Competence coverage	matrix											Jene	eral Co												Ma r' Dis
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HENT JNIVERSITY	Science in Fire Safety Engineering	Explosions and Industrial Fire Safety	Based Design		Seminar	ics, Heat and Mass Transfer	viour at Ambient and Elevated	Fire Protection I: Detection and	E051494 Active Fire Protection II: Smoke and Heat Control	d Legislation	Fire Protection	and Fire Dynamics	Safety Engineering	hods for Engineers	hanics	Element Analysis for Solids	Laboratory	Fire Investigation and Failure Analysis	Structural Design for Fire	E900533 Fire Safety, Engineering and Society	ent	E900305 Advanced Fire Dynamics	iour in Fire	Fires in Enclosures	
cademic year 2021-20	022	losions an	Performance-l	Dynamics	E051581 Fire Research Seminar	Thermodynamics,	E051570 Material Behaviour Temperatures	ve Fire Pro	ve Fire Pro	Safety and	Passive Fire F	Fire Science	Safety En	Research Methods for	E900528 Structural Mechanics	te Elemen	Science	Investigat	ctural Des	Safety, Er	Risk Assessment	anced Fire	nan Behaviour	Simulation of I	
egend:		40 Expl	22 Perf	Fire	31 Fire	31 Ther	70 Mate ratures	E051482 Active F Suppression	94 Activ	Fire	10 Pass		29 Fire		28 Stru	24 Finite	Fire	32 Fire		33 Fire	04 Risk	J5 Adva	36 Human		
T=teaching methods E=evaluation methods		E051540	E061522	E051430	E0515	E039161	E0515 Tempe	E0514	E0514	E051443	E051610 I	E900527	E900529	E900530	E9005	E900524	E900531	E900532	E900522	E9005	E900304 I	E9003	E900306 I	E900525	
Competences in one/more scientific	Master and apply advanced knowledge in the own engineering discipline in solving complex problems.		Т			T E		T E	T E		T E						T E	T E	T E		T E	T E	T E	T E	
discipline(s)	Apply Computer Aided Engineering (CAE) tools and advanced communication instruments in a creative and purposeful way.		T						T E										T E		T E	T E	T E	T E	T
	Master and apply knowledge of physics, chemistry, thermodynamics, heat and mass transfer to critically analyse and evaluate the development of fires in enclosures.		T	Т		T E	T E		_								T E	T E	T E		_	_	_	T E	
	Master and apply knowledge of element methods and dynamics of T 3 structures to critically analyse and evaluate the behaviour of simple structures in case of fire.		T E																T E						
	Master and apply knowledge of explosions to critically analyse and T 4 evaluate the associated risk.																	T E							
	Master and apply the advanced knowledge of fire dynamics, risk assessment, human behaviour and integrate this to develop a performance based fire safety design.		T	T E								T E					T E	T E	T E						
Scientific competences	Analyse complex problems and translate them into concrete research questions.		T		T E	T E		T E	T E		T E	T E						T E	T E		T E	T E	T E	T E	\vdash
	Consult the scientific literature as part of the own research. T 8		T		T E				_									T E	T E		T E		T E	T	
	Select and apply the appropriate models, methods and techniques.	5 T	Т		T		T	T E	T E			T E					T E	T	T		T	T E	T	T E	
	Develop and validate mathematical models and methods. T 3		T		_		_	_	_										_			T E		_	
	Interpret research findings in an objective and critical manner.	0	T		T E				T E			T E						T E	T E		T E	T	T E		
	Elaborate problems of fire risk assessment in a critical, autonomous and flexible manner with a limited amount of data.	Т	T						_			_					T E	T	T		T				
	Perform valid computer simulations of development and consequences of enclosure fires.		T						T E															T E	
ntellectual competences	Independently form an opinion on complex situations and problems, and defend this point of view.		T		T E	T E		T E	T E									T E	T E		T E		T E	Т	
ompetences	Apply knowledge in a creative, purposeful and innovative way to research, conceptual design and production.	Т	T					T E	T E			T E						T E					T E	Т	
	Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.	2 T	T					T	T E								T E	T	T E		T E	T E	T	T	
	Stay uptodate with the evolutions in the discipline to elevate the own competences to expert level.	2 T	Т					T	_	T E							T E	T E	T E		T E	T E	T E	T	
	Readily adapt to changing professional circumstances. T5	Т	Т					_		_							T		_		T E		_	Т	
	Develop scientifically sound arguments to optimize passive and active fire protection measures.		T				T	T E	T E		T E						T							Т	
Competences in	Have the ability to communicate in English about the own field of specialisation.	3 T	Т	T	T E		_	T	T E		_						_	T E	T E		T E	T E	T E	T E	
cooperation and communication	Project management: have the ability to formulate objectives, report efficiently, keep track of targets, follow the progress of the	2	T		T			T	T								T E	T E	T		T E	T	T	T	
	project, Have the ability to work as a member of a team in a multi disciplinary workingenvironment, as well as being capable of E 7		T		_			T	T								T	T	_		T E	_	T	Т	
	taking on supervisory responsibilities. Report on technical or scientific subjects verbally, in writing and		_ 		т			_ 	_ 								_ _	_ _			_	т	Т		
	using graphics. E 1 Function in an international environment (students, PhD students, T8	0	E		E			E	E								E	E	т		E	E	E	Т	
Saciatal compatance	scientific co-workers, scholars).		E		E			_	E								E	E	E T		т		Т	т	
Societal competences	Act in an ethical, professional and social way. T1 Recognize the most important business and legal aspects of the	1 E	E					E	E T								E	E T	E		E	E	E	•	
	own engineering discipline. Understand the historical evolution of the own engineering T6	E	E						Ė			Т						E	т		Т		Т		-
	discipline and its social relevance.		E						-	_		E						E	E		E		E		<u> </u>
	Master and apply critical insight in existing fire safety legislation and regulations in the development of a fire safety design.	E	E						E	E															
	Act in an ethical, professional and social way when developing and T 5 presenting a performance based fire safety design.		E						E										E					Т	
Profession-specific competence	Master the complexity of technical systems by using system and process models.	E	E						T E												T E				
	Reconcile conflicting specifications and prior conditions in a high quality and innovative concept or process.		T E					T E											T E			T E	T E	Т	
	Synthesize incomplete, contradictory or redundant data into useful T1 information.		T E		T E			T E	T E								T E		T E		T E	T E	T E	Т	
	Possess sufficient ready knowledge and understanding to evaluate T 1 the results of complex calculations, or make approximate estimates.		T E					T E	T E									T E	T E		T E	T E	T E	T E	
	Pay attention to entire life cycles of systems, machines, and processes.		T					T E															T E		

GHENT UNIVERSITY International Master of Academic year 2021-2 Legend: T=teaching methods E=evaluation methods			E051540 Explosions and Industrial Fire Safety	E061522 Performance-Based Design	E051430 Fire Dynamics	E051581 Fire Research Seminar	E039161 Thermodynamics, Heat and Mass Transfer	E051570 Material Behaviour at Ambient and Elevated Temperatures	E051482 Active Fire Protection I: Detection and Suppression	E051494 Active Fire Protection II: Smoke and Heat Control	E051443 Fire Safety and Legislation	E051610 Passive Fire Protection	E900527 Fire Science and Fire Dynamics	E900529 Fire Safety Engineering	E900530 Research Methods for Engineers	E900528 Structural Mechanics	E900524 Finite Element Analysis for Solids	E900531 Fire Science Laboratory	E900532 Fire Investigation and Failure Analysis	E900522 Structural Design for Fire	E900533 Fire Safety, Engineering and Society	E900304 Risk Assessment	E900305 Advanced Fire Dynamics	E900306 Human Behaviour in Fire	E900525 Simulation of Fires in Enclosures	E091105 Master's Dissertation
Profession-specific	Pay attention to sustainability, energyefficiency, environmental	T 4		T								Т						Т		T						
competence	cost, use of raw materials and labour costs.	E 4		Е								E						E		E						
	Pay attention to all aspects of reliability, safety, and ergonomics.	T 7		Т					T										Т	Т		Т		Т	Т	
	Have insight into and understanding of the importance of	E 7		E T					Е										Е	Е		Е	_	Е	Е	
	Have insight into and understanding of the importance of entrepreneurship.	T 2 E 2		Ė																			E			
	Show perseverance, innovativeness, and an aptitude for creating added value.	T 5 E 5		T E					T E	T E										T E						T E
			W 19 V	/ 38	W 3	W 10	W 4	W 3	W 19	W 23	W 2	W 4	W 6					W 16	W 23	W 25		W 21	W 16	W 21	W 24	W 27
			E 19 E	38	E 3	E 10	E 4	E 3	E 19	E 23	E 2	E 4	E 6					E 16	E 23	E 25		E 21	E 16	E 21	E 10	

FMingwAl G1 1 Master and apply advanced knowledge in the own engineering discipline in solving complex problems

Competences in one/more scientific discipline(s)

<<	EMingwALG1.1 Master and apply	advanced knowledge in the	own engineering discipline	in solving complex problems.	Competences in one/more scientific discipline(s
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- e	en evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche			
E051540	Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved and/or solid materials and to take the appropriate technical and organisation measures to INSIGHTS: understand the physical processes that occur or the solid processes that occur of the solid processes that occur occur occur occur occur of the solid processes that occur occu	
E061522	Performance-Based Design	group work self-reliant study activities project lecture	written examination with open questions report assignment participation	global risk performance based design.	previous courses by integrating the fire protection techniques into a grion in order to realise and evaluate an original fire safety design. performance based designs in an objective manner.
E039161	Thermodynamics, Heat and Mass Transfer	lecture seminar: coached exercises	written examination oral examination	Understand and calculate the consequences of heat transfe Quantify thermodynamic properties of pure substances and	er in case of fire. d mixtures. ic processes and the different modes of heat transfer that occur in rocesses of heat transfer.
	Active Fire Protection I: Detection and Suppression	lecture seminar project	open book examination report oral examination	Make a critical assessment of the different manual suppres incident types, by means of calculations and technical considerations.	
E051494	Active Fire Protection II: Smoke and Heat Con	trol lecture seminar: coached exercises project	written examination report oral examination open book examination	Perform a critical evaluation of a smoke and heat control sy Compute and critically evaluate the removal of heat from a Make a correct CFD calculation in the context of a smoke a Explain the processes involved in the production of smoke Compute and critically evaluate the movement of smoke in Calculate an original design of smoke and heat control syst Apply national and international standards and regulative design of smoke and re	ystem design n enclosure and heat control system design in case of fire side, into and out of an enclosure tems for a realistic configuration
E051610	Passive Fire Protection	lecture online lecture seminar: coached exercises	written examination	Classify a building product based on test results Analyse a construction detail for passive fire protection sys Give an overview of fire protection systems possible for diff disadvantages	tems ferent applications, including their respective advantages and
E900531	Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gas Demonstrate understanding of fire dynamics, including fire Demonstrate understanding of oxygen consumption calorin Demonstrate understanding of burning rate and fire spread	plumes netry.
E900532	Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire a conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their ap	nd explosions: heat transfer, fluid mechanics material response to fire oplication. Pering to evaluate the behaviour of materials in fire. Solve inverse

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E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe five relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. Skills and abilities For a passing grade the student must: • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to utilize methods and in virting, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilize methods and tools for basic decision problems concerning risks. Judgement and approach For a passing grade the student must: • be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	be able to reflect upon ethical and subjective dimensions of risk assessments. The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: be able to explain the effect of the enclosure on a fire sequence. be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. be able to aclulate the value of various physical variables associated with a fire sequence. be able to alculate the value of various physical variables associated with a fire sequence. be able to such analyse and interpret results from fire safety engineering experiments. be able to ostimate data values for input into computational models where these are lacking in the problem statement. be able to desting fire safety engineering systems for control and handling of combustion gases. be able to evaluate the effect the fire event can have on people occupying the building. be able to define fire safety engineering experiments in a clear and scientific manner. be able to plan and carry out fire safety engineering experiments in a clear and scientific manner. be able to parant results from fire safety engineering experiments. be able to plan and carry o

E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain she basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects of experiments with human participants (evacuation experiments)
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werdel	n niet teruggevonden in de studiefiche		
E061522 Performance-Based Design	group work	report	Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
E051494 Active Fire Protection II: Smoke and H	leat Control project	open book examination report oral examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration
E900522 Structural Design for Fire	lecture	written examination	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature
	seminar	skills test assignment	conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat
			Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
			Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses.
			 be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context. be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. demonstrate an understanding of various sources of information that can be used and the challenges in using them as input risk assessments. Skills and abilities For a passing grade the student must: be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. be able to evaluate the contents of existing risk assessments. be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. be able to utilise material in scientific publications relevant for risk assessment. be able to utilise methods and tools for basic decision problems concerning risks. Judgement and approach For a passing grade the student must: be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making. be able to reflect upon ethical and subjective dimensions of risk assessments.
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to analyse and interpret results from fire safety engineering experiments. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to calculate the effect the fire event can have on people occupying the building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to plan and carry out fire safety engineering experiments i

E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models	
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.	

Course	the development of fires in enclos	Teaching methods	Evaluation methods	Course learning outcome
	evaluatievormen voorafgegaan door ** werden niet terug	_	Evaluation methods	Course learning dutcome
E061522 P	erformance-Based Design	group work self-reliant study activities project lecture	report	Skills: Determine the uncertainties in the design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Knowledge: Master and apply the advanced knowledge of previous courses by integrating the fire protection techniques into a global risk performance based design.
E051430 F	ire Dynamics	lecture seminar: coached exercises practicum	written examination oral examination open book examination	Analyse fire dynamics in an enclosure.
E039161 T	hermodynamics, Heat and Mass Transfer	lecture seminar: coached exercises	written examination oral examination	Understand and calculate the consequences of heat transfer in case of fire. Solve a new complex problem, involving the thermodynamic processes and the different modes of heat transfer that occur in case of fire. Recognize the occurrence of mass transfer in case of fire.
	faterial Behaviour at Ambient and Elevated emperatures	lecture lecture: plenary exercises	oral examination	Recommend materials as function of the requested application Know, compare and interpret in a critical manner the temperature dependent properties of different materials
	ire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 F	ire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios.
E900522 S	tructural Design for Fire	lecture seminar	written examination skills test assignment	Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation. Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900525 S	imulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.
E091105 N	laster's Dissertation	master's dissertation	oral examination assignment	Knowledge and understanding: be able to describe various numerical methods for solving the equation sets. Define, study and analyse the research problem

Status GOEDGEKEURD op 2016-03-04 10:47:48.113 7/59 02-02-2022

EMingwFIRE1.2 Master and apply knowledge of element methods and dynamics of structures to critically analyse and evaluate the behaviour of Competences in one/more scientific discipline(s) simple structures in case of fire.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werde	n niet teruggevonden in de studiefiche		
E061522 Performance-Based Design	group work self-reliant study activities lecture	report	Skills: Make and evaluate approximate estimates in a design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Attitudes: Take up independent positions about fire safety designs and defend the point of view. Knowledge: Use functional criteria (performance) as a criterion in order to realise and evaluate an original fire safety design.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E091105 Master's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem

assignment

EMingwFIRE1.3 Master and apply knowledge of explosions to critically analyse and evaluate the associated risk.

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Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	report	Knowledge: Draw the appropriate safety conclusions from the risk analysis. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Knowledge: Use functional criteria (performance) as a criterion in order to realise and evaluate an original fire safety design. Knowledge: Evaluate self-reliantly the fire risk in a project. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Attitudes: Be aware of the own expertise and improve to expert level. Skills: Determine the uncertainties in the design.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

performance based fire safety Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	_		
TOGATE 22 Destarmance Board Design	group work	written exemination with ones	Knowledge, Draw the appropriate actaty conclusions from the righ analysis
E061522 Performance-Based Design	group work self-reliant study activities project lecture	written examination with open questions report assignment participation	Knowledge: Draw the appropriate safety conclusions from the risk analysis. Attitudes: Reflect on own way of thinking and acting. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Attitudes: Take up independent positions about fire safety designs and defend the point of view. Knowledge: Use functional criteria (performance) as a criterion in order to realise and evaluate an original fire safety design. Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Attitudes: Be aware of on-going evolutions in the field of interest. Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Attitudes: Communicate and collaborate with colleagues. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Attitudes: Be aware of the own expertise and improve to expert level. Knowledge: Master and apply the advanced knowledge of previous courses by integrating the fire protection techniques into a global risk performance based design. Skills: Determine the uncertainties in the design.
E051430 Fire Dynamics	lecture seminar: coached exercises practicum	written examination oral examination	Analyse fire dynamics in an enclosure.
E900527 Fire Science and Fire Dynamics	lecture	written examination skills test	Demonstrate understanding of the science which underpins current fire safety engineering calculations. Give appropriate consideration to uncertainties in fire problems. Perform certain typical fire safety engineering calculations, such as sprinkler activation times and compartment smoke filling, using a spread sheet model. Explain fire behaviour in each of the stages in a compartment fire. Estimate certain parameters of fires such as flame length, heat release rate, plume temperature and smoke production, for simple, well defined fuel packages.
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal

Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal

insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;

Define, study and analyse the research problem

02-02-2022 Status GOEDGEKEURD op 2016-03-04 10:47:48.113

E091105 Master's Dissertation

master's dissertation

oral examination

assignment

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods vonden in de studiefiche	Evaluation methods	Course learning outcome
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	written examination with open questions	Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Knowledge: Evaluate self-reliantly the fire risk in a project.
E051581 Fire Research Seminar	lecture lecture: plenary exercises project	assignment job performance assessment	Report in a structured and scientific manner, using appropriate language Perform a comprehensive literature study on a specified fire related topic, including scientific referencing Schedule work on a dedicated project, plan ahead and report intermediate steps
E039161 Thermodynamics, Heat and Mass Transfer	lecture seminar: coached exercises	written examination oral examination	Understand the mathematical formulation of the physical processes of heat transfer. Solve a new complex problem, involving the thermodynamic processes and the different modes of heat transfer that occur in case of fire.
E051482 Active Fire Protection I: Detection and Suppression	lecture seminar project	open book examination report oral examination	Make a critical assessment of the different manual suppression systems and automatic suppression methods for different incident types, by means of calculations and technical considerations. Make a critical assessment, by means of calculations and technical considerations, of different fire detection methods. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat Contro	l lecture seminar: coached exercises project	written examination report oral examination open book examination	Calculate an original design of smoke and heat control systems for a realistic configuration Compute and critically evaluate the removal of heat from an enclosure Make a correct CFD calculation in the context of a smoke and heat control system design Compute and critically evaluate the movement of smoke inside, into and out of an enclosure
E051610 Passive Fire Protection	lecture online lecture seminar: coached exercises	written examination	Analyse a construction detail for passive fire protection systems
E900527 Fire Science and Fire Dynamics	lecture	written examination skills test	Demonstrate understanding of the science which underpins current fire safety engineering calculations. Give appropriate consideration to uncertainties in fire problems. Perform certain typical fire safety engineering calculations, such as sprinkler activation times and compartment smoke filling, using a spread sheet model. Explain fire behaviour in each of the stages in a compartment fire. Estimate certain parameters of fires such as flame length, heat release rate, plume temperature and smoke production, for simple, well defined fuel packages.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation. Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the cours is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering ar their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as inpurisk assessments. **Skills and abilities** For a passing grade the student must: • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fir safety. • be able to evaluate the contents of existing risk assessments. • be able to persons with different knowledge backgrounds. • be able to utilise methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must: • be able to utilise methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must: • be able to critically reflect on the benefits and limitations of risk assessments as an input to

E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to calculate the value of various physical variables associated with a fire sequence. • be able to indicate the value of various physical variables associated with a fire sequence. • be able to oanalyse and interpret results from fire safety engineering experiments. • be able to oestimate data values for input into computational models where these are lacking in the problem statement. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to beach the time before critical conditions are reached for fires in a building. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to psea
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Ablitties For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

	cientific literature as part of the		Scientific competen
Course	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- en evaluatievormen voorafgegaan door ** werden nie			
E061522 Performance-Based Design	group work self-reliant study activities	participation report	Attitudes: Be aware of the own expertise and improve to expert level. Attitudes: Reflect on own way of thinking and acting.
	project	assignment	Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
	lecture	, and the second	Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design.
			Attitudes: Be aware of on-going evolutions in the field of interest. Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering.
E051581 Fire Research Seminar	lecture	assignment	Report in a structured and scientific manner, using appropriate language
	lecture: plenary exercises		Perform a comprehensive literature study on a specified fire related topic, including scientific referencing
	project		Present to audiences with different backgrounds
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to conditions, construction
	Schilla	assignment	techniques.
		oral examination	Appreciate the role of fire fighting systems/methods.
			Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse
			problems to reconstruct fire
			scenarios.
TOOOE 22 Structural Design for Fire	looturo	written exemination	Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions;
		assignment	Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire
			resistance - Includes advanced
			analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real
			Fires (Temperature vs. Heat
			Flux);
			Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
			Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work	oral examination	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk
	self-reliant study activities	skills test	assessment and how they can
	seminar lecture		support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the cour is aimed at providing a
			foundation for continuing studies in the risk management field.
			Knowledge and understanding
			For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different
			perspecives in a risk
			management context.
			 be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering ar their strengths and
			weaknesses.
			• be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks.
			 be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment contex be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency
			preparedness planning.
			 demonstrate an understanding of various sources of information that can be used and the challenges in using them as input
			risk assessments. Skills and abilities
			For a passing grade the student must:
			• be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fi
			safety.
			 be able to evaluate the contents of existing risk assessments. be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way
			understandable to persons with
			different knowledge backgrounds.
			 be able to utilise material in scientific publications relevant for risk assessment. be able to utilise methods and tools for basic decision problems concerning risks.
			Judgement and approach
			For a passing grade the student must:
			 be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making. be able to reflect upon ethical and subjective dimensions of risk assessments.
900306 Human Behaviour in Fire	group work	written examination	Knowledge and Understanding
	self-reliant study activities	skills test	For a passing grade the student must:
	seminar lecture	oral examination	 be able to explain the various factors (psychological and environmental) that influence fire setting behaviour be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations
	lecture		 be able to explain NSE 1-models (simple stimuli-response models) that are commonly user in guidelines and regulations be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in
			emergencies)
			 be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic feeters (a.g. age and mobility)
			factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important
			 be able to explain the basic assumptions behind egress models (network, grid and continuous models)
			Skills and Abilities For a passing grade the student must:
			For a passing grade the student must: apply RSET-models (simple stimuli-response models) to estimate the required safe escape time
			 analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire
			analyse exit design based on the theory of affordances analyse exit design based on the theory of affordances
			 apply egress models to simulate movement of people during evacuation analyse results from simulations with egress models and relate the results to the assumptions of the model
			 select appropriate occupant behaviour scenarios for fire safety engineering design
			communicate theories of human behaviour in fire to laymen and experts
			• communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation)
			 independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach
			For a passing grade the student must:
			 adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) adequately consider relevant ethical aspects relating to analysis of evacuation with egress models

E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

EMingwALG2.3 Select and appl Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	_	Lvaluation methods	Course rearning outcome
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Determine the uncertainties in the design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Knowledge: Master and apply the advanced knowledge of previous courses by integrating the fire protection techniques into a global risk performance based design.
E051581 Fire Research Seminar	lecture: plenary exercises	oral examination assignment	Perform a systematic data analysis.
E051570 Material Behaviour at Ambient and Elevated Temperatures	lecture lecture: plenary exercises	oral examination	Understand testing methods to determine properties of materials Know, compare and interpret in a critical manner the temperature dependent properties of different materials Recommend materials as function of the requested application
E051482 Active Fire Protection I: Detection and Suppression	lecture seminar project	open book examination report oral examination	Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment. Design, together with colleagues, a fire detection installation for a building.
E051494 Active Fire Protection II: Smoke and Heat C	<u>:</u>	open book examination report oral examination	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900527 Fire Science and Fire Dynamics	lecture	written examination skills test	Demonstrate understanding of the science which underpins current fire safety engineering calculations. Give appropriate consideration to uncertainties in fire problems. Perform certain typical fire safety engineering calculations, such as sprinkler activation times and compartment smoke filling, using a spread sheet model. Explain fire behaviour in each of the stages in a compartment fire. Estimate certain parameters of fires such as flame length, heat release rate, plume temperature and smoke production, for simple, well defined fuel packages.
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fir conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. ** **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input trisk assessments. * Skills and abilities For a passing grade the student must: • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize methods and tools for basic decision problems concerning risks.

Judgement and approach
For a passing grade the student must:
be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.
be able to reflect upon ethical and subjective dimensions of risk assessments.

E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to calculate the value of various physical variables associated with a fire sequence. • be able to indicate the value of various physical variables associated with a fire sequence. • be able to oranlyse and interpret results from fire safety engineering experiments. • be able to ostimate data values for input into computational models where these are lacking in the problem statement. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to plan and carry out fire safety engineering experiments in a clear and scientific manner. • be able to plan
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Ablitties For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	* adequatery consider relevant entical aspects relating to analysis of evacuation with egress models. Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

Course	Tooching mothods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werde	Teaching methods	Evaluation methods	Course learning outcome
werdt	an niet teruggevonden in de studienche		
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Make and evaluate approximate estimates in a design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to independent of the reasonableness of calculated results obtained from various computational models. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to design fire safety engineering systems for control and handling of combustion gases. • be able to evaluate the effect the fire event can have on people occupying the building. • be able to defend, orally and in writing, his/her choice of models and assumptions in the analysis of fire sequences. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to pean and carry out fire safety engineering experiments. Judgement and approach For a pass
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

oral examination assignment

Course	Topohina mother de	d critical manner.	Course learning outcome
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods vonden in de studiefiche	Evaluation methods	Course learning outcome
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Determine the uncertainties in the design. Attitudes: Reflect on own way of thinking and acting. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Attitudes: Communicate and collaborate with colleagues. Skills: Make and evaluate approximate estimates in a design. Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Attitudes: Be aware of the own expertise and improve to expert level.
E051581 Fire Research Seminar	lecture lecture: plenary exercises project	assignment job performance assessment	Report in a structured and scientific manner, using appropriate language Perform a comprehensive literature study on a specified fire related topic, including scientific referencing Schedule work on a dedicated project, plan ahead and report intermediate steps Present to audiences with different backgrounds
E051494 Active Fire Protection II: Smoke and Heat Contro	l project	open book examination report oral examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration
E900527 Fire Science and Fire Dynamics	lecture	written examination skills test	Demonstrate understanding of the science which underpins current fire safety engineering calculations. Give appropriate consideration to uncertainties in fire problems. Perform certain typical fire safety engineering calculations, such as sprinkler activation times and compartment smoke filling, using a spread sheet model. Explain fire behaviour in each of the stages in a compartment fire. Estimate certain parameters of fires such as flame length, heat release rate, plume temperature and smoke production, for simple, well defined fuel packages.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. Skills and abilities For a passing grade the student must: • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way

understandable to persons with different knowledge backgrounds.

be able to utilise material in scientific publications relevant for risk assessment.
be able to utilise methods and tools for basic decision problems concerning risks.

Judgement and approach

For a passing grade the student must:
be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.
be able to reflect upon ethical and subjective dimensions of risk assessments.

For apasing grade the student must. For a pasing grade the student of the incoloury on a fire sequence. Solid production. Solid production the range of applicability of the models and the applicable constraints for fire safety engineering computation. Solid production of the models and the applicability constraints for fire safety engineering computer models (2-zone models) for calculating various variables. Solid production that is a solid production of the models of the models of the polysteph of the solid production of t	E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding
in a compartment life. In a c				 For a passing grade the student must: be able to explain the effect of the enclosure on a fire sequence. be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must:
egous de Human Behaviour in Fire group work self-reliant study activities seminar lecture group work self-reliant study activities seminar lecture A group work self-reliant study activities seminar lecture For a passing grade the student must. be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations engrenaics) be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g., age and mobility) be able to explain the various factors (spsychological and environmental) that influence fire setting behaviour be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g., age and mobility) be able to explain the basic assumptions behind egress models (helvork, grid and continuous models) Skills and Abilities For a passing grade the student must: apply RSET-models (simple stimuli-response models) to estimate the required safe escape time analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire analyse a citie design based on the theory of affordances analyse acide that evaluate movement of people during evacuation analyse results from simulations with egress models to the assumptions of the model select appropriate occupant behaviour in fire to laymen and experts communicate theories of human behaviour in fire to laymen and experts communicate theories of human behaviour in fire to laymen and experts rowmunicate theories of human behaviour in fire to laymen and experts (oral, written and graphic representation) independently seek information (articles, reports, manuals, etc) about human participants (evacuation experiments) adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuat				 in a compartment fire. be able to calculate the value of various physical variables associated with a fire sequence. be able to analyse and interpret results from fire safety engineering experiments. be able to judge the reasonableness of calculated results obtained from various computational models. be able to estimate data values for input into computational models where these are lacking in the problem statement. be able to design fire safety engineering systems for control and handling of combustion gases. be able to evaluate the effect the fire event can have on people occupying the building. be able to calculate the time before critical conditions are reached for fires in a building. be able to defend, orally and in writing, his/her choice of models and assumptions in the analysis of fire sequences. be able to present results from fire safety engineering experiments in a clear and scientific manner. be able to search for and apply information concerning fire evolution inside buildings in scientific journals and manuals. be able to plan and carry out fire safety engineering experiments. Judgement and approach For a passing grade the student must:
self-reliant study activities seminar seminar or all examination seminar seminar or all examination seminar or all examination lecture **Description** **Self-reliant study activities seminar or all examination seminar or all examination lecture **Description** **Self-reliant study activities seminar or all examination lecture **Description** **Self-reliant study activities seminar or all examination lecture **Description** **Description	E900306 Human Behaviour in Fire	group work	written examination	 demonstrate insight into the responsibilities of a fire engineer in choosing and reporting parameters in such a way that the models are used properly.
analyse exit design based on the theory of affordances apply egress models to simulate movement of people during evacuation analyse results from simulations with egress models and relate the results to the assumptions of the model select appropriate occupant behaviour scenarios for fire safety engineering design communicate theories of human behaviour in fire to laymen and experts communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must:		self-reliant study activities seminar	skills test	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) **Skills and Abilities** For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time
E091105 Master's Dissertation master's dissertation oral examination Define, study and analyse the research problem				 analyse exit design based on the theory of affordances apply egress models to simulate movement of people during evacuation analyse results from simulations with egress models and relate the results to the assumptions of the model select appropriate occupant behaviour scenarios for fire safety engineering design communicate theories of human behaviour in fire to laymen and experts communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments)
	E091105 Master's Dissertation	master's dissertation	oral examination assignment	

<<	EMingwFIRE2.1	l Elaborate proble	ms of fire risk a	assessment in a	a critical, au	utonomous and	flexible manner	with a limited	amount of o	data

Scientific competences	
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Course	-		<u>, </u>	nd flexible manner with a limited amount of data.	Scientific competences
Course Voot: leer- e	n evaluatievormen voorafgegaan door ** werden niet te	Teaching methods eruggevonden in de studiefiche	Evaluation methods	Course learning outcome	
E051540	Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport and/or solid materials and to	
				take the appropriate technical and organisation measures to reduce such a risk to an acceptabl INSIGHTS: understand the physical processes that occur during explosions.	e level.
E061522	Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Knowledge: Draw the appropriate safety conclusions from the risk analysis. Skills: Select, motivate and apply the proper models, methods and techniques for risk based en Attitudes: Take up independent positions about fire safety designs and defend the point of view Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design.	
				Skills: Apply the concept of risk management and the fire prevention techniques in order to procacceptable risk. Skills: Determine the uncertainties in the design.	duce a fire safe design with an
E900531	Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry.	
E900532	Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Demonstrate understanding of burning rate and fire spread. Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid me conditions, construction techniques. Appreciate the role of fire fighting systems/methods.	echanics material response to fire
			oral examination	Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of m problems to reconstruct fire scenarios.	
E000522	Structural Design for Fire	locturo	written examination	Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretable Understanding the philosophical and statistical underpinnings of structural design at both ambients.	
E900522	Structural Design for File	lecture seminar	skills test assignment	conditions; Understand the role of loss of strength, deformation and thermal expansion and application to cresistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Tempe Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites insulation;	lesign of structures for fire rature vs. Time Curves; Real
E900304	Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	Survey the different analytical and empirical tools for fire calculations in both small and open plate. The aim of the course is that, in combination with earlier courses, the students gain the capability assessment and how they can support decisions in the area of risk management and especially in the area of fire safety enging is aimed at providing a	ty of utilizing tools for risk
				foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implication perspectives in a risk	ons of adopting the different
				 management context. be able to describe risk assessment methods, their areas of applicability, especially in the are their strengths and weaknesses. 	
				 be able to describe relevant risk measures, their limitations and strengths and how they can be able to describe different types of uncertainty and how they can be addressed and handle be able to describe how input from risk assessments can be utilised as a basis for decision-m preparedness planning. 	d in a risk assessment context. haking and emergency
				 demonstrate an understanding of various sources of information that can be used and the charisk assessments. Skills and abilities For a passing grade the student must: 	
				 be able to utilize, the concepts, methods and tools used in risk assessment, in new situations safety. be able to evaluate the contents of existing risk assessments. be able to report, both orally and in writing, and discuss the implications of a performed risk a 	
				 understandable to persons with different knowledge backgrounds. be able to utilise material in scientific publications relevant for risk assessment. 	
				 be able to utilise methods and tools for basic decision problems concerning risks. Judgement and approach For a passing grade the student must: be able to critically reflect on the benefits and limitations of risk assessments as an input to decision. 	ecision-making.
F091105	Master's Dissertation	master's dissertation	oral examination	 be able to reflect upon ethical and subjective dimensions of risk assessments. Define, study and analyse the research problem 	
_031103	iviastei s Disseltation	masici s uissellaliuil	oral examination	Denine, study and analyse the research problem	

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assignment

Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievorn	nen voorafgegaan door ** werden niet terugge\	vonden in de studiefiche			
E061522 Performance	e-Based Design	group work self-reliant study activities project lecture	assignment report	Skills: Determine the uncertainties in the design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based Skills: Analyse own results and results of others within fire performance based designs in an objective mattitudes: Communicate and collaborate with colleagues. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design. Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Knowledge: Master and apply the advanced knowledge of previous courses by integrating the fire protection of the performance based design.	ed design. nanner.
E051494 Active Fire F	Protection II: Smoke and Heat Control	lecture project	open book examination report oral examination	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design	
E900525 Simulation of	f Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the exe spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basi included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configuration programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the used. Knowledge and understanding: be able to describe various numerical methods for solving the equation is	e and for on-going on methods, as well as or advanced simulation cuted simulation of the on simulation using CFD s of assumptions ons using CFD the model components
E091105 Master's Dis	sertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem	DUIS.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	gevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Determine the uncertainties in the design. Attitudes: Reflect on own way of thinking and acting. Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Attitudes: Be aware of the own expertise and improve to expert level.
E051581 Fire Research Seminar	lecture lecture: plenary exercises project	oral examination job performance assessment assignment	Report in a structured and scientific manner, using appropriate language Perform a comprehensive literature study on a specified fire related topic, including scientific referencing Schedule work on a dedicated project, plan ahead and report intermediate steps Present to audiences with different backgrounds
E039161 Thermodynamics, Heat and Mass Transfer	lecture seminar: coached exercises	written examination oral examination	Solve a new complex problem, involving the thermodynamic processes and the different modes of heat transfer that occur in case of fire.
E051482 Active Fire Protection I: Detection and Suppression	project	oral examination report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat Conti	rol lecture project	open book examination report oral examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration Apply national and international standards and regulative documents for the design of smoke control systems
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. **Skills and abilities** For a passing grade the student must: • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to utilize methods and tools for basic decision problems concerning risks. **Judgment and approach** For a passing grade the student must: • be able to utilize material in scientific publications relevant for risk assessments. • be able to utilize methods and tools for basic decision problems concerning risks. **Judgment and approach**

E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: be able to explain the various factors (psychological and environmental) that influence fire setting behaviour be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) be able to explain social influence and give examples of situations when social influence will be particularly important be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: apply RSET-models (simple stimuli-response models) to estimate the required safe escape time analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire analyse exit design based on the theory of affordances apply egress models to simulate movement of people during evacuation analyse results from simulations with egress models and relate the results to the assumptions of the model select appropriate occupant behaviour scenarios for fire safety engineering design communicate theories of human behaviour in fire to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts accommunicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) independently seek information (articles, reports, manuals, etc) abo
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to decide on the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

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Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level.
			INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work	participation	Knowledge: Master and apply the advanced knowledge of previous courses by integrating the fire protection techniques into a
	self-reliant study activities project	report assignment	global risk performance based design.
	lecture	assignment	Attitudes: Reflect on own way of thinking and acting.
			Attitudes: Take up independent positions about fire safety designs and defend the point of view.
			Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design.
			Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design.
			Attitudes: Be aware of on-going evolutions in the field of interest.
			Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Skills: Discuss performance based design in the English language.
			Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an
E051482 Active Fire Protection I: Detection and	project	oral examination	acceptable risk.
Suppression	project	oral examination report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building.
••			Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat C		open book examination	Calculate an original design of smoke and heat control systems for a realistic configuration
	project	report oral examination	Make a correct CFD calculation in the context of a smoke and heat control system design
E900527 Fire Science and Fire Dynamics	lecture	written examination	Demonstrate understanding of the science which underpins current fire safety engineering calculations.
		skills test	Give appropriate consideration to uncertainties in fire problems.
			Perform certain typical fire safety engineering calculations, such as sprinkler activation times and compartment smoke filling, using a spread sheet model.
			Explain fire behaviour in each of the stages in a compartment fire.
			Estimate certain parameters of fires such as flame length, heat release rate, plume temperature and smoke production, for simple, well defined fuel
			packages.
E900532 Fire Investigation and Failure Analysis	lecture	written examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to f
	seminar	report	conditions, construction
		assignment oral examination	techniques. Appreciate the role of fire fighting systems/methods.
			Achieve an understanding of quantitative tools and their application.
			Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire
			scenarios.
			Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900306 Human Behaviour in Fire	group work	written examination	Knowledge and Understanding
	self-reliant study activities seminar	skills test oral examination	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour
	lecture		 be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations
			be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in amerganging)
			emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic
			factors (e.g. age and mobility)
			 be able to explain social influence and give examples of situations when social influence will be particularly important be able to explain the basic assumptions behind egress models (network, grid and continuous models)
			Skills and Abilities
			For a passing grade the student must:
			 apply RSET-models (simple stimuli-response models) to estimate the required safe escape time analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire
			analyse exit design based on the theory of affordances
			apply egress models to simulate movement of people during evacuation
			 analyse results from simulations with egress models and relate the results to the assumptions of the model select appropriate occupant behaviour scenarios for fire safety engineering design
			communicate theories of human behaviour in fire to laymen and experts
			• communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation)
			 independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach
			For a passing grade the student must:
			 adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) adequately consider relevant ethical aspects relating to analysis of evacuation with egress models
E900525 Simulation of Fires in Enclosures	lecture		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and
	self-reliant study activities		momentum.
			Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going
			improvement of his/her own competence in fire safety simulation.
			Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as
			their role in advanced building technical project planning and in human responsibility for their use
			Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation
			programs for combustion
			gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the
			spread of combustion gases
			in association with fire safety design and fire investigations.
			Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFI Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions
			included in the physical and
			numerical models used.
			Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD
			programs.
			Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components
			used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
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EMingwALG3.3 Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	eruggevonden in de studieticne		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Attitudes: Be aware of the own expertise and improve to expert level. Attitudes: Reflect on own way of thinking and acting. Attitudes: Take up independent positions about fire safety designs and defend the point of view. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Attitudes: Be aware of on-going evolutions in the field of interest. Skills: Analyse own results and results of others within fire performance based designs in an objective manner.
E051482 Active Fire Protection I: Detection and Suppression	project	oral examination report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat C	Control lecture project	open book examination report oral examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments; The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe be fiferent types of uncertainty and how they can be addressed and handled in a risk assessment context. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. Skills and abilities For a passing grade the student must: • be able to evaluate the contents of existing risk assessments. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making. • be able to reflect upon ethical and subjective dimensions of risk assessments.

Intellectual competences

E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to calculate the value of various physical variables associated with a fire sequence. • be able to analyse and interpret results from fire safety engineering experiments. • be able to be setimate data values for input into computational models where these are lacking in the problem statement. • be able to design fire safety engineering systems for control and handling of combustion gases. • be able to calculate the effect the fire event can have on people occupying the building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to osernate destination of the problems and manuals. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to persent results from fire safety engineering experiments in a clear and scientific manner. • be able to passent results from fire safety engineering experiments in
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Ablitties For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

EMingwALG3.4 Stay uptodate with the evolutions in the disc	cipline to elevate the own competences to exp	ert level.
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<<	EMingwALG3.4 Stay uptodate v	vith the evolutions in the disc	ipline to elevate the own co	ompetences to expert level.	Intellectual competence
Course		Teaching methods	Evaluation methods	Course learning outcome	
Voot: leer- ei	n evaluatievormen voorafgegaan door ** werden niet te	ruggevonden in de studiefiche			
E051540	Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transpand/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an accep INSIGHTS: understand the physical processes that occur during explosions.	
E061522	Performance-Based Design	lecture self-reliant study activities	participation report	Attitudes: Be aware of on-going evolutions in the field of interest.	
	Active Fire Protection I: Detection and Suppression	lecture seminar	assignment open book examination report	Make a critical assessment of the different manual suppression systems and automatic supincident types, by means of	pression methods for different
		project	oral examination	calculations and technical considerations. Make a critical assessment, by means of calculations and technical considerations, of differences of the consideration of the conside	
E051443	Fire Safety and Legislation	lecture	open book examination	adopt an attitude aimed at the follow-up and application of the most recent legislation	act extinguistiment.
E900531	Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.	
E900532	Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid conditions, construction techniques. Appreciate the role of fire fighting systems/methods.	d mechanics material response to fire
				Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, into	
F900522	Structural Design for Fire	lecture	written examination	Understanding the philosophical and statistical underpinnings of structural design at both an	· · · · · · · · · · · · · · · · · · ·
200022	Ottootalal Design for File	seminar	skills test assignment	conditions; Understand the role of loss of strength, deformation and thermal expansion and application resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Ten Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, compositions.	to design of structures for fire nperature vs. Time Curves; Real
				insulation; Survey the different analytical and empirical tools for fire calculations in both small and oper	
E900304	Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capa assessment and how they can support decisions in the area of risk management and especially in the area of fire safety en is aimed at providing a foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implic perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the	eations of adopting the different
				their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they care be able to describe different types of uncertainty and how they can be addressed and hand be able to describe how input from risk assessments can be utilised as a basis for decision preparedness planning. • demonstrate an understanding of various sources of information that can be used and the risk assessments. Skills and abilities For a passing grade the student must: • be able to utilize, the concepts, methods and tools used in risk assessment, in new situation safety. • be able to evaluate the contents of existing risk assessments. • be able to report, both orally and in writing, and discuss the implications of a performed risk understandable to persons with different knowledge backgrounds. • be able to utilise material in scientific publications relevant for risk assessment. • be able to utilise methods and tools for basic decision problems concerning risks. Judgement and approach	ndled in a risk assessment context. n-making and emergency challenges in using them as input to ons and in situations related to fire
				 For a passing grade the student must: be able to critically reflect on the benefits and limitations of risk assessments as an input t be able to reflect upon ethical and subjective dimensions of risk assessments. 	o decision-making.

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E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to aclculate the value of various physical variables associated with a fire sequence. • be able to aloculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the effect the fire event can have on people occupying the building. • be able to be serially the various firm fire safety engineeri
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Moviledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate rheories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experim
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		adequately consider relevant ethical aspects relating to analysis of evacuation with egress models Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche		-
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Attitudes: Communicate and collaborate with colleagues.
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input the risk assessments. **Skills and abilities** For a passing grade the student must: • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilise material in scientific publications relevant for risk assessment. • be able to utilise methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must: • be able to tritically reflect on the benefits and limitations of risk assessments as an input to decision-making.
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		 be able to reflect upon ethical and subjective dimensions of risk assessments. Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own
			competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFI Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs.

programs.

Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.

Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.

<<	EMingwFIRE3.1 De	evelop scientifically so	und arguments to	optimize passive and	d active fire protection measures.	

Intellectual competences

EMingwFIRE3.1 Develop scientifically sound arguments to optimize passive and active fire protection measures.				Intellectual competences	
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en	evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche			
E061522 F	Performance-Based Design	group work self-reliant study activities project lecture	written examination with open questions report assignment participation	Skills: Apply the concept of risk management and the fire prevention techniques in order to acceptable risk. Attitudes: Reflect on own way of thinking and acting. Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design in the English language.	
	Material Behaviour at Ambient and Elevated emperatures	lecture lecture: plenary exercises	oral examination	Understand testing methods to determine properties of materials Know, compare and interpret in a critical manner the temperature dependent properties of Recommend materials as function of the requested application	different materials
	Active Fire Protection I: Detection and Suppression	lecture seminar project	open book examination report oral examination	Make a critical assessment of the different manual suppression systems and automatic sur incident types, by means of calculations and technical considerations. Make a critical assessment, by means of calculations and technical considerations, of difference Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on which will be a report and present it orally to colleagues, with respect to the design of an automatic surface.	erent fire detection methods.
E051494 A	Active Fire Protection II: Smoke and Heat Cont	rol project	open book examination report oral examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration	·
E051610 F	Passive Fire Protection	lecture online lecture seminar: coached exercises	written examination	Classify a building product based on test results Analyse a construction detail for passive fire protection systems Give an overview of fire protection systems possible for different applications, including the disadvantages	eir respective advantages and
E900531 F	Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.	
E900525 S	Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conserva momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for furth improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire satheir role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and uprograms for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implication spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosu programs. Knowledge and understanding: be able to identify the limitations and most common source used.	her knowledge and for on-going afety simulation methods, as well as ser manuals for advanced simulation ons of the executed simulation of the of fire evolution simulation using CFD and on the basis of assumptions are configurations using CFD are of error of the model components
E091105 N	Master's Dissertation	master's dissertation	oral examination assignment	Knowledge and understanding: be able to describe various numerical methods for solving Define, study and analyse the research problem	the equation sets.

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Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- e	n evaluatievormen voorafgegaan door ** werden niet ten	uggevonden in de studiefiche		
E051540	Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522	Performance-Based Design	group work project lecture	written examination with open questions report assignment participation	Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Attitudes: Communicate and collaborate with colleagues. Skills: Discuss performance based design in the English language.
	Fire Dynamics	lecture practicum	oral examination	Analyse fire dynamics in an enclosure.
E051581	Fire Research Seminar	lecture lecture: plenary exercises project	oral examination job performance assessment assignment	Report in a structured and scientific manner, using appropriate language Present to audiences with different backgrounds
	Active Fire Protection I: Detection and Suppression	project	oral examination report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation.
E051494	Active Fire Protection II: Smoke and Heat Co	ntrol lecture seminar: coached exercises project	written examination report oral examination open book examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration Apply national and international standards and regulative documents for the design of smoke control systems
E900532	Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522	Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304	Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. Skills and abilities For a passing grade the student must: • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize material in scientific publications relevant for risk assessments. • be able to relictally reflect on the benefits and limitations of risk assessments

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E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to calculate the value of various physical variables associated with a fire sequence. • be able to judge the reasonableness of calculated results obtained from various computational models. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to oestimate data values for input into computational models where these are lacking in the problem statement. • be able to calculate the effect the fire event can have on people occupying the building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to peach for and apply information concerning fire evolution inside buildings in scien
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain she basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments)
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	• adequately consider relevant ethical aspects relating to analysis of evacuation with egress models Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gass preading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

Course	project,	Teaching methods	Evaluation methods	Course learning outcome
	n evaluatievormen voorafgegaan door ** werden niet t	_	Evaluation methods	Course learning outcome
-061522 F	Performance-Based Design	group work self-reliant study activities	participation report	Skills: Determine the uncertainties in the design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
		project	assignment	Skills: Report performance based design orally, in writing and with graphical methods.
		lecture	assignment	Skills: Control the results of a performance based design.
				Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design.
				Skills: Analyse own results and results of others within fire performance based designs in an objective manner.
				Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design.
				Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an
				acceptable risk.
051581 F	Fire Research Seminar	lecture	assignment	Report in a structured and scientific manner, using appropriate language
		lecture: plenary exercises	job performance assessment	Perform a comprehensive literature study on a specified fire related topic, including scientific referencing
		project		Schedule work on a dedicated project, plan ahead and report intermediate steps
	Active Fire Protection I: Detection and	project	report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation.
Suppression	Suppression			Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
-051494 /	Active Fire Protection II: Smoke and Heat C	Control project	report	Calculate an original design of smoke and heat control systems for a realistic configuration
	touve i me i rotoetteri in emette ana rieat e	ona or project	ropont	Make a correct CFD calculation in the context of a smoke and heat control system design
900531 F	Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous).
				Demonstrate understanding of fire dynamics, including fire plumes
				Demonstrate understanding of oxygen consumption calorimetry.
E000532 Fire Investigation	Fire Investigation and Failure Analysis	lecture	written examination	Demonstrate understanding of burning rate and fire spread. Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to
.900332 1	The Investigation and Landre Analysis	seminar	report	conditions, construction
			assignment	techniques.
			oral examination	Appreciate the role of fire fighting systems/methods.
				Achieve an understanding of quantitative tools and their application.
				Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire
				scenarios.
				Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
900522	Structural Design for Fire	lecture	written examination	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature
		seminar	skills test	conditions;
			assignment	Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced
				analytical principles and calculations, and structural design for fire.
				Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real
				Fires (Temperature vs. Heat
				Flux);
				Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
				Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Ass	Risk Assessment	group work	oral examination	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk
		self-reliant study activities	skills test	assessment and how they can
		seminar		support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the cours
		lecture		is aimed at providing a foundation for continuing studies in the risk management field.
				Knowledge and understanding
				For a passing grade the student must:
				 be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different
				perspecives in a risk
				 management context. be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering an
				their strengths and
				weaknesses.
				• be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks.
				• be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context
				 be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning.

risk assessments. Skills and abilities

For a passing grade the student must:

understandable to persons with different knowledge backgrounds.

Judgement and approach

• be able to evaluate the contents of existing risk assessments.

be able to utilise material in scientific publications relevant for risk assessment.
be able to utilise methods and tools for basic decision problems concerning risks.

• demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to

• be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire

• be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way

For a passing grade the student must:

• be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.

• be able to reflect upon ethical and subjective dimensions of risk assessments.

E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to aclculate the value of various physical variables associated with a fire sequence. • be able to aloculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the value of various physical variables associated with a fire sequence. • be able to oalculate the effect the fire event can have on people occupying the building. • be able to be serially the various firm fire safety engineeri
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Moviledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate rheories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experim
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		adequately consider relevant ethical aspects relating to analysis of evacuation with egress models Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

EMingwALG4.3 Have the ability to work as a member of a team in a multidisciplinary workingenvironment, as well as being capable of taking on Competences in cooperation and communication supervisory responsibilities.

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supervisory responsibilities.			
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche		
E061522 Performance-Based Design	group work project lecture	participation report assignment	Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Attitudes: Take up independent positions about fire safety designs and defend the point of view. Skills: Control the results of a performance based design.
E051482 Active Fire Protection I: Detection and Suppression	project	report	Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment. Design, together with colleagues, a fire detection installation for a building.
E051494 Active Fire Protection II: Smoke and Heat Control	ol project	oral examination	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios.
			Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. **Skills and abilities** For a passing grade the student must: • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilise methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must:
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	 be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making. be able to reflect upon ethical and subjective dimensions of risk assessments. Knowledge and Understanding For a passing grade the student must: be able to explain the various factors (psychological and environmental) that influence fire setting behaviour be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) be able to explain social influence and give examples of situations when social influence will be particularly important be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: apply RSET-models (simple stimuli-response models) to estimate the required safe escape time analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire analyse exit design based on the theory of affordances apply egress models to simulate movement of people during evacuation analyse results from simulations with egress models and relate the results to the assumptions of the model select appropriate occupant behaviour scenarios for fire safety engineering design communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress models to laymen and experts communicate results from simulations with egress

E900525 Simulation of Fires in Enclosures

lecture self-reliant study activities

Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum.

Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own

competence in fire safety simulation.

Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced

building technical project planning and in human responsibility for their use

Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading.

Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases

in association with fire safety design and fire investigations.

Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and

numerical models used.

Skills and abilities: be able to assess calculated results against experimental data

Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD

Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.

Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome
E061522 Performance-Based Design	group work project lecture	participation report assignment	Skills: Report performance based design orally, in writing and with graphical methods.
E051581 Fire Research Seminar	lecture lecture: plenary exercises project	oral examination job performance assessment assignment	Report in a structured and scientific manner, using appropriate language Present to audiences with different backgrounds
E051482 Active Fire Protection I: Detection and Suppression	project	report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat Control	ol project	oral examination report	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe risk assessment methods, their imitations and strengths and how they can be applied to evaluate risks. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input trisk assessments. Skills and abilities For a passing grade the student must: • be able to veluate the contents of existing risk assessment. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilize methods and tools for basic decision problems concerning risks. Judgement and approach For a passing grade the student must: • be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	 be able to reflect upon ethical and subjective dimensions of risk assessments. The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. **Knowledge and understanding** For a passing grade the student must: be able to explain the effect of the enclosure on a fire sequence. be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. be able to characterise the various stages of a fire sequence based on various variables. **Skills and abilities** For a passing grade the student must: be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. be able to calculate the value of various physical variables associated with a fire sequence. be able to judge the reasonableness of calculated results obtained from various computational models. be able to be distinct data values for input into computational models where these are lacking in the problem statement. be able to estimate data values for input into computational models where these are lacking in the problem statement. be able to estimate data values for input into computational models where these are lacking in the problem statement. be able to evaluate the effect the fire event can have on people occupying the building. be able to evaluate the effect the fire event can have on people

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	n in an international environment (st		
Course	Teaching methods	Evaluation methods	Course learning outcome
oot: leer- en evaluatievormen voorafgegaan door ** we	rden niet teruggevonden in de studiefiche		
061522 Performance-Based Design	group work project lecture	participation report assignment	Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Attitudes: Communicate and collaborate with colleagues. Skills: Discuss performance based design in the English language.
E051581 Fire Research Seminar	lecture lecture: plenary exercises project	assignment job performance assessment	Report in a structured and scientific manner, using appropriate language Schedule work on a dedicated project, plan ahead and report intermediate steps Present to audiences with different backgrounds
E051494 Active Fire Protection II: Smoke an	<u> </u>	oral examination report	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration Apply national and international standards and regulative documents for the design of smoke control systems
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analy	rsis lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Knowledge and understanding: be able to describe various numerical methods for solving the equation sets. Define, study and analyse the research problem

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EMingwALG5.1 Act in an ethic			Societal competence
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	Teaching methods	Evaluation methods	Course learning outcome
voot: ieer- en evaluatievormen vooratgegaan door "" werden nie	t teruggevonden in de studietiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project	participation report assignment	Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Attitudes: Reflect on own way of thinking and acting. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design.
E051482 Active Fire Protection I: Detection and Suppression	lecture project	report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat	Control project	oral examination	Calculate an original design of smoke and heat control systems for a realistic configuration
E900531 Fire Science Laboratory	practicum	report report	Make a correct CFD calculation in the context of a smoke and heat control system design Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. ** **Rowledge and understanding** **For a passing grade the student must:* • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. **Skills and abilities** **For a passing grade the student must:* • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must: • be able to utilize methods and tools for basic decision problems concerning risks. **Judgement and approach** • be able to thillies methods and tools for basic decision problems concerning risks. **Judgement and approach**

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E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to haracterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to analyse and interpret results from fire safety engineering experiments. • be able to be stimate data values for input into computational models where these are lacking in the problem statement. • be able to destinate data values for input into computational models where these are lacking in the problem statement. • be able to destinate data values for input into computational models where these are lacking in the problem statement. • be able to destinate data values for input into computation and models where these are lacking in the problem statement. • be able to defend, orally and in writing, his/his/her choice of models and assumptions in the analysis of fire sequences. • be able to defend, orally and in writing, his/his/her choice of models and assumptions in the analysis of f
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) **Skills and Ablitities** For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire *Judgement and approach
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	only evaluation	oral examination assignment	Define, study and analyse the research problem

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EMingwALG5.2 Recognize the most important business and legal aspects of the own engineering discipline.

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Control the results of a performance based design.
E051494 Active Fire Protection II: Smoke and Heat C	Control project	oral examination report	Apply national and international standards and regulative documents for the design of smoke control systems
E900532 Fire Investigation and Failure Analysis	lecture seminar	written examination report assignment oral examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.

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adequately consider relevant ethical aspects relating to analysis of evacuation with egress models

Skills and Abilities

Judgement and approach

For a passing grade the student must:

For a passing grade the student must:

• analyse exit design based on the theory of affordances

• apply egress models to simulate movement of people during evacuation

• communicate theories of human behaviour in fire to laymen and experts

• select appropriate occupant behaviour scenarios for fire safety engineering design

apply RSET-models (simple stimuli-response models) to estimate the required safe escape time
analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire

• independently seek information (articles, reports, manuals, etc) about human behaviour in fire

· analyse results from simulations with egress models and relate the results to the assumptions of the model

• communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation)

adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments)

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EMingwFIRE5.1 Master and apply critical insight in existing fire safety legislation and regulations in the development of a fire safety design.

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	t teruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Attitudes: Collaborate in the multidisciplinary environment of Fire Safety Engineering. Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Attitudes: Communicate and collaborate with colleagues. Skills: Discuss performance based design in the English language. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with ar acceptable risk.
E051494 Active Fire Protection II: Smoke and Heat Control project		oral examination report	Apply national and international standards and regulative documents for the design of smoke control systems
E051443 Fire Safety and Legislation	lecture	open book examination	critical insight into existing legislation and regulations adopt an attitude aimed at the follow-up and application of the most recent legislation
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

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<< EMingwFIRE5.2 Act in an ethical, p	MingwFIRE5.2 Act in an ethical, professional and social way when developing and presenting a performance based fire safety design.		Societal competences	
Course	Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche			
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Analyse own results and results of others within fire performance based designs in Attitudes: Reflect on own way of thinking and acting. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in the Attitudes: Act in an ethical, professional and social way when presenting and defining performance based designs in the Attitudes: Act in an ethical professional and social way when presenting and defining performance based designs in the Attitudes in	,
E051494 Active Fire Protection II: Smoke and Heat Control	ol lecture seminar: coached exercises project	written examination report oral examination open book examination	Perform a critical evaluation of a smoke and heat control system design Make a correct CFD calculation in the context of a smoke and heat control system design Calculate an original design of smoke and heat control systems for a realistic configuration.	
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both conditions; Understand the role of loss of strength, deformation and thermal expansion and applicat resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, con insulation; Survey the different analytical and empirical tools for fire calculations in both small and or	ion to design of structures for fire Temperature vs. Time Curves; Real nposites; fire proofing and thermal
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for consermomentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implicated spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimincluded in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosprograms. Knowledge and understanding: be able to identify the limitations and most common sour used.	vation of mass, material, energy, and urther knowledge and for on-going safety simulation methods, as well as user manuals for advanced simulation ations of the executed simulation of the d of fire evolution simulation using CFD ated on the basis of assumptions sure configurations using CFD rices of error of the model components
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Knowledge and understanding: be able to describe various numerical methods for solvir Define, study and analyse the research problem	ig the equation sets.

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EMingwALG6.1 Master the control of the control o	EMingwALG6.1 Master the complexity of technical systems by using system and process models.		
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden n	iet teruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Determine the uncertainties in the design. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Skills: Report performance based design orally, in writing and with graphical methods. Skills: Control the results of a performance based design. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk.
E051494 Active Fire Protection II: Smoke and Hea	at Control project	oral examination report	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the cours is aimed at providing a foundation for continuing studies in the risk management field. ** **Knowledge and understanding** **For a passing grade the student must:* • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input risk assessments. **Skills and abilities** **For a passing grade the student must:* • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to report, both orally and ria writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize material in scientific publications relevant for risk assessments. • be able to utilise material in scientific publications relevant for risk assessments. • be able to tuilise material in scientific publications relevant for risk assessments as an input to decision-making.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	be able to reflect upon ethical and subjective dimensions of risk assessments. Define, study and analyse the research problem

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	Teaching methods	Evaluation methods	Course learning outcome
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models. Skills: Control the results of a performance based design. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Discuss performance based design in the English language.
E051482 Active Fire Protection I: Detection and	project	oral examination	Skills: Make and evaluate approximate estimates in a design. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
Suppression E900522 Structural Design for Fire	locture	report written examination	Design, together with colleagues, a fire detection installation for a building. Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature
E900522 Structural Design for Fire	lecture seminar	skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux);
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments; The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variable in a compartment fire. • be able to analyse and interpret results from fire safety engineering experiments. • be able to analyse and interpret results from fire safety engineering experiments. • be able to design fire safety engineering systems for control and handling of combustion gases. • be able to design fire safety engineering systems for control and handling of combustion gases. • be able to destign fire safety engineering systems for control and handling of combustion gases. • be able to design fire safety engineering experiments in a clear and scientific journals and manuals. • be able to persent results from fire safety engineering experiments in a clear and scientific manner.
			models are used properly.
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and ap

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E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

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EMingwALG6.3 Synthesize in	complete, contradictory or redu	undant data into useful inforn	nation. Profession-specific competence
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	et teruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project	participation report assignment	Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
E051581 Fire Research Seminar	lecture lecture lecture: plenary exercises project	assignment job performance assessment	Report in a structured and scientific manner, using appropriate language Perform a comprehensive literature study on a specified fire related topic, including scientific referencing Present to audiences with different backgrounds
E051482 Active Fire Protection I: Detection and Suppression	project	oral examination report	Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment. Design, together with colleagues, a fire detection installation for a building.
E051494 Active Fire Protection II: Smoke and Hea	t Control project	oral examination report	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat
			Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. **Knowledge and understanding** For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspecives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. **Skills and abilities** For a passing grade the student must: • be able to evaluate the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety. • be able to evaluate the contents of existing risk assessments. • be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way understandable to persons with different knowledge backgrounds. • be able to utilise methods and tools for basic decision problems concerning risks. **Judgement and approach** For a passing grade the student must: • be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.

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E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to characterise the various physical variables associated with a fire sequence. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to alculate the value of various physical variables associated with a fire sequence. • be able to pidge the reasonableness of calculated results obtained from various computational models. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to desting fire safety engineering systems for control and handling of combustion gases. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to person fire safety engineering systems for control and handling of combustion gases. • be able to plan and carry out fire safety engineering experiments in a clear and scientific manner. • be able to plan and carr
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities		Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components used. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

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Professi	on-speci	ific comi	petence
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Course	Teaching methods	Evaluation methods	Course learning outcome
vourse loot: leer- en evaluatievormen voorafgegaan door ** werde	_	Lvaluation methods	Course rearring outcome
		onen hook evamination	TOPICS: industrial fire and explosion protection.
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous
	221111		and/or solid materials and to
			take the appropriate technical and organisation measures to reduce such a risk to an acceptable level.
COCATION Desfermence Based Design	and the state of	ist	INSIGHTS: understand the physical processes that occur during explosions.
061522 Performance-Based Design	group work self-reliant study activities	written examination with open questions	Skills: Determine the uncertainties in the design. Attitudes: Reflect on own way of thinking and acting.
	project	report	Attitudes: Take up independent positions about fire safety designs and defend the point of view.
	lecture	assignment	Knowledge: Evaluate self-reliantly the fire risk in a project.
		participation	Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design.
			Skills: Analyse own results and results of others within fire performance based designs in an objective manner. Skills: Make and evaluate approximate estimates in a design.
			Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an
			acceptable risk.
			Attitudes: Be aware of the own expertise and improve to expert level.
051482 Active Fire Protection I: Detection and	d project	oral examination	Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
Suppression O51494 Active Fire Protection II: Smoke and I	Heat Cantral la atura	report	Design, together with colleagues, a fire detection installation for a building.
205 1494 Active Fire Protection II: Smoke and I	seminar: coached exercises	written examination report	Perform a critical evaluation of a smoke and heat control system design Compute and critically evaluate the removal of heat from an enclosure
	project	oral examination	Make a correct CFD calculation in the context of a smoke and heat control system design
	, ,	open book examination	Compute and critically evaluate the movement of smoke inside, into and out of an enclosure
			Calculate an original design of smoke and heat control systems for a realistic configuration
E900532 Fire Investigation and Failure Analysi		written examination	Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to
	seminar	report assignment	conditions, construction techniques.
		oral examination	Appreciate the role of fire fighting systems/methods.
			Achieve an understanding of quantitative tools and their application.
			Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse
			problems to reconstruct fire
			scenarios. Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation.
900522 Structural Design for Fire	lecture	written examination	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature
	seminar	skills test	conditions;
		assignment	Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire
			resistance - Includes advanced
			analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real
			Fires (Temperature vs. Heat
			Flux);
			Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal
			insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E900304 Risk Assessment	group work	oral examination	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk
Trian / tooodaman	self-reliant study activities	skills test	assessment and how they can
	seminar		support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the cours
	lecture		is aimed at providing a
			foundation for continuing studies in the risk management field. Knowledge and understanding
			For a passing grade the student must:
			• be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different
			perspecives in a risk
			 management context. be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering an
			their strengths and
			weaknesses.
			• be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks.
			 be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context
			 be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning.
			 demonstrate an understanding of various sources of information that can be used and the challenges in using them as input
			risk assessments.
			Skills and abilities
			For a passing grade the student must: • he able to utilize the concents, methods and tools used in risk assessment, in new cituations and in situations related to fir
			 be able to utilize, the concepts, methods and tools used in risk assessment, in new situations and in situations related to fire safety.
			 be able to evaluate the contents of existing risk assessments.
			 be able to report, both orally and in writing, and discuss the implications of a performed risk assessment in a way
			understandable to persons with
			different knowledge backgrounds.
			 be able to utilise material in scientific publications relevant for risk assessment. be able to utilise methods and tools for basic decision problems concerning risks.
			Judgement and approach
			For a passing grade the student must:
			 be able to critically reflect on the benefits and limitations of risk assessments as an input to decision-making.
			 be able to reflect upon ethical and subjective dimensions of risk assessments.

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E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to analyse and interpret results from fire safety engineering experiments. • be able to judge the reasonableness of calculated results obtained from various computational models. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to estimate data values for input into computational models where these are lacking in the problem statement. • be able to calculate the effect the fire event can have on people occupying the building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to pearch for and apply information concerning
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Ablitties For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider rele
E900525 Simulation of Fires in Enclosures	lecture self-reliant study activities	written examination with open questions job performance assessment assignment participation written examination with multiple choice questions	Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and momentum. Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going improvement of his/her own competence in fire safety simulation. Judgement and approach: demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD programs. Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.

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EMingwALG6.5 Pay attention to entire life cycles of syste	ems, machines, and processes.
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Profession-specific competence	

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	eruggevonden in de studiefiche		
E051540 Explosions and Industrial Fire Safety	lecture seminar	open book examination	TOPICS: industrial fire and explosion protection. COMPETENCES: assess the fire and explosion risks involved with the use, handling, transport or storage of liquid, gaseous and/or solid materials and to take the appropriate technical and organisation measures to reduce such a risk to an acceptable level. INSIGHTS: understand the physical processes that occur during explosions.
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Skills: Select, motivate and apply the proper models, methods and techniques for risk based engineering models.
E051482 Active Fire Protection I: Detection and Suppression	project	report	Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment. Design, together with colleagues, a fire detection installation for a building.
E900306 Human Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	Knowledge and Understanding For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant scientific and ethical aspects of experiments with human participants (evacuation experiments) • adequately consider relevant estimates.

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EMingwALG6.6 Pay attention to sustainability, energyefficiency, environmental cost, use of raw materials and labour costs.

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Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werde	n niet teruggevonden in de studiefiche		
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk.
E051610 Passive Fire Protection	lecture online lecture	written examination	Give an overview of fire protection systems possible for different applications, including their respective advantages and disadvantages
E900531 Fire Science Laboratory	practicum	report	Demonstrate understanding of ignition (solid and liquid/gaseous). Demonstrate understanding of fire dynamics, including fire plumes Demonstrate understanding of oxygen consumption calorimetry. Demonstrate understanding of burning rate and fire spread.
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;

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<<	EMingwALG6.7 Pay attention to	•		Profession-specific competence
Course loot: leer- en	evaluatievormen voorafgegaan door ** werden niet te	Teaching methods	Evaluation methods	Course learning outcome
			and the artists	
E061522 P	erformance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Knowledge: Draw the appropriate safety conclusions from the risk analysis. Attitudes: Take up independent positions about fire safety designs and defend the point of view. Skills: Control the results of a performance based design. Knowledge: Evaluate self-reliantly the fire risk in a project. Attitudes: Act in an ethical, professional and social way when presenting and defining performance based design. Skills: Discuss performance based design in the English language. Skills: Make and evaluate approximate estimates in a design. Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk.
E051482 A	ctive Fire Protection I: Detection and	project	oral examination	Skills: Determine the uncertainties in the design. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
S	uppression ire Investigation and Failure Analysis	lecture seminar	report written examination report assignment oral examination	Design, together with colleagues, a fire detection installation for a building. Apply fundamental knowledge required to investigate fire and explosions: heat transfer, fluid mechanics material response to fire conditions, construction techniques. Appreciate the role of fire fighting systems/methods. Achieve an understanding of quantitative tools and their application. Awareness of the application of fire science and fire engineering to evaluate the behaviour of materials in fire. Solve inverse problems to reconstruct fire scenarios.
E900522 S	tructural Design for Fire	lecture seminar	written examination skills test assignment	Understand the legislative framework and philosophy of the courts: evidence, insurance, interpretation. Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation;
	tisk Assessment	group work self-reliant study activities seminar lecture	oral examination skills test	Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments; The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools for risk assessment and how they can support decisions in the area of risk management and especially in the area of fire safety engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field. Knowledge and understanding For a passing grade the student must: • be able to describe different perspectives of the concept of risk and be aware of the implications of adopting the different perspectives in a risk management context. • be able to describe risk assessment methods, their areas of applicability, especially in the area of fire safety engineering and their strengths and weaknesses. • be able to describe relevant risk measures, their limitations and strengths and how they can be applied to evaluate risks. • be able to describe different types of uncertainty and how they can be addressed and handled in a risk assessment context. • be able to describe how input from risk assessments can be utilised as a basis for decision-making and emergency preparedness planning. • demonstrate an understanding of various sources of information that can be used and the challenges in using them as input to risk assessments. Skills and abilities For a passing grade the student must: • be able to evaluate the contents of existing risk assessments. • be able to persons with different knowledge backgrounds. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize material in scientific publications relevant for risk assessment. • be able to utilize methods and tools for basic decision problems concerning risks. Judgement and approach For a passing grade the student must: • be able to utilize methods and tools for basic decision problems concerning risks.
E900306 F	luman Behaviour in Fire	group work self-reliant study activities seminar lecture	written examination skills test oral examination	For a passing grade the student must: • be able to explain the various factors (psychological and environmental) that influence fire setting behaviour • be able to explain RSET-models (simple stimuli-response models) that are commonly user in guidelines and regulations • be able to describe different theories of human behaviour in fire (e.g. role-rule model, affiliation, affordances and help in emergencies) • be able to state typical walking speeds for evacuation and explain how movement of people is influenced by demographic factors (e.g. age and mobility) • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain social influence and give examples of situations when social influence will be particularly important • be able to explain the basic assumptions behind egress models (network, grid and continuous models) Skills and Abilities For a passing grade the student must: • apply RSET-models (simple stimuli-response models) to estimate the required safe escape time • analyse a fire accident and relate the behaviour of occupants to theories of human behaviour in fire • analyse exit design based on the theory of affordances • apply egress models to simulate movement of people during evacuation • analyse results from simulations with egress models and relate the results to the assumptions of the model • select appropriate occupant behaviour scenarios for fire safety engineering design • communicate theories of human behaviour in fire to laymen and experts • communicate results from simulations with egress models to laymen and experts (oral, written and graphic representation) • independently seek information (articles, reports, manuals, etc) about human behaviour in fire Judgement and approach For a passing grade the student must: • adequately consider relevant ethical aspects relating to analysis of evacuation with egress models

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E900525 Simulation of Fires in Enclosures Knowledge and understanding: be able to describe the physical models used for conservation of mass, material, energy, and lecture written examination with open self-reliant study activities questions momentum. job performance assessment Judgement and approach: demonstrate capability for identifying his/her own needs for further knowledge and for on-going assignment improvement of his/her own participation competence in fire safety simulation. written examination with multiple Judgement and approach:demonstrate insight into the possibilities and limitations of fire safety simulation methods, as well as their role in advanced choice questions building technical project planning and in human responsibility for their use Skills and abilities:be able to make use of material published in technical references and user manuals for advanced simulation programs for combustion gas spreading. Skills and abilities:be able to report on, both orally and in writing, and discuss the implications of the executed simulation of the spread of combustion gases in association with fire safety design and fire investigations. Skills and abilities:be able to understand and use professional terminology within the field of fire evolution simulation using CFD Skills and abilities:be able to decide on how the uncertainty in a simulation can be estimated on the basis of assumptions included in the physical and numerical models used. Skills and abilities: be able to assess calculated results against experimental data Skills and abilities: be able to calculate the spread of combustion gases in various enclosure configurations using CFD Knowledge and understanding: be able to identify the limitations and most common sources of error of the model components Knowledge and understanding: be able to describe various numerical methods for solving the equation sets.

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EMingwALG6.8 Have insight into a	nd understanding of the	importance of e	entrepreneurship.

<> EMingwALG6.8 Have insight into and understanding of the importance of entrepreneurship. Profess			Profession-specific competend
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werd	en niet teruggevonden in de studiefiche		
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Skills: Apply the concept of risk management and the fire prevention techniques in order to produce a fire safe design with an acceptable risk. Attitudes: Be aware of on-going evolutions in the field of interest.
E900305 Advanced Fire Dynamics	group work seminar: coached exercises self-reliant study activities seminar lecture	written examination skills test assignment open book examination	The overriding aim of the course is that, after taking the course, the students will understand the various stages that a fire in a building goes through. Furthermore, the course is aimed at providing the students with a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence, as well as developing their ability to critically examine those methods in terms of practical application. The course is also aimed at increasing the engineering-related ability to construct and analyse models. Knowledge and understanding For a passing grade the student must: • be able to explain the effect of the enclosure on a fire sequence. • be able to explain the range of application of the models and the applicable constraints for fire safety engineering computations. • be able to characterise the various stages of a fire sequence based on various variables. Skills and abilities For a passing grade the student must: • be able to apply various manual computation models and computer models (2-zone models) for calculating various variables in a compartment fire. • be able to aclculate the value of various physical variables associated with a fire sequence. • be able to aclculate the value of various physical variables associated with a fire sequence. • be able to able to aclculate data values for input into computational models where these are lacking in the problem statement. • be able to design fire safety engineering systems for control and handling of combustion gases. • be able to evaluate the effect the fire event can have on people occupying the building. • be able to calculate the time before critical conditions are reached for fires in a building. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be able to present results from fire safety engineering experiments in a clear and scientific manner. • be abl

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EMingwALG6.9 Show perseverance, innovativeness, and an aptitude for creating added value.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	eruggevonden in de studiefiche		
E061522 Performance-Based Design	group work self-reliant study activities project lecture	participation report assignment	Attitudes: Be aware of the own expertise and improve to expert level. Attitudes: Be aware of on-going evolutions in the field of interest.
E051482 Active Fire Protection I: Detection and Suppression	project	oral examination report	Write a report and present it orally to colleagues, with respect to the design of an automatic fire protection installation. Design, together with colleagues, a fire detection installation for a building. Design, together with colleagues, a fire suppression installation that is not only based on water extinguishment.
E051494 Active Fire Protection II: Smoke and Heat Control project		oral examination report	Calculate an original design of smoke and heat control systems for a realistic configuration Make a correct CFD calculation in the context of a smoke and heat control system design
E900522 Structural Design for Fire	lecture seminar	written examination skills test assignment	Understanding the philosophical and statistical underpinnings of structural design at both ambient and elevated temperature conditions; Understand the role of loss of strength, deformation and thermal expansion and application to design of structures for fire resistance - Includes advanced analytical principles and calculations, and structural design for fire. Understanding heat transfer calculations based on standard fires - ISO 834, Parametric Temperature vs. Time Curves; Real Fires (Temperature vs. Heat Flux); Describe the effect of temperature on material properties of - Steel, concrete, wood, composites; fire proofing and thermal insulation; Survey the different analytical and empirical tools for fire calculations in both small and open plan compartments;
E091105 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem

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