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:

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

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
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:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ME 4154</td>
<td>Industrial Energy Management</td>
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<tr>
<td>ME 4204</td>
<td>Internal Combustion Engines</td>
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<tr>
<td>ME 4224</td>
<td>Aircraft Engines and Gas Turbines</td>
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<tr>
<td>ME 4234</td>
<td>Aerospace Propulsion Systems (same as AOE 4234)</td>
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<tr>
<td>ME 4244</td>
<td>Marine Engineering (same as AOE 4244)</td>
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<tr>
<td>ME 4xxx</td>
<td>Fluids-Heat Transfer Design (new course)</td>
</tr>
<tr>
<td>ME 4424</td>
<td>Thermodynamics of Fluid Flow</td>
</tr>
<tr>
<td>ME 4434</td>
<td>Fluid Power Systems and Controls (same as BSE 4424)</td>
</tr>
<tr>
<td>ME 4524</td>
<td>Introduction to Robotics and Automation</td>
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<tr>
<td>ME 4534</td>
<td>Land Vehicle Dynamics</td>
</tr>
<tr>
<td>ME 4554</td>
<td>Advanced Technology Motor Vehicles</td>
</tr>
<tr>
<td>ME 4614</td>
<td>Mechanical Design II</td>
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<tr>
<td>ME 4624</td>
<td>Finite Element Practice in Mechanical Design</td>
</tr>
<tr>
<td>ME 4634</td>
<td>Introduction to Computer Aided Design and Manufacturing</td>
</tr>
<tr>
<td>ME 4644</td>
<td>Introduction to Rapid Prototyping</td>
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<tr>
<td>ME 4724</td>
<td>Engineering Acoustics</td>
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<tr>
<td>ME 4734</td>
<td>Mechatronics (same as ECE 4734)</td>
</tr>
<tr>
<td>ME 4994</td>
<td>Undergraduate Research (variable credits: 50 hours effort per credit)</td>
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</tbody>
</table>
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  Tech 1  3 credits (6 CP)
ME  4554  Advanced Technology Motor Vehicles  Tech 2  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  Tech 3  3 credits (6 CP)
AOE  4404  Applied Numerical Methods  Math  3 credits (6 CP)
TA  2024  Introduction to Acting  Non-ME  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  Math  3 credits (6 CP)
ME  4644  Introduction to Rapid Prototyping  Tech 1  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  Tech 2  3 credits (6 CP)
ISE  4264  Industrial Automation  Tech 3  3 credits (6 CP)
ME  5634  Finite Elements in Machine Design  MSprog  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  Non-ME  3 credits (6 CP)
TOTAL  6 credits (12 CP)