed electives	STAT 213,215, or 217	none	IDE 50.	CHEM 003 may be taken in place of MTE 125.	none		IDE 110. CHEM 221/222 will satisfy technical elective requirement. No free electives applied toward degree.
<b>Chemical Engineering</b>	ENG 060 or ENG 160 or SPMS 085	none	none	IDE 50 is not required but is recommended as a free elective. Up to 6 hours of free electives.	CHEM 003	CS 73/77, CS 74/78, or CS 53/54		CHEM 221, 222, 223, 224. Students transferring in the fall are strongly encouraged to take CHENG 120 and 141 at Missouri S&T the summer before they transfer. ME 219 (227) may be used as a substitution for CHENG 141, if necessary. Spring semester transfers may take CHENG 120 and 141 the first semester at Missouri S&T.
<b>Civil Engineering</b>	ENG 060 or ENG 160 or SPMS 085	STAT 213	none	IDE 50. IDE 150.	none	none		GEO/GE 050. IDE 110. IDE 120. No free electives applied toward degree.
<b>Computer Engineering</b>	SPMS 085 is required	STAT 217 MATH 208 satisfies mathematics elective	EE 151 and passing score on EE Advancement Exam	IDE 050 + 150 will satisfy science elective requirement.	none	CS 53/54 and CS 153 required.		Up to 5 hours of free electives.
<b>Electrical Engineering</b>	SPMS 085 is required	STAT 217 MATH 208	EE 151 and passing score on EE Advancement Exam	IDE 050 + 150 will satisfy science elective requirement.	none	CS 53/54		Up to 5 hours of free electives.
<b>Engineering Management</b>	ENG 160 AND either ENG 060 or SPMS 085 are required	STAT 211, 213, or 215	EE 281 or 151	IDE 50. IDE 150.	none	CS 74/78 or CS 53/54	PSY 050 General Psychology required	ME 227. IDE 110. IDE 120. Up to 6 hours of free electives.
<b>Environmental Engineering</b>	ENG 060 or ENG 160 or SPMS 085	STAT 213	none	IDE 50 + IDE 150 will be substituted for IDE 140.	CHEM 003	none	Students are advised to take HIS 175 or 176, which will satisfy the prerequisite for a required upper level history course at	BIO/SC 110. GEO/GE 050. ME 227. Up to 6 hours of free electives.
<b>Geological Engineering</b>	SPMS 085 or ENG 160	none	none	IDE 50. IDE 150.	none	none		GEO/GE 050. IDE 110. No free electives applied toward degree.
<b>Mechanical Engineering</b>	ENG 060 or ENG 160 or SPMS 085	MATH 208, STAT 213, or STAT 215 satisfies math/stat or comp sci elective	EE 281 or 151	IDE 050. AE/ME 160. Dept may substitute IDE 150 if 3D topics are covered.	none	CS 73/77, CS 74/78, or CS 53/54	Literature required.	ME 219. MET 121. IDE 110. IDE 120. Up to 6 hours of free electives.
<b>Metallurgical Engineering</b>	ENG 060 or ENG 160 or SPMS 085	STAT 213 or 215	EE 281 or 151	IDE 50.	none	none		MET 121. IDE 110. Up to 5 hours of free electives.
<b>Mining Engineering</b>	ENG 060 or ENG 160	STAT 213	none	IDE 50. IDE 150. (IDE 50+150 will be substituted for IDE 140. IDE 50+110+150 will be substituted for MiEng 232.)	none	none		GEO/GE 050. MET 121 is technical elective. No free electives applied toward degree.
<b>Nuclear Engineering</b>	ENG 060 or ENG 160	STAT 215	none	IDE 50	none	CS 73/77, CS 74/78, or CS 53/54		MET 121. Up to 6 hours of free electives.
<b>Petroleum Engineering</b>	ENG 065	none	none	IDE 50. IDE 150.	none	none		GEO/GE 050. ME 227. IDE 110. No free electives applied toward degree.

# Engineering Curricula at Missouri University of Science and Technology, Rolla, For Reference Only

Contact Transfer Office at Rolla for more information about courses and requirements

## Bachelor of Science Mechanical Engineering

### FRESHMAN YEAR

First Semester	Credit
Bas En 10 Study and Careers in Engineering . . . . .	1
Chem 1 General Chemistry . . . . .	4
Chem 2 General Chemistry Lab . . . . .	1
Math 14 Calculus I for Engineers <sup>a</sup> . . . . .	4
Engl 20 Exposition and Argumentation . . . . .	3
Hist 112, 175, 176, or Pol Sc 90 . . . . .	<u>3</u>
	16

Second Semester	
Bas En 20 Engineering Design with Computer Appl. . . . .	3
Math 15 Calculus II for Engineers <sup>a</sup> . . . . .	4
Phys 23 Engineering Physics I <sup>a</sup> . . . . .	4
Econ 121 or 122 . . . . .	3
Elective-Hum or Soc Sci <sup>f</sup> . . . . .	<u>3</u>
	17

### SOPHOMORE YEAR

First Semester	Credit
Cmp Sc 73 Basic Scientific Programming or Cmp Sc 74-Intro to Programming Methodology . . . . .	2
Cmp Sc 77 Cmp Programming Lab or Cmp Sc 78-Programming Methodology Lab. . . . .	1
Bas En 50 -Eng Mech-Statics. . . . .	3
Math 22-Calculus w/Analytic Geometry III <sup>a</sup> . . . . .	4
Physics 24-Eng Physics II . . . . .	4
Mc Eng 153-Intro to Manufacturing Processes . . . . .	<u>3</u>
	17

Second Semester	
Mc Eng 161-Intro to Design . . . . .	3
Mc Eng 219-Thermodynamics <sup>a,b</sup> . . . . .	3
EMech 160-Eng Mech-Dynamics <sup>b</sup> . . . . .	3
Math 204-Elementary Differential Equations . . . . .	3
Mt Eng 121-Metallurgy for Engineers . . . . .	<u>3</u>
	15

### JUNIOR YEAR

First Semester	Credit
Mc Eng 213-Machine Dynamics <sup>a</sup> . . . . .	3
Mc Eng 221-Applied Thermodynamics . . . . .	3
El Eng 281-Electrical Circuits . . . . .	3
Bas Eng 110-Mechanics of Materials <sup>c</sup> . . . . .	3
Bas Eng 120-Material Lab . . . . .	1
Elective-Math/Stat or Cmp Sc <sup>e</sup> . . . . .	<u>3</u>
	16

Second Semester	
Mc Eng 211-Linear Systems in Mc Eng <sup>a,b</sup> . . . . .	3
Mc Eng 208-Machine Design I <sup>c</sup> . . . . .	3
Mc Eng 225-Heat Transfer . . . . .	3
Mc Eng 231-Thermofluid Mechanics I . . . . .	3
Mc Eng 240-Mechanical Instrumentation . . . . .	2
Elective-Communications <sup>d</sup> . . . . .	<u>3</u>
	17

### SENIOR YEAR

First Semester	Credit
Mc Eng 242-Mech Engineering Systems . . . . .	2
Mc Eng 279-Automatic Control of Mech Systems . . . . .	3
Mc Eng technical elective <sup>g</sup> . . . . .	3
Elective <sup>i</sup> . . . . .	3
Literature elective <sup>f</sup> . . . . .	3
Elective-Hum or Soc Sci <sup>f</sup> . . . . .	<u>3</u>
	17

Second Semester	
Eng Mg 209-Eng Economy & Management . . . . .	3
Mc Eng 261-Analysis & Synthesis in Eng Design . . . . .	3
Mc Eng 280-Control Systems Lab . . . . .	1
Mc Eng 3xx technical elective <sup>g</sup> . . . . .	<u>3</u>
Elective <sup>l</sup> . . . . .	13

**NOTE:** Students must satisfy the common engineering freshman year course requirements, and be admitted into the department, in addition to the sophomore, junior and senior year requirements listed above with a minimum of 128 hours.

- a) A grade of "C" or better in Math 14, 15, 22 and Physics 23 is required both for enrollment in Mc Eng 211, Mc Eng 213 and Mc Eng 219 and for graduation. Math 8 and 21 may be substituted for Math 14 and 15, respectively.
- b) A grade of "C" or better in EMech 160, Mc Eng 211 and Mc Eng 219 is required both for enrollment in any courses which require either EMech 160 or Mc Eng 211 or 219 as prerequisites, and for graduation.
- c) A grade of "C" or better in Bas En 110 is required both for enrollment in Mc Eng 208 and for graduation.
- d) This course must be selected from the following: English 60, 160 or SP&M S 85, or the complete four course sequence in Advanced ROTC (Mil Sc 105, 106, 107 and 108 or Arosp S 350,351,380 and 381.)
- e) This course must be selected from the following: Cmp Sc 228, Math 203, 208, Stat 213, 215 or any 300-level math or computer science course approved by the student's advisor.
- f) All electives must be approved by the student's advisor. Students must comply with the School of Engineering general education requirements with respect to selection and depth of study. These requirements are specified in the current catalog.
- g) Electives must be approved by the student's advisor. Six hours of technical electives, which may not include Ae Eng/EMech/Mc Eng 202, 300 or 390, must be in the Department of Mechanical and Aerospace Engineering and Engineering Mechanics. At least three of these technical elective hours in the Department must be at the 300 level. Honors students have special requirements for technical electives.
- h) All Mechanical Engineering students must take the Fundamentals of Engineering Examination prior to graduation. A passing grade on this examination is not required to earn a B.S. degree, however, it is the first step toward becoming a registered professional engineer. This requirement is part of the UMR assessment process as described in Assessment Requirements found elsewhere in this catalog. Students must sign a release form giving the University access to their Fundamentals of Engineering Examination score.
- i) Free electives are to be chosen in consultation with the student's academic advisor. Courses which do not count towards this requirement are deficiency courses such as algebra and trigonometry, physical education courses, extra credits in required courses and basic Air Force and Army ROTC courses (courses taught in the first two years of the ROTC program).

## BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING

Catalog Year Beginning WS 2004

Name \_\_\_\_\_  
Student # \_\_\_\_\_

Transfer Credit From \_\_\_\_\_  
Advisor \_\_\_\_\_

FRESHMAN Year First Semester	Cr	Gr	FRESHMAN YEAR Second Semester	Cr	Gr
BE 10 – Study and Careers in Engineering	1		BE 20 – Engineering Design w/ Computer Applications	3	
Chem 1 – General Chemistry	4		ChE 20 – Computers and Chemical Engineering or CmpSc73/77 or CmpSc74/78 or CmpSc 53/54	3	
Chem 2 – General Chemistry Laboratory	1		Chem 3 – General Chemistry II	3	
Engl 20 – Exposition and Argumentation	3		Math 15 – Calculus II for Engineers	4	
Hist – 112, 175, 176 or Pol Sci – 90	3		Physics 23 – Engineering Physics I	4	
Math 14 – Calculus I for Engineers	4				
TOTAL	16		TOTAL	17	
SOPHOMORE YEAR First Semester	Cr	Gr	SOPHOMORE YEAR Second Semester	Cr	Gr
ChE 120 – Chemical Engineering Material Balances <sup>1</sup>	3		ChE 141 – Chemical Engineering Thermodynamics I <sup>1</sup>	3	
Chem 221 – Organic Chemistry	3		ChE 145 – Chemical Process Materials	3	
Econ 121 or 122 – Principles Micro/Macroeconomics	3		Humanities Elective <sup>2</sup>	3	
Math 22 – Calculus with Analytical Geometry III	4		Humanities or Social Science Elective <sup>2</sup>	3	
Physics 24 – Engineering Physics II	4		Math 204 – Elementary Differential Equations	3	
TOTAL	17		TOTAL	15	
JUNIOR YEAR First Semester	Cr	Gr	JUNIOR YEAR Second Semester	Cr	Gr
ChE 231 – Chemical Engineering Fluid Flow	3		ChE 234 – Chemical Engineering Laboratory I <sup>4</sup>	2	
ChE 233 – Chemical Engineering Heat Transfer	2		ChE 235 – Staged Mass Transfer	3	
ChE 245 – Chemical Engineering Thermodynamics II <sup>1</sup>	3		ChE 237 – Continuous Mass Transfer	3	
Chem 241 – Physical Chemistry	3		ChE 247 – Molecular Chemical Engineering	3	
General Education Upper Level Elective <sup>3</sup>	3		Chemistry & Laboratory Elective <sup>5</sup>	4	
Humanities or Social Science Upper Level Elective <sup>2</sup>	3				
TOTAL	17		TOTAL	15	
SENIOR YEAR First Semester	Cr	Gr	SENIOR YEAR Second Semester	Cr	Gr
ChE 211 – Professional Practice and Ethics <sup>6</sup>	1		ChE 283 – Chemical Engineering Economics <sup>4</sup>	2	
ChE 236 – Chemical Engineering Laboratory II <sup>4</sup>	3		ChE 285 – Chemical Process Safety <sup>4</sup>	3	
ChE 251 – Process Dynamics and Control	3		ChE 288 – Chemical Process Design <sup>4</sup>	3	
ChE 252 – Process Dynamics and Control Laboratory	1		ChE 3XX – Chemical Engineering Elective <sup>7</sup>	3	
ChE 281 – Chemical Engineering Reactor Design	3		Free Elective <sup>8</sup>	3	
ChE 3XX – Chemical Engineering Elective <sup>7</sup>	3				
Free Elective <sup>8</sup>	3				
TOTAL	17		TOTAL	14	

<sup>(1)</sup> A grade of "C" or better is required in Ch Eng 120 and in Ch Eng 141 to enroll in Ch Eng 245.

<sup>(2)</sup> From approved list by School of Engineering.

<sup>(3)</sup> General Education Upper Level Elective –all Hu/SS upper level electives and also: Engl 60, Engl 160, Sp&M 85, and Sp&M 181.

<sup>(4)</sup> Writing emphasized course.

<sup>(5)</sup> Chemistry & Laboratory Electives: Chem 51(2), 52(2) or Chem 223(3), 224(1) or Chem 243(3), 242(1) or Chem 361(3), 362(1) or BioSci 211(4).

<sup>(6)</sup> FE exam must be taken as part of UMR Assessment.

<sup>(7)</sup> Chemical Engineering Elective: Any Ch Eng 3XX class. But only one of Ch Eng 300, 390 or 390H can be used to fulfill this requirement.

<sup>(8)</sup> Each student is required to take six hours of free electives in consultation with his/her academic advisor. Any courses outside of Engineering and Science must be at least three credit hours. ECE 281 recommended for preparation for FE exam.

Note: The minimum number of hours required for a degree in Chemical Engineering is 128.

# Curriculum

## Bachelor of Science

### Electrical Engineering<sup>1</sup>

#### FRESHMAN YEAR *First Semester*

FE 10-Study & Careers in Eng <sup>2</sup>	Credit	1
Math 14-Calculus I for Engineers <sup>3</sup>		4
Chem 1-General Chemistry		4
Chem 2-General Chemistry Lab		1
Hist 112, 175, 176, or Pol Sc 90		3
English 20-Exposition & Argumentation		<u>3</u>
		16

#### FRESHMAN YEAR *Second Semester*

IDE 20-Eng Design with Comp Appl	Credit	3
Math 15-Calculus II for Engineers <sup>3</sup>		4
Physics 23-Engineering Physics I <sup>3,4</sup>		4
Econ 121 or 122		3
Elective-Hum <sup>5</sup>		<u>3</u>
		17

#### SOPHOMORE YEAR *First Semester*

El Eng 151-Circuits I <sup>3,6,7</sup>	Credit	3
El Eng 152-Circuits Analysis I Lab <sup>3,6</sup>		1
Cp Eng 111-Introduction to Computer Engineering <sup>3,6,8</sup>		3
Cp Eng 112-Computer Engineering Lab <sup>3,6</sup>		1
Math 22-Calculus w/ Analytic Geometry III <sup>3</sup>		4
Physics 24-Engineering Physics II <sup>3,4</sup>		<u>4</u>
		16

#### SOPHOMORE YEAR *Second Semester*

El Eng 121-Introduction to Electronic Devices <sup>3,6,7,10</sup>	Credit	3
El Eng 122-Electronic Devices Lab <sup>3,6,7</sup>		1
El Eng 153-Circuits II <sup>3,7,9</sup>		3
Math 204-Elementary Differential Equations <sup>3</sup>		3
Engineering Science Elective <sup>11</sup>		3
Cp Sc 53-Introduction to Programming		3
Cp Sc 54-Introduction to Programming Lab		<u>1</u>
		17

#### JUNIOR YEAR *First Semester*

El Eng 215-Discrete Linear Systems I <sup>3,6,9</sup>	Credit	3
El Eng 216-Discrete Linear Systems I Lab <sup>3,6,9</sup>		1
El Eng 253-Electronics I <sup>3,6,9,10</sup>		3
El Eng 255-Electronics I Lab <sup>3,6,9,10</sup>		1
Math 208-Linear Algebra		3
Sp&M 85-Principles of Speech		<u>3</u>
		14

#### JUNIOR YEAR *Second Semester*

El Eng 271-Electromagnetics <sup>3,6,9</sup>	Credit	3
El Eng 272-Electromagnetics Lab <sup>3,6,9</sup>		1
El Eng 217-Continuous Linear Systems I <sup>3,6</sup>		3
El Eng 218-Continuous Linear Systems I Lab <sup>3,6</sup>		1
El Eng Elective A <sup>10,14</sup>		3
Stat 217-Prob & Stat for Eng and Scientists <sup>12</sup>		3
English 160-Technical Writing <sup>13</sup>		<u>3</u>
		17

#### SENIOR YEAR *First Semester*

El Eng Power Elective <sup>3,6,9,15</sup>	Credit	3
El Eng Power Elective Lab <sup>3,6,9,15</sup>		1
El Eng Elective B <sup>10,14</sup>		3
El Eng Elective D <sup>10,16</sup>		3
El Eng 391-El Eng Senior Project I		1
Elective-Hum or Soc (any level) <sup>5</sup>		3
Free Elective <sup>18</sup>		<u>2</u>
		16

#### SENIOR YEAR *Second Semester*

El Eng Elective C <sup>10,14</sup>	Credit	3
El Eng Elective E <sup>17</sup>		3
El Eng 392-El Eng Senior Project II		3
Elective-Hum or Soc (upper level) <sup>5</sup>		3
Free Elective <sup>18</sup>		3
Assessment <sup>19</sup>		<u>0</u>
		15

**NOTE:** Students must satisfy the common engineering freshman year requirements and be admitted into the department. See Freshman Engineering Program.

- The minimum number of hours required for a degree in Electrical Engineering is 128.
- Students that transfer after their freshman year are not required to enroll in Freshman Engineering Seminars.
- A minimum grade of "C" must be attained in Math 14, 15, 22, and 204, Physics 23 and 24 (or their equivalents), El Eng 151, 152, 153, 121, 122, 215, 216, 217, 218, 253, 255, 271 and 272, the El Eng power elective (205 and 208 or 207 and 209), and Cp Eng 111 and 112. Also, students may not enroll in other courses that use these courses as prerequisites until the minimum grade of "C" is attained.
- Students may take Physics 21 and 22 or Physics 21 and 27 in place of Physics 23. Students may take Physics 25 and 26 or Physics 25 and 28 in place of Physics 24.
- All electives must be approved by the student's advisor. Students must comply with the engineering general education requirements with respect to selection and depth of study. These requirements are specified in the current catalog.
- Students who drop a lecture prior to the last week to drop a class must also drop the corequisite lab.
- Students must earn a passing grade on the El Eng Advancement Exam I (associated with El Eng 151) before they enroll in El Eng 153 or 121 and 122.
- Students must earn a passing grade on the Cp Eng Advancement Exam (associated with Cp Eng 111) before they enroll in any course with Cp Eng 111 and 112 as prerequisites.
- Students must earn a passing grade on the El Eng Advancement Exam II (associated with El Eng 153) before they enroll in El Eng 205 and 208, 207 and 209, 253 and 255, 215 and 216, or 271 and 272.
- Students must earn a passing grade on the El Eng Advancement Exam III (associated with El Eng 121) before they enroll in El Eng 253 and 255 or other courses with El Eng 121 as a prerequisite.
- Students must take IDE 140, Mc Eng 219, Mc Eng 227, Physics 207, Physics 208, Chem 221, Biology 211, or Biology 231. The following pairs of courses are substitutions for any single course: IDE 50 and IDE 150, Physics 107 and Physics 311, Physics 107 and Cr Eng 284, Physics 107 and Nu Eng 205, or Eng Mt 211 and Eng Mt 282.
- Students may replace Stat 217 with Stat 215 or Stat 343.
- Students may replace English 160 with English 60.
- El Eng Electives A, B, and C must be chosen from the El Eng 205 and 208, 207 and 209, 225, 231 or 235, 243, 254, or Cp Eng 213.
- The El Eng Power Elective may be satisfied with El Eng 205 and 208 or El Eng 207 and 209.
- El Eng Elective D must be a 300-level El Eng or Cp Eng course with at least a 3-hour lecture component. This normally includes all El Eng and Cp Eng 3xx courses except El Eng 300, 390, 391, and 392.
- El Eng Elective E may be any 200 or 300-level El Eng or Cp Eng course except El Eng 281, 282, and 283 and El Eng or Cp Eng 391 and 392.
- Students are required to take five hours of free elective in consultation with their academic advisors. Credits that do not count toward this requirement are deficiency courses (such as algebra and trigonometry) and extra credits from courses meeting other requirements. Any courses outside of engineering and science must be at least three credit hours. El Eng 281, 282, and 283 and CpE 391 and 392 may not be used for free electives.
- All Electrical Engineering students must take the Fundamentals of Engineering Examination prior to graduation. A passing grade on this examination is not required to earn a B.S. degree, however, it is the first step toward becoming a registered professional engineer. This requirement is part of the Missouri S&T assessment process as described in Assessment Requirements found elsewhere. Students must sign a release form giving the University access to their Fundamentals of Engineering Examination score.

Students may pursue an emphasis specialty in circuits, electronics, power, communications-signal processing, controls, electromagnetics, optic/devices, or computer engineering. An emphasis is not required.