

Technische Universität Darmstadt
Bachelorstudium in Mechanical and Process Engineering
3rd year (5th and 6th semester) at Virginia Tech

Suggested Courses

Approximate annual dates at Virginia Tech:
August 15 – May 15 (or July 10)

SUMMARY OF SUGGESTED COURSE EQUIVALENCES:

Virginia Tech	Technische Universität Darmstadt
ME 3404 Fluid Mechanics	Technische Strömungslehre (6 CP)
ME 4504 Dynamic Systems – Controls Engineering I	Grundlagen der Regelungstechnik (6 CP)
ME 4015 Engineering Design and Project I	Bachelor-Thesis (12 CP)
ME 4016 Engineering Design and Project II	
ME 3504 Dynamic Systems – Vibrations	Maschinendynamik I (6 CP)
ME 3304 Heat and Mass Transfer	Wärme- und Stoffübertragung (4 CP) Wahlpflichtbereich A (2 CP)
Applied mathematics elective (3 credits)	Numerische Berechnungsverfahren (4 CP) Wahlpflichtbereich A (2 CP)
Electives outside of Mechanical Engineering (2 credits)	LV anderer Fachbereiche (4 CP)
Technical electives (8 credits)	Wahlpflichtbereich A (16 CP)
31 semester hour credits	62 credit points

The normal workload at Virginia Tech is 15-18 semester hour credits (5-6 courses) per semester; the latter is considered a heavy load. Therefore, if desired, the TUD student can take 15 semester hour credits per semester during the Fall and Spring semesters (August 15 through May 15), followed by up to approximately 6 semester hour credits (or two courses) during the Summer I semester (May 15 – July 10). Because the course selection is reduced during the Summer I semester, it is suggested that these last credits (if any) be permitted to be completed as **ME 4994 Undergraduate Research** and be counted as **Wahlpflichtbereich A**. At Virginia Tech, ME 4994 credits count as technical electives. The student might also take graduate courses as a senior and thus effectively start his or her master studies before completing the requirements for a bachelor degree (see *Sample Study Program II* at the end of this document).

FALL SEMESTER (August 20 – December 20)

ME 3404 Fluid Mechanics

Comprehensive first course in basic and applied fluid mechanics. Fluid properties, statics, kinematics, and dynamics. Euler's and Bernoulli's equations. Hydrodynamics. Dimensional analysis and similitude. Real fluids, laminar and turbulent flows. Boundary layer model and approximate analysis. Compressible flow and propulsion devices. Flow measurement. Introduction to turbomachinery with applications. Pre: ESM 2304, MATH 2214; Co: 3124. Offered: FALL, SPRING. (3 semester credits, 6 credit points)
Corresponds to *Technische Strömungslehre* (6 credit points)

ME 4504 Dynamic Systems – Controls Engineering I

Fundamentals of feedback control theory, classical analysis and design techniques for automatic controls; introduction to modern control theory. Pre: 3514.
Offered: FALL, SPRING. (3 semester credits, 6 credit points)
Corresponds to *Grundlagen der Regelungstechnik* (6 credit points)

ME 4015 Engineering Design and Project I

Team oriented, open-ended, multi-disciplinary design projects focused on industrially relevant problems. A specific, complex engineering design problem is normally taken from problem definition to product realization and testing. Emphasis is placed on documenting and reporting technical work, idea generation and selection, application of design and analysis tools developed in previous courses, project management, selling technical ideas and working in teams. Pre: 4005, 3614, 3304, and either 3504 or 4504.
Offered: FALL. (3 semester credits, 6 credit points)
Corresponds to the first 50% of *Bachelor-Thesis* (6 credit points)

Two or three additional courses (3 semester credits each).

SPRING SEMESTER (January 15 – May 15)

ME 3504 Dynamic Systems – Vibrations

Principles of dynamic system modeling with emphasis on second order mechanical systems. Harmonic and nonharmonic vibrations of single and multi-degree of freedom systems. Applications of computer simulation and analysis techniques in vibrations. Pre: MATH 2214, ESM 2304, 3514. Offered: SPRING. (3 semester credits, 6 credit points)
Corresponds to *Maschinendynamik I* (6 credit points)

ME 3304 Heat and Mass Transfer

Comprehensive basic course in heat and mass transfer for mechanical engineering students. Principles of conduction, convection, and radiation with applications to heat exchangers and other engineering systems. Pre: 3124, 3134 or 3114; Co: 3404.
Offered: SPRING. (3 semester credits, 6 credit points)
Corresponds to *Wärme- und Stoffübertragung* (4 credit points) and *Wahlpflichtbereich A* (2 credit points)

ME 4016 Engineering Design and Project II

Team oriented, open-ended, multi-disciplinary design projects focused on industrially relevant problems. A specific, complex engineering design problem is normally taken from problem definition to product realization and testing. Emphasis is placed on documenting and reporting technical work, idea generation and selection, application of design and analysis tools developed in previous courses, project management, selling technical ideas and working in teams. Pre: 4005, 3614, 3304, and either 3504 or 4504.
Offered: SPRING. (3 semester credits, 6 credit points)
Corresponds to the second 50% of *Bachelor-Thesis* (6 credit points)

Two or three additional courses (3 semester credits each).

APPLIED MATHEMATICS ELECTIVES

The following undergraduate courses are suggested as applied mathematics courses:

AOE	4404	Applied Numerical Methods (same as MATH 4404)
ESM	4084	Engineering Design Optimization
ESM	4094	Computational Methods in Mechanics
ESM	4734	An Introduction to the Finite Element Method
ME	4624	Finite Element Practice in Mechanical Design

Note that these courses are not all offered every year. For instance, ESM 4094 was not offered during the 2005-2006 academic year.

TECHNICAL ELECTIVES

The Bachelor of Science in Mechanical Engineering (BSME) program at Virginia Tech requires 15 semester hour credits (30 credit points) of technical electives. A technical elective is defined as an upper-level course—typically at the 3000 or 4000 level—that presumes the basic engineering courses have been completed. The Virginia Tech BSME program does not differentiate between ME and non-ME technical electives. For the complete list of BSME technical electives, please see the following document:

<http://www.me.vt.edu/programs/undergrad/techelectives.pdf>

The course catalog with the description of all undergraduate courses in the College of Engineering and in the College of Science can be found at the following two locations:

<http://www.undergradcatalog.registrar.vt.edu/eng/>

<http://www.undergradcatalog.registrar.vt.edu/science/>

The following are suggested as TUD BSME technical electives (Wahlpflichtbereich A):

Mechanical Engineering:

ME	4154	Industrial Energy Management
ME	4204	Internal Combustion Engines
ME	4224	Aircraft Engines and Gas Turbines
ME	4234	Aerospace Propulsion Systems (same as AOE 4234)
ME	4244	Marine Engineering (same as AOE 4244)
ME	4xxx	Fluids-Heat Transfer Design (new course)
ME	4424	Thermodynamics of Fluid Flow
ME	4434	Fluid Power Systems and Controls (same as BSE 4424)
ME	4524	Introduction to Robotics and Automation
ME	4534	Land Vehicle Dynamics
ME	4554	Advanced Technology Motor Vehicles
ME	4614	Mechanical Design II
ME	4624	Finite Element Practice in Mechanical Design
ME	4634	Introduction to Computer Aided Design and Manufacturing
ME	4644	Introduction to Rapid Prototyping
ME	4724	Engineering Acoustics
ME	4734	Mechatronics (same as ECE 4734)
ME	4994	Undergraduate Research (variable credits: 50 hours effort per credit)

Aerospace and Ocean Engineering:

AOE	3104	Aircraft Performance
AOE	3114	Compressible Aerodynamics
AOE	3124	Aerospace Structures
AOE	3204	Naval Architecture
AOE	3224	Ocean Structures
AOE	3264	Resistance and Propulsion of Ships
AOE	4004	Computer Aided Control System Design
AOE	4054	Stability of Structures
AOE	4064	Fluid Flow in Nature
AOE	4084	Engineering Design Optimization (ESM 4084)
AOE	4114	Applied Computational Aerodynamics
AOE	4124	Configuration Aerodynamics
AOE	4134	Astromechanics
AOE	4140	Spacecraft Dynamics and Control
AOE	4184	Design and Optimization of Composite Structures (ESM 4184)
AOE	4204	Ocean Acoustics
AOE	4214	Ocean Wave Mechanics
AOE	4274	Computer Based Design of Ocean Structures
AOE	4334	Ship Dynamics

Industrial and Systems Engineering:

ISE	4244	Fundamentals of Computer Integrated Manufacturing
ISE	4264	Industrial Automation

Chemical Engineering:

CHE	3134	Separation Processes
CHE	3184	Chemical Reactor Analysis and Design
CHE	4104	Process Materials
CHE	4134	Chemical Process Modeling
CHE	4185-4186	Process and Plant Design (two-course sequence)
CHE	4214	Introduction to Polymer Materials
CHE	4224	Introduction to Polymer Processing

Materials Science and Engineering:

MSE	4554	Polymer Engineering
MSE	4604	Composite Materials

SAMPLE STUDY PROGRAM I

This program would complete the required 31 semester credit hours (62 CP) in two semesters. The dates shown are for the 2005-2006 academic year.

Fall Semester (August 22 – December 15)

ME	3404	Fluid Mechanics		3 credits (6 CP)
ME	4504	Dynamic Systems – Controls Engineering I		3 credits (6 CP)
ME	4015	Engineering Design and Project I		3 credits (6 CP)
ME	4204	Internal Combustion Engines	<i>Tech 1</i>	3 credits (6 CP)
ME	4554	Advanced Technology Motor Vehicles	<i>Tech 2</i>	3 credits (6 CP)
TOTAL				15 credits (30 CP)

Spring Semester (January 17 – May 10)

ME	3504	Dynamic Systems – Vibrations		3 credits (6 CP)
ME	3304	Heat and Mass Transfer		3 credits (6 CP)
ME	4016	Engineering Design and Project II		3 credits (6 CP)
ME	4534	Land Vehicle Dynamics	<i>Tech 3</i>	3 credits (6 CP)
AOE	4404	Applied Numerical Methods	<i>Math</i>	3 credits (6 CP)
TA	2024	Introduction to Acting	<i>Non-ME</i>	3 credits (6 CP)
TOTAL				18 credits (36 CP)

SAMPLE STUDY PROGRAM II

This program would complete the required 31 semester credit hours (62 CP) across three semesters, while at the same time earning 3 semester credit hours (6 CP) towards a master degree (ME 5634). The dates shown are for the 2005-2006 academic year.

Fall Semester (August 22 – December 15)

ME	3404	Fluid Mechanics		3 credits (6 CP)
ME	4504	Dynamic Systems – Controls Engineering I		3 credits (6 CP)
ME	4015	Engineering Design and Project I		3 credits (6 CP)
ME	4624	Finite Element Practice in Mechanical Design	<i>Math</i>	3 credits (6 CP)
ME	4644	Introduction to Rapid Prototyping	<i>Tech 1</i>	3 credits (6 CP)
TOTAL				15 credits (30 CP)

Spring Semester (January 17 – May 10)

ME	3304	Heat and Mass Transfer		3 credits (6 CP)
ME	4016	Engineering Design and Project II		3 credits (6 CP)
ME	4524	Introduction to Robotics and Automation	<i>Tech 2</i>	3 credits (6 CP)
ISE	4264	Industrial Automation	<i>Tech 3</i>	3 credits (6 CP)
ME	5634	Finite Elements in Machine Design	<i>MSprog</i>	3 credits (6 CP)
TOTAL				15 credits (30 CP)

Summer I Semester (May 22 – July 1)

ME	3504	Dynamic Systems – Vibrations		3 credits (6 CP)
PHIL	1204	Knowledge and Reality	<i>Non-ME</i>	3 credits (6 CP)
TOTAL				6 credits (12 CP)