

**Course Structure Diagram 2014-15**  
**Bachelor of Science (technology) in Mechanical Engineering**  
**3 years, 180 ECTS credits**

**COMPULSORY BASIC AND INTERMEDIATE STUDIES**

Year 1 / Autumn semester			Year 1 / Spring semester		
		Scope ECTS cr			Scope ECTS cr
<a href="#">460083P</a>	Orientation Course for New Students <sup>1</sup>	1,0	<a href="#">031011P</a>	Calculus II	6,0
<a href="#">031010P</a>	Calculus I	5,0	<a href="#">461010A</a>	Strength of Materials I	7,0
<a href="#">460084P</a>	Mathematical Analysis in Mechanical Engineering	7,0	<a href="#">463052A</a>	Introduction to Manufacturing Technology	5,0
<a href="#">461016A</a>	Statics	5,0	<a href="#">464052A</a>	CAD	3,5
<a href="#">464051A</a>	Machine Drawing, examination	3,5	<a href="#">555260P</a>	Basic Course in Occupational Safety and Wellbeing at Work	3,0
<a href="#">555220P</a>	Basic Course in Industrial Engineering and Management	3,0	<a href="#">761103P</a>	Electricity and Magnetism	4,0
<a href="#">761121P</a>	Laboratory Exercises in Physics 1	3,0	<a href="#">761104P</a>	Wave Motion	3,0
	Foreign Language <sup>2</sup>	2,0(3,0)		Foreign Language <sup>2</sup>	2,0(3,0)
Total		29 (30 ECTS cr)	Total		33,5 (34,5 ECTS cr)

<sup>1</sup> Includes an orientation day organized by the department and the faculty and participating in student tutorials.

<sup>2</sup> The student may choose English or German language studies. English studies are divided into two modules (2 ECTS cr/ module), which are completed during 1<sup>st</sup> year and 2<sup>nd</sup> year autumn semester ([902011P](#) Technical English 3). German language studies are completed during the first year of studies, 3 ECTS in the autumn term and 3 ECTS cr in the spring term ([903009P](#) Technical German, Elementary Course; 6 ECTS cr, [903010P](#) Technical German 1; 6 ECTS cr, [903012P](#) Technical German 3; 6 ECTS cr).

**COMPULSORY BASIC AND INTERMEDIATE STUDIES**

Year 2 / Autumn semester		Scope ECTS cr	Year 2 / Spring semester		Scope ECTS cr
<a href="#">464055A</a>	Machine Design I	4,0(/8,0)	<a href="#">031017P</a>	Differential Equations	4,0
<a href="#">465061A</a>	Materials Engineering I	5,0	<a href="#">464055A</a>	Machine Design I	4,0(/8,0)
<a href="#">555263A</a>	Technology, Society and Work	2,0	<a href="#">460085A</a>	Engineering Software Tools	3,0
<a href="#">555280P</a>	Basic Course of Project Management	2,0	<a href="#">461018A</a>	Dynamics	4,0
<a href="#">780109P</a>	Basic Principles in Chemistry	4,0	<a href="#">461035A</a>	Heat and Mass Transfer I	3,5
	Foreign Language <sup>2</sup>	2,0	<a href="#">463053A</a>	Manufacturing Technology I	3,5
Total		19	Total		23

<sup>2</sup> The student may choose English or German language studies. English studies are divided into two modules (2 ECTS cr/ module), which are completed during 1<sup>st</sup> year and 2<sup>nd</sup> year autumn semester ([902011P](#) Technical English 3). German language studies are completed during the first year of studies, 3 ECTS in the autumn term and 3 ECTS cr in the spring term ([903009P](#) Technical German, Elementary Course; 6 ECTS cr, [903010P](#) Technical German 1; 6 ECTS, [903012P](#) Technical German 3; 6 ECTS cr).

## MODULE PREPARING FOR THE OPTION

In addition to the module preparing for the option, the student selects supplementary studies consisting of another option's supplementary module

### Motor Vehicle and Heavy Equipment Technology

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">462021A</a> Machine Automation I	5,0
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">555361A</a> Machine Safety and Usability	3,5
Total	10,5	Total	8,5

### Machine Design

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
Total	10,5	Total	8,5

### Materials Engineering

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
		<a href="#">465071A</a> Introduction to Materials Science	3,5
Total	10,5	Total	11,0

**Mechatronics and Machine Diagnostics**

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
Total	10,5	Total	8,5

**Structural Engineering and Construction Technology**

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
Total	10,5	Total	8,5

**Engineering Mechanics**

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
Total	10,5	Total	8,5

## Industrial Engineering and Management

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">721172A</a> Management Accounting	5,0
<a href="#">555223A</a> Introduction to Production Control <sup>3</sup>	1,5/3,0	<a href="#">555223A</a> Introduction to Production Control <sup>3</sup>	1,5/3,0
Total	8,5	Total	6,5

<sup>3</sup> The course continues from autumn to spring semester

## Production Technology

Year 2 / Autumn semester		Year 2 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461011A</a> Strength of Materials II	7,0	<a href="#">555361A</a> Machine Safety and Usability	3,5
<a href="#">465077A</a> Welding Technology	3,5	<a href="#">462021A</a> Machine Automation I	5,0
Total	10,5	Total	8,5

## OPTIONAL STUDIES

In addition to basic and intermediate studies, the module preparing for the option and supplementary studies, the student can complete optional studies included in the degree already during the 2<sup>nd</sup> year of study. Optional studies (approx.10 ECTS cr) are freely selected and must be at least at intermediate-level. Optional studies may include studies offered by the University of Oulu or some other Finnish or foreign university.

If the module preparing for the option and the supplementary module selected by the student include the same courses, the student must select optional studies to make up for the overlapping studies, so that the total extent of the bachelor's degree is the minimum of 180 ECTS credits.

The student should note that at bachelor's level, he/she cannot select as supplementary studies courses which are compulsory in the module preparing for the option or the supplementary module or courses which at master's level are included in the module for the option, the supplementary module, advanced module or special module

Listed below are examples of studies, which can be completed already in the 2<sup>nd</sup> year, provided that prerequisites for the course are met.

<a href="#">031018A</a> Complex Analysis	4,0	<a href="#">031022A</a> Numerical Analysis	5,0
<a href="#">031050A</a> Signal Analysis <sup>3</sup>	4,0	<a href="#">031026A</a> Variational Methods	5,0
<a href="#">300002A</a> Advanced Information Skills	1,0		
<a href="#">460071A</a> Structural Systems in Automotive Vehicles I	5,0	<a href="#">460072S</a> Structural Systems in Automotive Vehicles II	8,5
<a href="#">460074S</a> Internal Combustion Engines II	5,0	<a href="#">460073A</a> Internal Combustion Engines I	3,5
<a href="#">460075S</a> Experimental Methods in Internal Combustion Engines	3,5	<a href="#">460118A</a> Building Materials	3,0
<a href="#">460076A</a> Mobile Hydraulics	3,5	<a href="#">460127S</a> Design of Steel Structures	4,0
<a href="#">460116A</a> Introduction to Building Construction	3,0	<a href="#">460135A</a> Introduction to Structural Timber Design	4,0
<a href="#">460117A</a> Introduction to Structural Design	6,0	<a href="#">460148S</a> Design of Concrete Structures	4,0
<a href="#">460125A</a> Introduction to Design of Steel Structures	4,0	<a href="#">460155S</a> Concrete Technology	4,5
<a href="#">460128S</a> Advanced Topics on Design of Steel Structures I	4,0	<a href="#">460160S</a> Building Physics	3,5
<a href="#">460136S</a> Structural Timber Design	4,0	<a href="#">460163S</a> Foundation engineering	5,0
<a href="#">460137S</a> Advanced Topics on Structural Timber Design I	4,0	<a href="#">460170A</a> Introduction to Transportation Engineering	5,0
<a href="#">460147A</a> Introduction to Design of Concrete Technology	4,0	<a href="#">460176A</a> Introduction to Highway Engineering	5,0
<a href="#">460149S</a> Advanced Topics on Design of Concrete Structures I	4,0	<a href="#">460180S</a> Automation of Road Construction	5,0
<a href="#">460154A</a> Introduction to Concrete Technology	4,0	<a href="#">460182S</a> Automation of Building and Bridge Construction	5,0
<a href="#">460156S</a> Advanced Topics Concrete Technology I	4,0	<a href="#">461013A</a> Plates and Shells	5,0

<a href="#">460159S</a>	Steel-concrete composite structures	5,0	<a href="#">461019S</a>	Mechanical Vibrations	6,0
<a href="#">460165A</a>	Introduction to Construction Economics I <sup>3</sup>	3,0	<a href="#">461021S</a>	Fracture Mechanics	5,0
<a href="#">460166S</a>	Introduction to Construction Economics II	3,0	<a href="#">461026S</a>	Continuum Mechanics	6,0
<a href="#">460184S</a>	Automation of Foundation Engineering	5,0	<a href="#">462021A</a>	Machine Automation I	5,0
<a href="#">460186S</a>	Roads and Earth Works	5,0	<a href="#">462051S</a>	Mechatronics	5,0
<a href="#">461012A</a>	Energy Principles and Their Use in Beam Structures	7,0	<a href="#">462055S</a>	Virtual engineering of mechatronic products	5,0
<a href="#">461020S</a>	Advanced Course in Finite Element Methods	5,0	<a href="#">463060S</a>	Planning of Flexible Manufacturing System	3,5
<a href="#">461023A</a>	Optimization of Structures <sup>4</sup>	5,0	<a href="#">463067A</a>	Manufacturing Technology of Sheet Metal Products	3,5
<a href="#">461027S</a>	Mechanics of Composites <sup>5</sup>	5,0	<a href="#">464057S</a>	Machine Design III*	7,0
<a href="#">461028S</a>	Experimental Methods in Engineering Mechanics	6,0	<a href="#">464087A</a>	Maintenance Technology	5,0
<a href="#">461033A</a>	Finite Element Methods I	3,5	<a href="#">465071A</a>	Introduction to Materials Science	3,5
<a href="#">461034A</a>	Finite Element Methods II <sup>3</sup>	3,5	<a href="#">465079S</a>	Failure Analysis	3,5
<a href="#">461036S</a>	Heat and Mass Transfer II	3,5	<a href="#">465080S</a>	Welding Metallurgy	8,5
<a href="#">462022S</a>	Machine Automation II	5,0	<a href="#">465064S</a>	Strength of metal alloys	7,0
<a href="#">462035A</a>	Mechanisms	3,5	<a href="#">465084S</a>	Exercises in Physical Metallurgy	4,0
<a href="#">462038A</a>	Precision Engineering <sup>3</sup>	3,5	<a href="#">465093S</a>	Advanced Course in Welding Technology	5,0
<a href="#">462040A</a>	Tribology	3,5	<a href="#">465095A</a>	Sheet Metal Forming	3,5
<a href="#">462044S</a>	Computer Aided Design	3,5	<a href="#">477041S</a>	Experimental Design	5,0
<a href="#">462050A</a>	Automotive Engineering <sup>3</sup>	5,0	<a href="#">477413S</a>	Experimental research in extractive metallurgy	10,0
<a href="#">462052S</a>	Advanced Course in Mechatronics	8,0	<a href="#">477603A</a>	Control System Design	4,0
<a href="#">462053A</a>	Sensor Technology of Machine Automation	5,0	<a href="#">488111S</a>	Modelling in Geoenvironmental Engineering	5,0
<a href="#">463054S</a>	Manufacturing Technology II <sup>3</sup>	17,0	<a href="#">521142A</a>	Embedded Systems Programming	5,0
<a href="#">463055S</a>	Manufacturing Technology II (lecture course)*	5,0	<a href="#">521144A</a>	Algorithms and Data Structures	6,0
<a href="#">463058A</a>	Foundry Technology	3,5	<a href="#">555223A</a>	Introduction to Production Control	3,0
<a href="#">463059S</a>	Computer Aided Manufacturing	4,0	<a href="#">555281A</a>	Basic Course of Quality Management	5,0
<a href="#">463062S</a>	Quality in Production	3,5	<a href="#">555282A</a>	Project Management	4,0

<a href="#">463064S</a>	Manufacturing of Electronics Products <sup>3</sup>	5,0	<a href="#">555322S</a>	Production Management	3,0
<a href="#">463065A</a>	Manufacturing of Plastics Products	3,5	<a href="#">555324S</a>	Advanced Supply Chain Management	3,0
<a href="#">463066A</a>	Introduction to Sheet Metal Design	3,5	<a href="#">555326S</a>	Research Project in Production Management	5,0
<a href="#">463068S</a>	Laser Processing <sup>3</sup>	3,5	<a href="#">555341S</a>	Productivity and Performance Management	3,0
<a href="#">464056A</a>	Machine Design II <sup>3</sup>	6,0	<a href="#">555342S</a>	Operations Research	3,0
<a href="#">464061A</a>	Techniques of Creative Working	3,0	<a href="#">555343S</a>	Product Data Management	5,0
<a href="#">464074S</a>	Paper Machinery Construction	7,0	<a href="#">555344S</a>	Management Information Systems	5,0
<a href="#">464079S</a>	Programmable Controllers and Field Bus Systems, examination	5,0	<a href="#">555346S</a>	Product Management	5,0
<a href="#">464085A</a>	Patenting	3,5	<a href="#">555348S</a>	Research Project in Technology Management	5,0
<a href="#">464088S</a>	Diagnosis of Machine Condition	8,0	<a href="#">555360S</a>	Administration, Organization and Education in Working Life	5,0
<a href="#">464089S</a>	Measuring Instrumentation and Techniques for Diagnosis of Machine Condition	5,0	<a href="#">555361A</a>	Machine Safety and Usability	3,5
<a href="#">465062S</a>	Materials Engineering II	3,0	<a href="#">555380S</a>	Quality Management	5,0
<a href="#">465075A</a>	Research Techniques for Materials	3,5	<a href="#">555388S</a>	Project Work in Project Management	5,0
<a href="#">465077A</a>	Welding Technology	3,5	<a href="#">721172A</a>	Management Accounting	5,0
<a href="#">465063S</a>	Microstructural changes of metallic alloys	7,0			
<a href="#">465088S</a>	Utilization of Electron Optical Methods <sup>4</sup>	3,5			
<a href="#">465089S</a>	Processing and Properties of Steels <sup>4</sup>	3,5			
<a href="#">465090A</a>	Rolling Technology	8,0			
<a href="#">465094A</a>	Furnace Technology	4,0			
<a href="#">477305S</a>	Flow Dynamics	5,0			
<a href="#">477412S</a>	Phenomena-based modelling in extractive metallurgy	10,0			
<a href="#">477414S</a>	Process simulation in extractive metallurgy	10,0			
<a href="#">477602A</a>	Control System Analysis	4,0			
<a href="#">477604S</a>	Fundamentals of PID Control	3,0			
<a href="#">477605S</a>	Digital Control Theory	4,0			
<a href="#">488115S</a>	Geomechanics <sup>3</sup>	5,0			



<a href="#">488121S</a>	Municipality Geotechnics	5,0
<a href="#">521404A</a>	Digital Techniques II	5,0
<a href="#">521412A</a>	Digital Techniques I	6,0
<a href="#">521431A</a>	Principles of Electronics Design	5,0
<a href="#">521457A</a>	Software Engineering	5,0
<a href="#">555222A</a>	Demonstration in Industrial Engineering and Management	2,0
<a href="#">555224A</a>	Methods of Production Management and Logistics	4,0
<a href="#">555240A</a>	Basic Course in Product Development	3,0
<a href="#">555320S</a>	Strategic Management	5,0
<a href="#">555321S</a>	Risk Management	3,0
<a href="#">555323S</a>	Sourcing Management	3,0
<a href="#">555326S</a>	Research Project in Production Management	5,0
<a href="#">555327S</a>	Seminar in production management	5,0
<a href="#">555340S</a>	Technology management	4,0
<a href="#">555345S</a>	Advanced course in product development	6,0
<a href="#">555347S</a>	Seminar in technology management	5,0
<a href="#">555348S</a>	Research project in technology management	5,0
<a href="#">555362S</a>	Safety in process industry <sup>3</sup>	5,0
<a href="#">555366S</a>	Exercises in work science <sup>3</sup>	6,0
<a href="#">555382S</a>	Project business	5,0
<a href="#">555386S</a>	Seminar in project management	5,0
<a href="#">555388S</a>	Project work in project management	5,0
<a href="#">721412A</a>	Product and Market Strategies	5,0
<a href="#">721704A</a>	Business Logistics <sup>3</sup>	5,0

<sup>3</sup> Course continues from autumn to spring term

<sup>4</sup> The course is held every second year

<sup>5</sup> The course is held every second year, if necessary.

**COMPULSORY BASIC AND INTERMEDIATE STUDIES**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">030005P</a> Information Skills <sup>6</sup>	1,0	<a href="#">030005P</a> Information Skills <sup>6</sup>	(1,0)
<a href="#">460001A</a> Practical Training	5,0	<a href="#">901008P</a> Second Official Language (Swedish) <sup>7</sup>	2,0
<a href="#">901008P</a> Second Official Language (Swedish) <sup>7</sup>	2,0		
<hr/>		<hr/>	
Total	8,0	Total	2,0

<sup>6</sup> 030005P Information Skills is completed either in 2<sup>nd</sup> year spring semester or 3<sup>rd</sup> year autumn semester

<sup>7</sup> 901008P Second Official Language can be completed in autumn or spring semester

**MODULE PREPARING FOR THE OPTION**

In addition to the module preparing for the option, the student selects studies included in another option's supplementary module.

**Motor Vehicle and Heavy Equipment Technology**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461033A</a> Finite Element Methods I	3,5	<a href="#">462050A</a> Automotive Engineering	5,0
<a href="#">464056A</a> Machine Design II <sup>4</sup>	6,0	<a href="#">464056A</a> Machine Design II <sup>4</sup>	6,0
<a href="#">464061A</a> Techniques of Creative Working	3,0		
<a href="#">464085A</a> Patenting	3,5		
<hr/>		<hr/>	
Total	16,0	Total	11,0

<sup>4</sup> The course continues from autumn to spring semester

**Machine Design**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461033A</a> Finite Element Methods I	3,5	<a href="#">464056A</a> Machine Design II <sup>4</sup>	6,0
<a href="#">464085A</a> Patenting	3,5	<a href="#">464087A</a> Maintenance Technology	5,0
<a href="#">464061A</a> Techniques of Creative Working	3,0		
<a href="#">464056A</a> Machine Design II <sup>4</sup>	6,0		
<hr/>		<hr/>	
Total	16,0	Total	11,0

<sup>4</sup> The course continues from autumn to spring semester

**Materials Engineering**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461033A</a> Finite Element Methods I	3,5	<a href="#">465095A</a> Sheet Metal Forming	3,5
<a href="#">463058A</a> Foundry Technology	3,5		
<a href="#">464061A</a> Techniques of Creative Working	3,0		
<hr/>		<hr/>	
Total	10,0	Total	3,5

**Mechatronics and Machine Diagnostics**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">461033A</a> Finite Element Methods I	3,5	<a href="#">462051S</a> Mechatronics	5,0
<a href="#">464061A</a> Techniques of Creative Working	3,0	<a href="#">464087A</a> Maintenance Technology	5,0

<a href="#">462053A</a>	Sensor Technology of Machine Automation	5,0			
Total		11,5	Total	10,0	

### Structural Engineering and Construction Technology

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">461033A</a>	Finite Element Methods I	3,5	<a href="#">460118A</a>	Building Materials	3,0
<a href="#">460116A</a>	Introduction to Building Construction	3,0	<a href="#">460135A</a>	Introduction to Structural Timber Design	4,0
<a href="#">460117A</a>	Introduction to Structural Design	6,0			
<a href="#">460154A</a>	Introduction to Concrete Technology	4,0			
Total		16,5	Total	7,0	

### Engineering Mechanics

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">464061A</a>	Techniques of Creative Working	3,0	<a href="#">461013A</a>	Plates and Shells	5,0
<a href="#">461033A</a>	Finite Element Methods I	3,5			
<a href="#">461012A</a>	Energy Principles and Their Use in Beam Structures	7,0			
Total		13,5	Total	5,0	

### Industrial Engineering and Management

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">464061A</a>	Techniques of Creative Working	3,0	<a href="#">555281A</a>	Basic Course of Quality Management	5,0
<a href="#">555222A</a>	Demonstration in Industrial Engineering and Management	2,0	<a href="#">555282A</a>	Project Management	4,0
<a href="#">721412A</a>	Product and Market Strategies	5,0			
<a href="#">555224A</a>	Methods of Production Management and Logistics	4,0			
Total		14,0	Total		9,0

**Production Technology**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">464061A</a>	Techniques of Creative Working	3,0	<a href="#">555223A</a>	Introduction to Production Control <sup>4</sup>	3,0
<a href="#">464085A</a>	Patenting	3,5	<a href="#">464087A</a>	Maintenance Technology	5,0
<a href="#">463058A</a>	Foundry Technology	3,5			
<a href="#">555223A</a>	Introduction to Production Control <sup>4</sup>	3,0			
Total		13,0	Total		8,0

<sup>4</sup> The course continues from autumn to spring semester

**SUPPLEMENTARY MODULES****Motor Vehicle and Heavy Equipment Technology**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">464056A</a>	Machine Design II <sup>4</sup>	6,0	<a href="#">462050A</a>	Automotive Engineering	5,0
			<a href="#">464056A</a>	Machine Design II <sup>4,8</sup>	6,0
			or		
			<a href="#">464087A</a>	Maintenance Technology <sup>8</sup>	5,0
<hr/>			<hr/>		
Total		6,0	Total		11,0

<sup>4</sup> The course continues from autumn to spring semester

<sup>8</sup> Alternative courses

**Machine Design**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">464056A</a>	Machine Design II <sup>4</sup>	6,0	<a href="#">464056A</a>	Machine Design II <sup>4</sup>	6,0
<a href="#">464085A</a>	Patenting <sup>8</sup>	3,5 tai	<a href="#">464087A</a>	Maintenance Technology <sup>8</sup>	5,0
<hr/>			<hr/>		
Total		9,5	Total		11,0

<sup>4</sup> The course continues from autumn to spring semester

<sup>8</sup> Alternative courses



**Materials Engineering**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
		<a href="#">465071A</a> Introduction to Materials Science	3,5
		<a href="#">465095A</a> Sheet Metal Forming	3,5
Total	0,0	Total	7,0

**Mechatronics and Machine Diagnostics**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">462053A</a> Sensor Technology of Machine Automation	5,0	<a href="#">464087A</a> Maintenance Technology <sup>8</sup> or <a href="#">462051S</a> Mechatronics <sup>8</sup>	5,0
Total	5,0	Total	5,0

<sup>8</sup> Alternative courses**Structural Engineering and Construction Technology**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">460116A</a> Introduction to Building Construction	3,0	<a href="#">460118A</a> Building Materials	3,0
<a href="#">460117A</a> Introduction to Structural Design	6,0		
Total	9,0	Total	3,0

**Engineering Mechanics**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">461012A</a>	Energy Principles and Their Use in Beam Structures	7,0	<a href="#">461013A</a>	Plates and Shells	5,0
Total		7,0	Total		5,0

**Industrial Engineering and Management**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">555222A</a>	Demonstration in Industrial Engineering and Management	2,0	<a href="#">555223A</a>	Introduction to Production Control <sup>4</sup>	3,0
<a href="#">555223A</a>	Introduction to Production Control <sup>4</sup>	3,0			
<a href="#">555224A</a>	Methods of Production Management and Logistics	4,0			
Total		9,0	Total		3,0

<sup>4</sup> The course continues from autumn to spring semester

**Production Technology**

Year 3 / Autumn semester		Scope ECTS cr	Year 3 / Spring semester		Scope ECTS cr
<a href="#">463058A</a>	Foundry Technology	3,5	<a href="#">464087A</a>	Maintenance Technology	5,0

<a href="#">555223A</a> Introduction to Production Control <sup>4</sup>	3,0	<a href="#">555223A</a> Introduction to Production Control <sup>4</sup>	3,0
Total	6,5	Total	8,0

<sup>4</sup> The course continues from autumn to spring semester

## OPTIONAL STUDIES

In addition to basic and intermediate studies, the module preparing for the option and supplementary studies, the student can complete optional studies included in the degree already during the 2nd year of study. Optional studies (approx.10 ECTS cr) are freely selected and must be at least at intermediate-level. Optional studies may include studies offered by the University of Oulu or some other Finnish or foreign university.

If the module preparing for the option and the supplementary module selected by the student include the same courses, the student must select optional studies to replace the credits for the overlapping studies, so that the total extent of the bachelor's degree is the minimum of 180 ECTS credits.

The student should note that at bachelor's level, he/she cannot select as supplementary studies courses which are compulsory in the module preparing for the option or the supplementary module or courses which at master's level are included in the module for the option, the supplementary module, advanced module or special module.

Listed below are examples of studies, which can be completed already in the 2nd year, providing that all prerequisites for the course are met.

<a href="#">031018A</a> Complex Analysis	4,0	<a href="#">031022A</a> Numerical Analysis	5,0
<a href="#">031050A</a> Signal Analysis <sup>4</sup>	4,0	<a href="#">031026A</a> Variational Methods	5,0
<a href="#">300002A</a> Advanced Information Skills	1,0		
<a href="#">460071A</a> Structural Systems in Automotive Vehicles I	5,0	<a href="#">460072S</a> Structural Systems in Automotive Vehicles II	8,5
<a href="#">460074S</a> Internal Combustion Engines II	5,0	<a href="#">460073A</a> Internal Combustion Engines I	3,5
<a href="#">460075S</a> Experimental Methods in Internal Combustion Engines	3,5	<a href="#">460118A</a> Building Materials	3,0
<a href="#">460076A</a> Mobile Hydraulics	3,5	<a href="#">460127S</a> Design of Steel Structures	4,0
<a href="#">460116A</a> Introduction to Building Construction	3,0	<a href="#">460135A</a> Introduction to Structural Timber Design	4,0
<a href="#">460117A</a> Introduction to Structural Design	6,0	<a href="#">460148S</a> Design of Concrete Structures	4,0
<a href="#">460125A</a> Introduction to Design of Steel Structures	4,0	<a href="#">460155S</a> Concrete Technology	4,5
<a href="#">460128S</a> Advanced Topics on Design of Steel Structures I	4,0	<a href="#">460160S</a> Building Physics	3,5

<a href="#">460136S</a>	Structural Timber Design	4,0	<a href="#">460163S</a>	Foundation engineering	5,0
<a href="#">460137S</a>	Advanced Topics on Structural Timber Design I	4,0	<a href="#">460170A</a>	Introduction to Transportation Engineering	5,0
<a href="#">460147A</a>	Introduction to Design of Concrete Technology	4,0	<a href="#">460176A</a>	Introduction to Highway Engineering	5,0
<a href="#">460149S</a>	Advanced Topics on Design of Concrete Structures I	4,0	<a href="#">460180S</a>	Automation of Road Construction	5,0
<a href="#">460154A</a>	Introduction to Concrete Technology	4,0	<a href="#">460182S</a>	Automation of Building and Bridge Construction	5,0
<a href="#">460156S</a>	Advanced Topics Concrete Technology I	4,0	<a href="#">461013A</a>	Plates and Shells	5,0
<a href="#">460159S</a>	Steel-concrete composite structures	5,0	<a href="#">461019S</a>	Mechanical Vibrations	6,0
<a href="#">460165A</a>	Introduction to Construction Economics I <sup>4</sup>	3,0	<a href="#">461021S</a>	Fracture Mechanics	5,0
<a href="#">460166S</a>	Introduction to Construction Economics II	3,0	<a href="#">461026S</a>	Continuum Mechanics	6,0
<a href="#">460184S</a>	Automation of Foundation Engineering	5,0	<a href="#">462021A</a>	Machine Automation I	5,0
<a href="#">460186S</a>	Roads and Earth Works	5,0	<a href="#">462051S</a>	Mechatronics	5,0
<a href="#">461012A</a>	Energy Principles and Their Use in Beam Structures	7,0	<a href="#">462055S</a>	Virtual engineering of mechatronic products	5,0
<a href="#">461020S</a>	Advanced Course in Finite Element Methods	5,0	<a href="#">463060S</a>	Planning of Flexible Manufacturing System	3,5
<a href="#">461023A</a>	Optimization of Structures <sup>5</sup>	5,0	<a href="#">463067A</a>	Manufacturing Technology of Sheet Metal Products	3,5
<a href="#">461027S</a>	Mechanics of Composites <sup>6</sup>	5,0	<a href="#">464057S</a>	Machine Design III*	7,0
<a href="#">461028S</a>	Experimental Methods in Engineering Mechanics	6,0	<a href="#">464087A</a>	Maintenance Technology	5,0
<a href="#">461033A</a>	Finite Element Methods I	3,5	<a href="#">465071A</a>	Introduction to Materials Science	3,5
<a href="#">461034A</a>	Finite Element Methods II <sup>4</sup>	3,5	<a href="#">465079S</a>	Failure Analysis	3,5
<a href="#">461036S</a>	Heat and Mass Transfer II	3,5	<a href="#">465080S</a>	Welding Metallurgy	8,5
<a href="#">462022S</a>	Machine Automation II	5,0	<a href="#">465064S</a>	Strength of metal alloys	7,0
<a href="#">462035A</a>	Mechanisms	3,5	<a href="#">465084S</a>	Exercises in Physical Metallurgy	4,0
<a href="#">462038A</a>	Precision Engineering <sup>4</sup>	3,5	<a href="#">465093S</a>	Advanced Course in Welding Technology	5,0
<a href="#">462040A</a>	Tribology	3,5	<a href="#">465095A</a>	Sheet Metal Forming	3,5
<a href="#">462044S</a>	Computer Aided Design	3,5	<a href="#">477041S</a>	Experimental Design	5,0
<a href="#">462050A</a>	Automotive Engineering <sup>4</sup>	5,0	<a href="#">477413S</a>	Experimental research in extractive	10,0

			metallurgy	
<a href="#">462052S</a>	Advanced Course in Mechatronics	8,0	<a href="#">477603A</a>	Control System Design 4,0
<a href="#">462053A</a>	Sensor Technology of Machine Automation	5,0	<a href="#">488111S</a>	Modelling in Geoenvironmental Engineering 5,0
<a href="#">463054S</a>	Manufacturing Technology II <sup>4</sup>	17,0	<a href="#">521142A</a>	Embedded Systems Programming 5,0
<a href="#">463055S</a>	Manufacturing Technology II (lecture course)*	5,0	<a href="#">521144A</a>	Algorithms and Data Structures 6,0
<a href="#">463058A</a>	Foundry Technology	3,5	<a href="#">555223A</a>	Introduction to Production Control 3,0
<a href="#">463059S</a>	Computer Aided Manufacturing	4,0	<a href="#">555281A</a>	Basic Course of Quality Management 5,0
<a href="#">463062S</a>	Quality in Production	3,5	<a href="#">555282A</a>	Project Management 4,0
<a href="#">463064S</a>	Manufacturing of Electronics Products <sup>4</sup>	5,0	<a href="#">555322S</a>	Production Management 3,0
<a href="#">463065A</a>	Manufacturing of Plastics Products	3,5	<a href="#">555324S</a>	Advanced Supply Chain Management 3,0
<a href="#">463066A</a>	Introduction to Sheet Metal Design	3,5	<a href="#">555326S</a>	Research Project in Production Management 5,0
<a href="#">463068S</a>	Laser Processing <sup>4</sup>	3,5	<a href="#">555341S</a>	Productivity and Performance Management 3,0
<a href="#">464056A</a>	Machine Design II <sup>4</sup>	6,0	<a href="#">555342S</a>	Operations Research 5,0
<a href="#">464061A</a>	Techniques of Creative Working	3,0	<a href="#">555343S</a>	Product Data Management 5,0
<a href="#">464074S</a>	Paper Machinery Construction	7,0	<a href="#">555344S</a>	Management Information Systems 5,0
<a href="#">464079S</a>	Programmable Controllers and Field Bus Systems, examination	5,0	<a href="#">555346S</a>	Product Management 5,0
<a href="#">464085A</a>	Patenting	3,5	<a href="#">555348S</a>	Research Project in Technology Management 5,0
<a href="#">464088S</a>	Diagnosis of Machine Condition	8,0	<a href="#">555360S</a>	Administration, Organization and Education in Working Life 5,0
<a href="#">464089S</a>	Measuring Instrumentation and Techniques for Diagnosis of Machine Condition	5,0	<a href="#">555361A</a>	Machine Safety and Usability 3,5
<a href="#">465062S</a>	Materials Engineering II	3,0	<a href="#">555380S</a>	Quality Management 5,0
<a href="#">465075A</a>	Research Techniques for Materials	3,5	<a href="#">555388S</a>	Project Work in Project Management 5,0
<a href="#">465077A</a>	Welding Technology	3,5	<a href="#">721172A</a>	Management Accounting 5,0
<a href="#">465063S</a>	Microstructural changes of metallic alloys	7,0		
<a href="#">465088S</a>	Utilization of Electron Optical Methods <sup>3</sup>	3,5		
<a href="#">465089S</a>	Processing and Properties of Steels <sup>3</sup>	3,5		
<a href="#">465090A</a>	Rolling Technology	8,0		

<a href="#">465094A</a>	Furnace Technology	4,0
<a href="#">477305S</a>	Flow Dynamics	5,0
<a href="#">477412S</a>	Phenomena-based modelling in extractive metallurgy	10,0
<a href="#">477414S</a>	Process simulation in extractive metallurgy	10,0
<a href="#">477602A</a>	Control System Analysis	4,0
<a href="#">477604S</a>	Fundamentals of PID Control	3,0
<a href="#">477605S</a>	Digital Control Theory	4,0
<a href="#">488115S</a>	Geomechanics <sup>4</sup>	5,0
<a href="#">488121S</a>	Municipality Geotechnics	5,0
<a href="#">521404A</a>	Digital Techniques II	5,0
<a href="#">521412A</a>	Digital Techniques I	6,0
<a href="#">521431A</a>	Principles of Electronics Design	5,0
<a href="#">521457A</a>	Software Engineering	5,0
<a href="#">555222A</a>	Demonstration in Industrial Engineering and Management	2,0
<a href="#">555224A</a>	Methods of Production Management and Logistics	4,0
<a href="#">555240A</a>	Basic Course in Product Development	3,0
<a href="#">555320S</a>	Strategic Management	5,0
<a href="#">555321S</a>	Risk Management	3,0
<a href="#">555323S</a>	Sourcing Management	3,0
<a href="#">555326S</a>	Research Project in Production Management	5,0
<a href="#">555327S</a>	Seminar in production management	5,0
<a href="#">555340S</a>	Technology management	4,0
<a href="#">555345S</a>	Advanced course in product development	6,0
<a href="#">555347S</a>	Seminar in technology management	5,0
<a href="#">555348S</a>	Research project in technology management	5,0
<a href="#">555362S</a>	Safety in process industry <sup>4</sup>	5,0
<a href="#">555366S</a>	Exercises in work science <sup>4</sup>	6,0
<a href="#">555382S</a>	Project business	5,0

<a href="#">555386S</a>	Seminar in project management	5,0
<a href="#">555388S</a>	Project work in project management	5,0
<a href="#">721412A</a>	Product and Market Strategies	5,0
<a href="#">721704A</a>	Business Logistics <sup>4</sup>	5,0

<sup>4</sup> The course continues from autumn to spring semester

<sup>5</sup> The course is held every second year

<sup>6</sup> The course is held every second year, if necessary.

**BACHELOR'S THESIS AND ASSOCIATED COMMUNICATION STUDIES**

Year 3 / Autumn semester		Year 3 / Spring semester	
	Scope ECTS cr		Scope ECTS cr
<a href="#">900060A</a> Technical Communication <sup>9</sup>	2,0	<a href="#">900060A</a> Technical Communication <sup>9</sup>	2,0
		<a href="#">469081A</a> Bachelor's Thesis / Mechanical Engineering	8,0
		<a href="#">469080A</a> The Maturity Test for Bachelor's Degree	0,0
<hr/>		<hr/>	
Total	2,0	Total	10,0

<sup>9</sup> The course can be completed in autumn or spring semester but it cannot be completed in the same semester as 901008P Second Official Language.