Steinbeis-Hochschule Berlin – Steinbeis University Berlin SHB
Steinbeis Transfer Institute Advanced Risk Technologies

DRAFT

European Master of Risk Engineering and Management
and the respective
Professional Certification Program

Study Regulations

Proposal aligned with:

and used in projects

iNTeg-Risk www.integrisk.eu-vri.eu

ESPRiT www.esprit.risk-technologies.com

SafeChina www.safechina.risk-technologies.com

Stuttgart, September 2011

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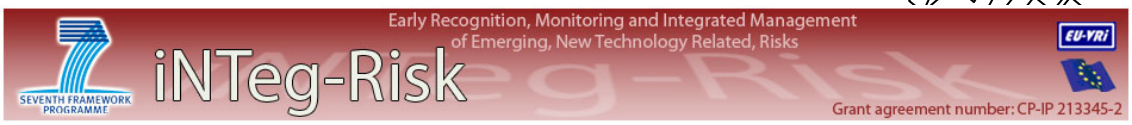

Report title:	European Master of Risk Engineering and Management and the respective Professional Certification Program					
Costumer:	European Commission					
Project title:	Early Recognition, Monitoring and Integrated Management of Emerging, New Technology related Risks		**Customer order Nr.:**	CP-IP 213345-2		
			Internal project Nr.:	12005		
			Project start:	December 01, 2008		
			Project end:	May 31, 2013		
Subproject:	SP4		**Applicable codes / standards:**	EU Guidelines		
Work package:	WP4.10		**Date of order acceptance:**	December 01, 2008		
Task:	T4.10.1 (professional education), T4.10.2 (academic education), T4.10.3 (training Risk Assessors), T4.10.4 (training Risk Examiners), T4.10.5 (on-the-job training)		**Date of completion:**	May 31, 2013		
Participants / Distribution:	**Participants in the activity:**		**Distribution (list):**			
	EU-VRi, R-Tech, Iberdrola, NIS, INCDPM, SWISSI, INERIS, CEA, USTUTT (ZIRN), SINTEF, Demokritos, FTN, UNIBO (CONPRICI), UNIPD (CONPRICI), CNR-IRC, UNIPI (CONPRICI), EU-VRi (SHB), University of Magdeburg		WP4.10 participants			
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Abbreviations

Abbreviation	Meaning
AP	Oral master thesis defense
CP	credit point (ECTS, European Credit Transfer System, basis 30h/CP)
EF	Supplementation facultative
EPF	Supplementation compulsory
h	hour (basis 9h/day)
K	Written exam
LNW	Examination
MT	Master thesis
PK	Project
PSA	Project study work
RBI	Risk Based Inspection
RCM	Reliability Centered Maintenance
RCFA	Root Cause Failure Analysis
S	Contact time
SHB	Steinbeis University Berlin
SL	Self-learning
SP	Subproject
SPO	Study and Examination Regulations
TA	Transfer paper
TR	Transfer
ZLG	curriculum with certification
WP	Work Package

1 Concept and objectives

European Master of Risk Engineering and Management and the respective Professional Certification Program is envisaged to match the current needs of industry, R&D and regulators in the areas of

1. Industrial safety
2. Safety of (complex) industrial and other systems and their components
3. Integrated response and risk management, in particular focused onto risks related and or emerging from new technologies
4. European and international regulation and governance in the above areas

European Master of Risk Engineering and Management the respective Professional Certification Program and curriculum is designed for students who wish to develop their knowledge, skills and competences in the fields of modeling, formulation, analysis and implementation of simulation tools for advanced risks problems, as well as skills for understanding these approaches in the broader context of engineering science. Students will benefit from a leading group of academics and an exciting international environment. Students may take the Master as a distinctive step in their professional career, or in preparation for a Ph.D. degree.

The curriculum design is in compatibility with educational projects in the area developed in the national and EU projects, in particular with:

1. EU project iNTeg-Risk (www.integrisk.eu-vri.eu) - running
2. DEG/kfw project ESPRiT (www.esprit.risk-technologies.com) – finished in 2010
3. DEG/kfw project SafeChina (http://www.safechina.risk-technologies.com) – running
4. EU framework ERASMUS MUNDUS (http://ec.europa.eu/erasmus-mundus)

The certification program is accredited by the Steinbeis University Berlin (SHB) as the coordinator of the joint activities. SHB itself is accredited under German law.

The whole activity is accompanied by the on-the-job training reflecting the Steinbeis principle of “dual education” (professional and academic part well aligned and going hand-in-hand).

2 General Program of the Study

The curriculum presented here is based on the educational scheme for the area of

Risk Engineering and Management

leading to possible (see Figure 1):

a) **technical specialization** is smoothly combined with,

b) **academic career**.

Both lines are supported by **on-the job training** through participation in industrial projects.

Figure 1: Two main lines of education in the area of Risk Engineering and Management

The curriculum is based on and compliant with the European Credit Transfer System (ECTS). ECTS is a student-centered system based on the student workload required to achieve the objectives of a program, objectives specified in terms of learning outcomes and competences to be acquired.

The **Master** program lasts two academic years (120 ECTS Credit Points), including practical training in an industrial or applied research environment and ends with the Master Thesis. The first term is aimed at providing a solid background on mechanics and numerical methods. It consists of a set of core modules (20 ECTS Credit Points) complemented by elective modules (10 ECTS Credit points). The second term (30 ECTS Credit Points) consists of a major elective courses aimed at providing a deeper knowledge in selected areas. The second term should preferably be followed in the institution different from the one selected for the first term.

The Master Thesis and related project work (60 ECTS Credit Points) are done during the third and fourth terms. Practical training can be performed both in industry and with an application-oriented research centre. The Master thesis can be continued towards the PhD (“Bologna”) title.

The **technical specialization** is envisaged as specialization (Figure 2) in the areas of:

- Asset / plant oriented risk engineering and management (in industry)
- Hazard (consequence) oriented risks management (in industry) and
- Business risk / risks governance.

The **emphasis of the whole curriculum** is on:

a) power, chemical, petrochemical and process industries

b) new technologies (e.g. nano, CCS, energy…)

c) emerging risk and

d) integrated risk management.

It is designed in such a way that it can be extended with other topics in the due course.

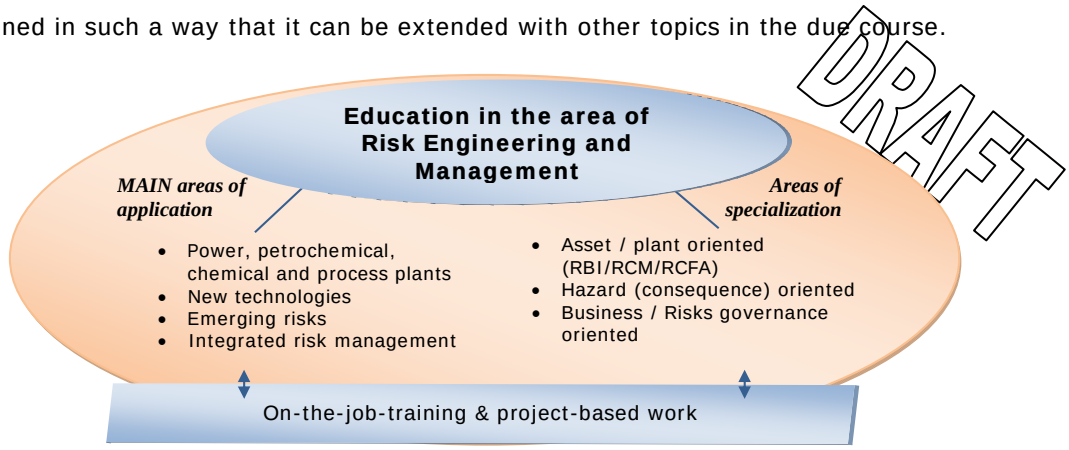


Figure 2: Specialization in the area of Risk Engineering and Management

The **certification**, in generally follows the pattern of

- one certification exam at (written, test-based, oral examination only in exceptional cases) at the end of the respective course
- one additional certification oral exam for the respective titles at the end of a group of single courses, namely (s. Figure 1)
  - Risk Professionals
  - Risk Examiners
  - Risk Assessors and
  - Risk governance specialists.

In terms of organization and link the curriculum is linked to (Table 1):

a) Project-independent Master of Engineering (Specialization Master of Risk Engineering and Management) path at Steinbeis University Berlin (SHB) – in collaboration with EU-VRi and University of Stuttgart (s. e.g. Table 4)

b) finished project “ESPRiT”, as described in Annex II

c) running project “iNTeg-Risk” with the goal to establish European Master of Risk Management, primarily with collaboration partners listed A.VII.3,

d) Running project “SafeChina”

e) Possible future project Erasmus Mundus in the area – again, possibly involving partners listed in A.VII.3.

Table 1: Embedding of the SHB educational concept “Risk Engineering and Management” into different project

	DEG	DEG	FP7	Erasmus Mundus
Project Name	**ESPRiT** “Enhancing Industrial Safety, Environmental Protection and Risk Management in Serbia by means of dedicated Training, Education and Technology Transfer	**SafeChina** “Promoting the EU and German standards and practices of Environmental Protection and Industrial Safety in China”	iNTeg-Risk “Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks” ”	“HEARisk - Harmonized EU Education in the Area of Risk Engineering and Management”
Status 2011	finished	running	running	planned
Primary focus	Education of risk professionals according to EU safety norms and regulation	Education of risk professionals according to EU safety norms and regulation	Emerging Risk related to development and use of new technologies	Consolidation and harmonization of EU education in the area of risk engineering and management

	DEG	DEG	FP7	Erasmus Mundus
Time frame	2008-2010	2010 - 2012	2008-2013	2010-2014

The elements of the program are defined according to Annex I and Annex VI. In principle, students can select to follow the courses at different locations among the participating universities.

The application of the general concept (Figure 3) in the case of ESPRiT project is shown in Figure 4. The link to the certification for the professional titles is shown in Table 7.

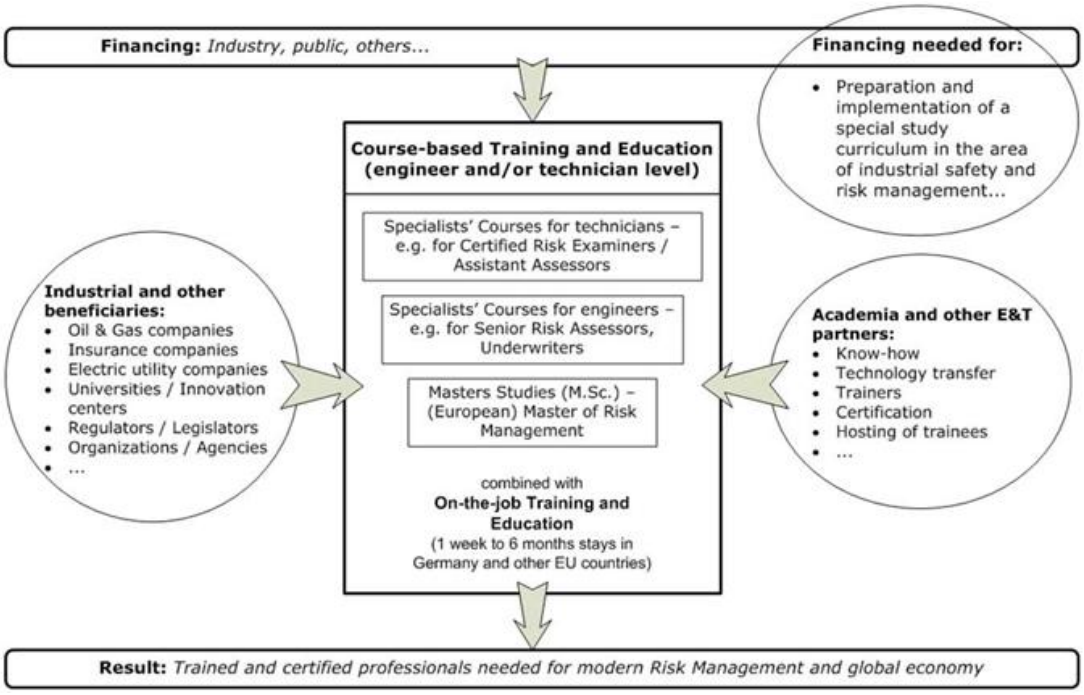


Figure 3: General training concept in ESPRiT project (2008 – 2010)

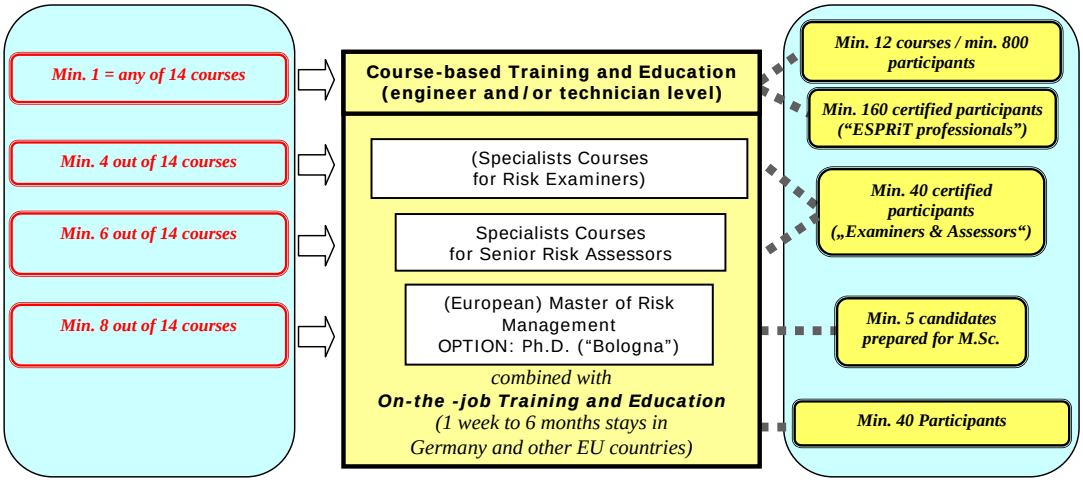


Figure 4: Curriculum as applied in ESPRiT project (2008 - 2010)

3 Contents

3.1 Areas of the study

Preliminary and non-comprehensive research done on identification of relevant risk and reliability courses and programs at some European Universities/institutions is described in A.VII.3. The results are used as an input for the development/extension of the curriculum for the European Master of Risk Engineering and Management and the respective Professional Certification Program.

In terms of contents included, the curriculum covers the following main areas:

I. **Introduction**, basics – risks in industry (e.g. general introduction, specific introduction/basics for single industry branches)

II. **Asset / plant oriented** risks management (e.g. RBI, RCM, RCFA, …)

III. **Hazard (consequence) oriented** risks management (e.g. HSE, HSSE, HAZOP, consequence modeling, dangerous chemicals, fire , explosion, …)

IV. **Business / governance oriented** risk management (e.g. business continuity risks, insurance issues, governance frameworks, e.g. the IRGC one, …)

V. **Additional topics**

3.2 Courses and Modules

The overall curriculum consists of courses grouped in specific modules (i.e. clusters of courses).

The **basic, core modules / courses** cover primarily the introductory and basic theoretical concepts in the area of risk identification, assessment and management.

The **elective courses** can be pursued at any of the partner institutions, as well as, if organized by them on other venues, provided that the standards set by SHB are met. Elective Courses include topics industrially or academically oriented, as well as practical modules on modern methods, software and techniques.

The curriculum includes already 21 courses (up to #R20) but is to be extended by ten new courses (#R21 - #R30) proposed and developed by the partners in WP4.10 of the iNTeg-Risk project (see Figure 5). New courses are to be defined using the template for the course profile as given in A.VII.1. Extended curriculum will allow a student to profile own study program to suit the actual need. An example of the course profile is given in A.VII.2.

The contents of each respective instance of the training can be defined separately, as for instance in the project ESPRiT up to the course #R13 and the project iNTeg-Risk up to #R30, as shown in Figure 5.

3.3 Master thesis and project work

For the **Master Thesis and practical (on-the-job, project-related) training** the students can choose a topic related to one of their areas of specialization. The content of the Thesis can be oriented toward a research interest or should be application oriented. Each student will present at the beginning of the second academic year a research project plan and the students are allowed and encouraged to complete their thesis at their earliest convenience, but must submit this work 4 months before end of the second year. Practical training is an essential element in the curriculum of the students and will be developed during the second academic year. This training should preferably be closely related to the master thesis and provide application knowledge and skills needed in Risk Engineering/Management projects.

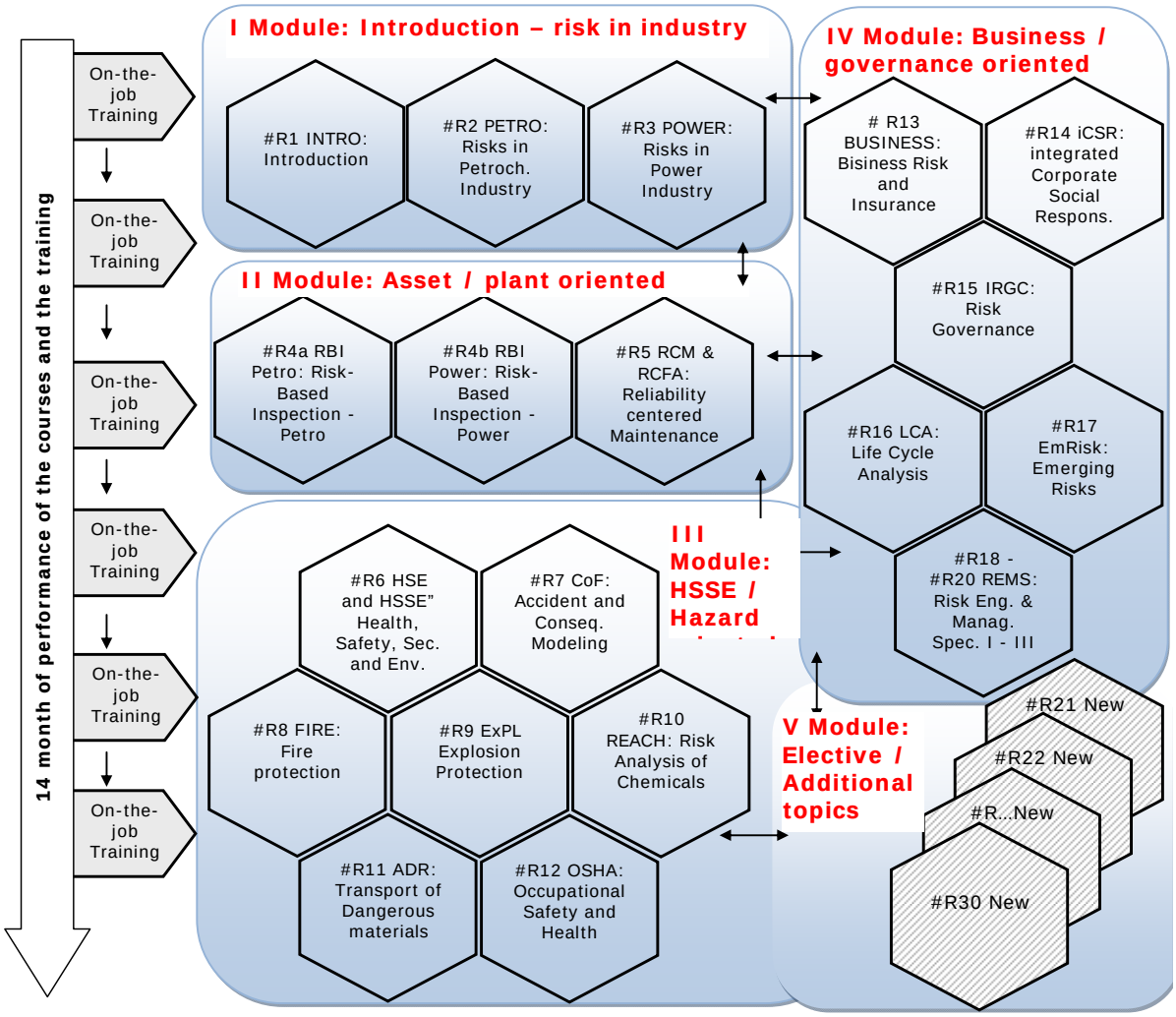


Figure 5: Contents of the curriculum
("shaded" courses, #R21 – #R30, to be defined and included)

3.4 Duration, structure of the courses and credit points (Cps)

The courses and the work for the Master program are normally covered in the max. time span of 24 calendar month, including Master Thesis, as in Table 2.

The courses needed for the certified professional levels are supposed to be finished within 12 calendar months. The respective CPs are given in Table 3

Table 2: Envisaged/agreed distribution for the acquisition of the ECTS credit points

Term:	1st term	2nd term	3rd and 4th terms	Total
Contents:	Basic, core courses + elective courses	Elective courses, (basic courses excep-tionally)	Master thesis + (transfer) Project work (elective courses exceptionally	
CPs:	20+10=30	30	40+20=60	120
Duration:	6 months	6 months	12 months	24 months

Table 3: Relationship between days, hours and ECTS CPs in the curriculum

	Target Days	Target hours	CPs

		Target Days	Target hours	CPs
a.	Courses (with transfer)	155	1395	60
b.	Recommended self learning	45	405	s.a
c.	Master thesis	133	1200	40
d.	Practical work on projects in industry	67	600	20
	Total	400	3600	120

3.5 Admission requirements

The application process and communication with applicants are generally web-based and defined by the rules of the respective university involved – if not defined otherwise all internal rules and regulations of SHB apply. A candidate must hold a Bachelor of Science or Engineering, or an appropriate science degree (including candidates with economic/ managerial university background) deemed to be a satisfactory standard for the purpose of postgraduate admission and awarded by an institution recognized by SHB, or upon a special agreement, by the collaborating partner.

Candidates will be required to provide:

a) the degree classification, class rank and full academic transcript

b) TOEFL, IELTS or similarly internationally recognized English language proficiency score

c) a statement of purpose, describing their interest in risk engineering/management, their personal aims in this field and their preferred areas of specialization

d) a complete Curriculum Vitae including additional language skills other than English and any additional information available that may relate to the potential performance of the student.

This data as well as the standing of the University awarding their degree will be used to rank students. Once ranked, SHB will allocate available places to candidates on the basis of their ranking. In doing so, the SHB will attempt to ensure that: candidate's choice of specialization is adhered to; that competencies in languages other than English (i.e., Spanish, French and German) are exploited; and that well balanced (in terms of ethnicity, gender and worldwide origin). Relevant professional experience and/or other evidence of particular interest in the topics of risk engineering/management may be taken as the positive factor in the ranking process.

3.6 Study, examination and certification regulation and fees

Study and Examination Regulation as defined by the Steinbeis University Berlin for the Master of Risk Engineering and Management is given in Annex I and for Certification program in Annex VI.

General regulations of Steinbeis University Berlin and information related to the curriculum and its application in projects are shortly presented in Annex IV.

Fees for master study and certification program as per Annex VIII.

4 Collaboration with other universities, projects and industry

The European Master of Risk Engineering and Management and the respective Professional Certification Program aims to offer a selection of courses over a 2-year program and the curriculum presented here is based on available training infrastructure. It is not expected that one university alone is able to offer all courses. Mobilization of students among the selected universities is therefore required.

The research conducted within iNTeg-Risk project, task WP4.10.2, on identifying relevant risk and reliability courses and programs at European Universities/institutions has included

- University partners in iNTeg-Risk project
- Third parties in iNTeg-Risk (or working through a main partner)
- Other European universities offering relevant courses (not partners in iNTeg-Risk).

The results of the mentioned research are given in A.VII.3.

The curriculum for Master of Engineering study in the field of Advanced Risk Technologies, area of specialization Risk Engineering and Management of Steinbeis University Berlin (Steinbeis Hochschule Berlin), Germany, taken here as a basis for European Master of Risk Engineering and Management and the respective Professional Certification Program, involves a strong collaboration and alignment with universities listed in Table 4 and Table 5.

Current stage of the curriculum development is linked to:

1. EU FP7 projects iNTeg-Risk "**Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks**" (www.integrisk.eu-vri.eu)
2. National (Germany) DEG project ESPRiT. ESPRiT stands for "**E**nhancing Industrial **S**afety, Environmental **P**rotection and **Ri**sk Management in Serbia by means of dedicated **T**raining, Education and Technology Transfer" (www.esprit.risk-technologies.com). This is a **PPP** (Private-Public Partnership) Project started with the support of Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG, part of the Bank Group kfw)
3. National (Germany) DEG project SafeChina "Promoting the EU and German standards and practices of Environmental Protection and Industrial Safety in China (www.safechina.risk-technologies.com). This is also **PPP** (Private-Public Partnership) Project started with the support of Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG, part of the Bank Group kfw)

Within the SafeChina project the courses (up to #R13) currently (August 2011) encompass:

- 45 hours of teaching and exercises (usually in blocks of 5 days) and
- 1.5 hour examination at the end of the course.

It is embedded into the education and certification system of SHB as per Annex I and Annex VI.

Current status of the collaboration is summarized in the tables below:

Table 4: Envisaged/agreed collaboration with other EU Universities

Nr.	EU University	Comment
1.	University of Stuttgart, ZIRN, Germany	Collaboration running, Formal agreement being prepared
2.	University of Bologna, Italy	Possible collaboration, yet to be discussed

Nr.	EU University	Comment
3.	Ecole des Mines, Paris, France	Possible collaboration, yet to be discussed
4.	Jožef Stefan International Postgraduate School – IPS, Ljubljana, Slovenia	Possible collaboration being discussed
5.	University Ramon Lull, Barcelona, Spain	Possible collaboration yet to be discussed
6.	CORNIS-Group	Possibilities of collaboration yet to be discussed
7.	Otto Guericke University Magdeburg, Germany	Collaboration being prepared
8.	Other partners from iNTeg-Risk project	Possible collaboration yet to be discussed

Table 5: Envisaged/agreed collaboration with other non-EU Universities

Nr.	non-EU University	Comment
9.	University of Tokyo, Japan	Collaboration running
10.	Universities of Belgrade, Novi Sad and Kragujevac, Serbia	Collaboration running
11.	Normal University Beijing, China	Possible collaboration being discussed
12.	ETH, Zürich, Switzerland	Possible collaboration yet to be discussed
13.	IIT Mumbay, India	Possible collaboration yet to be discussed
14.	Norwegian University of Science and Technology (NTNU), Norway	Possible collaboration being discussed
15.	MIT, USA	Possible collaboration yet to be discussed
16.	Other partners from iNTeg-Risk project	Possible collaboration yet to be discussed

5 The curriculum and the possible Erasmus Mundus initiative

This option is currently still under discussion/preparation. General idea is that the direct cooperation agreements, as in A.III.1, are made with a number of universities and industrial organizations, and then a proposal for an Erasmus Mundus project, yet to be elaborated (Figure 6).

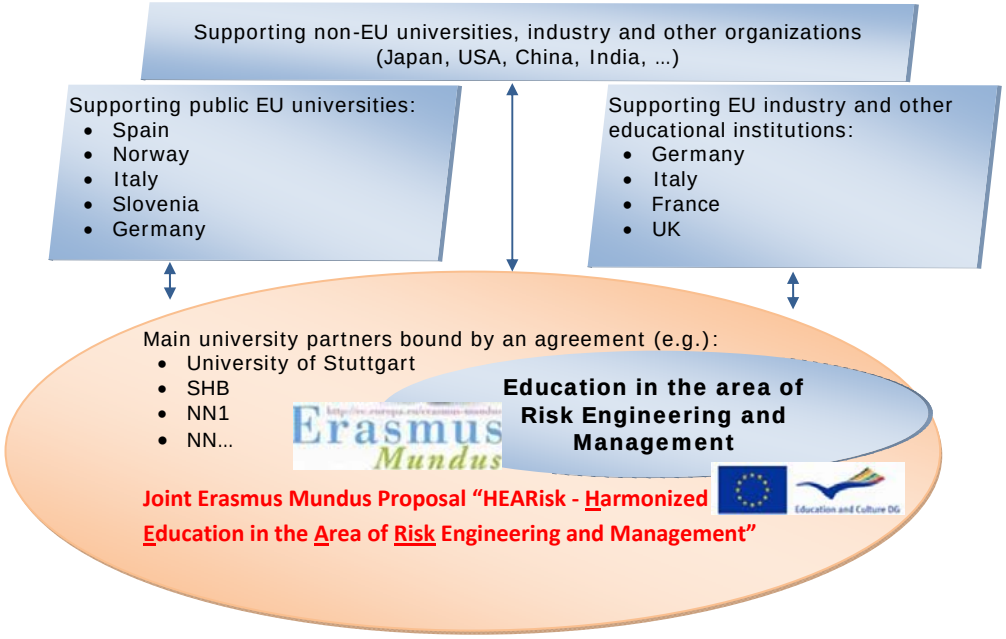


Figure 6: Currently discussed possibility to use the SHB education in the area of Risk Engineering and Management as the "core" of a potential Erasmus Mundus Proposal "HEARisk - Harmonized EU Education in the Area of Risk Engineering and Management" (tentative title)

6 References

[1] ESPRiT (2008). DEG Project "Enhancing Industrial Safety, Environmental Protection and Risk Management in Serbia by means of dedicated Training, Education and Technology Transfer" www.esprit.risk-technologies.com

[2] Erasmus Mundus (2009). Erasmus Mundus Programme – support for academic excellence and the attractiveness of Europe's higher education worldwide http://ec.europa.eu/education/external-relation-programmes/doc72_en.htm

[3] iNTeg-Risk (2008). EU-FP7 Project "Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks" www.integrisk.eu-vri.eu

[4] SafeChina (2010). DEG Project "Promoting the EU and German standards and practices of Environmental Protection and Industrial Safety in China" www.safechina.risk-technologies.com

[5] Steinbeis University Berlin regulation www.steinbeis-hochschule.de

[6] European Credit Transfer and Accumulation System (ECTS) http://ec.europa.eu/education/lifelong-learning-policy/doc48_en.htm

Annexes

Annex I **Regulation, modules and examination for European Master of Risk Engineering and Management**

Study and Examination Regulations (SER)

Master of Engineering (M.Eng.) II

at Steinbeis University Berlin (SHB)

DRAFT

§ 1
Scope

The SER at hand regulates the application oriented Master studies in Engineering with the degree "Master of Engineering" (M.Eng.) in the field of "**Advanced Risk Technologies**" and the regarding areas of specialization within the framework of the general study and examination regulations of SHB.

§ 2
Duration and Structure of the Program

(1) The program is laid out as a residential course, supplemented by self-study and transfer periods. As a general rule, the programme takes 24 months, which students normally pass in a consecutively.

(2) Events, deadlines and locations as well as additional offers are specified in the respective student contract (study plan).

(3) Structure of the study plan:

	min.-	-days	-hours (h)	-CP
a	**Modules**	158	1.422	60
b	project documentation and project work (i.a. master thesis)	200	1.800	60
c	**Self-studies (recommended)**	42	378	s.a.
d	Total study time	**400**	**3.600**	**120**

§ 3
Modules, Credits, Examinations

(1) Required modules are specified in annex I of the SER at hand, areas of specialization with optional modules are specified in the SER's annex II.

(2) Credits and examinations of required courses are specified in the SER's annex I, credits and examinations for areas of specialisation with optional courses are specified in annex II of these SER.

§ 4 Commencement

This study and examination regulations shall come into effect on 01.09.2009.

Annex I: SER M.Eng II
Field: Advanced Risk Technologies
Areas of specialization: Risk Engineering & Management

Determined by SHB's University Council and confirmed by the authorised administration of the Senate of Berlin for this MBA, the following specifications shall apply:

1. Duration:

No additional regulations.

2. Structure of the study plan

No additional regulations.

3. Special admissions requirements

3.1 Bachelor of Science or Engineering (with a minimum of 180 Credit Points), or an appropriate science degree deemed to be a satisfactory standard for the purpose of postgraduate admission and awarded by an institution recognized by SHB.

3.2 TOEFL, IELTS or similarly internationally recognized English language proficiency score.

3.3 Furthermore, admission tests may lead to a prescription of supplementary courses.

4. Modules: Definitions and annotations

4.1 Transfer:

41a Workload: see modules (courses) with transfer.

41b Workload: see modules (courses) with transfer. Based on the selection of the student and the decisions of the examination committee and documented in the study plan.

4.2 Basics:

-

4.3 Focus:

-

4.4 Optional compulsory:

44a Grade: One Grade with equal parts of K and PSA in the selected course.

CP: Added to the CP of the selected course.

4.5 Supplementation compulsory:

45a In case admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses. During the time of individual prestudies, students are preliminarily admitted to the program (academic preparations); after having finished these preliminary studies successfully, they are fully admitted to the program. During the time of studies, students are admitted to the program (additional courses).

4.6 Supplementation facultative:

46a Add-on courses, specified in the educational contract (compulsory for University Certificates).

46b In order to obtain the title of a **Risk Examiner**, the candidates must have at least 4 relevant courses and have at least 1 assisted case in the track subjects. The successful candidate should also participate in at least 1 application studies in 2 years after the exam. The certificate obtained is valid for 2 years.

46c In order to obtain the title of a **Senior Assessor**, the candidates must have the title Risk Examiner and at least 6 relevant courses and have at least 2 assisted and at least 1 lead case in one of the track subjects. The successful candidate should also participate in on-the-job-training and at least in 2 application studies in 2 years after the exam. The certificate obtained is valid for 3 years.

4.7 General annotations:

AI (AII)	Annex I (Annex II)
AP	Oral master thesis defence (final exam)
Art	Type
C	Case
CP	Credit Point (ECTS, European Credit Transfer System)
EF	Supplementation facultative

EPF	Supplementation compulsory
h	Hour (basis 9h/day)
K	Written examination
LNW	Examination
MT	Master thesis
Note	Grade
PK	Project
PSA	Project Study Paper
S	Seminar (also as lecture, blended learning-unit, tutorial, etc. [cf. study plan])
SER	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer paper
Tage	Days
TR	Transfer

5. Modules/courses:

See annex II.

Annex II: Modules and Examinations

Modul (Modulteil/Schwerpunktinhalte) Modules / Courses			Days			LNW		Gew. Note	CP
			S	SL	TR	Type	h		
Risk Engineering & Management / transfer / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136462-
PK1	**Project (PK)**	According to the admittance # cf. PK-modules	0	0	200	0	0	0	60
Risk Engineering & Management / transfer / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136463-
PK1.1	**Transfer Papers (TA)**	SPO: AI-41a	0	0	0	TA	0	0	0
Risk Engineering & Management / transfer / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136464-
PK1.2	**Project Study Paper (PSA)**	SPO: AI-41b	0	0	0	PSA	0	0	0
Risk Engineering & Management / transfer / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136465-
PK1.3	**Project work (PA)**	Basis for and documented in the thesis.	0	0	67	0	0	0	20
Risk Engineering & Management / basics / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136466-
PK1.4	**Thesis**	Scientific documentation, based on the project.	0	0	133	MT, AP	1	0	40
Risk Engineering & Management / basics / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136467-
I	**Introduction, basics - risks in industry**	*	15	6	0	0	0	0	6
Risk Engineering & Management / basics / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136468-
I-R1	**INTRO: Introduction to Risk and Safety Management in Industry**	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / basics / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136469-
I-R2	**PETRO: Risk Analysis in Chemical/ Petroleum Industries**	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. Current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / basics / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136470-
I-R3	**POWER: Risk Analysis in Power Industries**	Knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136471-
II	**Asset/plant oriented risks management**		15	6	6	0	0	0	9
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136472-
#R4a	**RBI-Petro: Risk Based Inspection - Petro**	Principles of risk based inspection, existing approaches and gives links to applied codes and standards. The focus is given to API 581. Levels of analysis and usage of analysis results will be elaborated and illustrated with examples.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136473-
#R4b	**RBI-Power: Risk Based Inspection - Power**	The state-of-the art knowledge of risk based approaches currently applied in power generation industries to the wide range of professionals involved in different activities in conventional power generation.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136474-
#R5	**RCM / RCFA: Reliability Centered Maintenance and Root Cause Failure Analysis**	Reliability Centered Maintenance (RCM) and Root Cause Failure Analysis (RCFA) as methodologies used for logical decision-making process for analysis and definition of the equipment maintenance requirements, as well as for accident prevention. The focus of the course is on the damage mechanisms appearing in different industries. A large number of well elaborated examples is included.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136475-
III	**Hazard (consequence) oriented risks management**	*	35	14	6	0	0	0	17

Modul (Modulteil/Schwerpunktinhalte) Modules / Courses			Days			LNW		Gew. Note	CP
			S	SL	TR	Type	h		
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136476-
III-R6	**HSE / HSSE: Health, Safety, Security and Environment**	Overview of EU regulation in the field of HSE and HSSE (health, safety, security and environment), explain the objectives and requirements, explain state-of-the art in application including constraint and advantages, and elaborate used techniques on a number of examples	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136477-
III-R7	**CoF: Accident and Consequences Modeling**	General techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136478-
III-R8	**FIRE: Fire protection**	Theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136479-
III-R9	**ExP: Explosion protection**	EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136480-
III-R10	**REACH: Risk analysis of chemicals**	Principles of the EU regulation in the area of registration, evaluation and authorization of chemicals – REACH (EC Nr. 1907/2006). The course explains principles and obligations for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136481-
III-R11	**ADR: Transport of dangerous materials**	International and EU policies and legislative requirements related to the transport of dangerous materials and explains the European Agreement concerning the International Carriage of Dangerous Goods. It elaborates the main issues from ADR 2009 as well as safety measures and procedures in case of accidents.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136482-
III-R12	**OSHA: Occupational Safety and Health**	Regulations in the field of safety and health of workers at work. It will explain general principles concerning the prevention of occupational risks, the protection of safety and health, the elimination of risk and accident factors, the informing, consultation, balanced participation in accordance with national laws and/or practices and training of workers and their representatives, as well as general guidelines for the implementation of the said principles. The EU member states are obliged to integrate these matters into their national regulations. Where appropriate this is exemplified with regulations from Germany.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136483-
IV	**Business/governance oriented risk management**	*	40	16	12	0	0	0	21
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies									REM-136484-
IV-R13	**BUSINESS: Business continuity risks & insurance**	Complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and	5	2	0	K, [PSA]	1.5	3	2

Modul (Modulteil/Schwerpunktinhalte) Modules / Courses			Days			LNW		Gew. Note	CP
			S	SL	TR	Type	h		
		business side of the company operation and asset management: therefore these will be tackled, too.							
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136485-	
IV-R14	**iCSR & Sustainability: integrated Corporate Social Responsibility in Industry**	Basic elements of the concept of Corporate (Social) Responsibility (CSR) and its practical application in industry. The course which focuses onto the following topics: • Key elements of the CSR and how these elements function as an integrated system • How CSR should be practically embedded into corporate and/or country business strategy and daily practice (CSR methodologies and tools) • The technology related aspects as a part of the modern practices of industry (HSE, HSSE) • Analysis/comparison of the practices in the EU, US and other countries • Relevant data and information on best practices world-wide, including a number of relevant case studies from the key industries and references to main sources of relevant data and information • Examples and projects using interactive and on-line course materials, also from external sources (e.g., the World Bank, GRI …). A particular unit of the course is dedicated to new ISO 260000 standard.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136486-	
IV-R15	**Risk Gov: Risk Governance**	Principles of modern risk governance including its main elements (eg. IRGC framework): a- pre-assessment, b- risk appraisal, c- risk characterization and evaluation d- risk management and e- risk communication. Apart from the general concept and the items to be considered under each of the elements (e.g. under "Risk Assessment": hazard identification and estimation, exposure and vulnerability assessment, risk estimation, risk perceptions, social concerns, socio-economic impacts) the examples from the industrial practice will be shown and explained. A separate part of the course will be dedicated to the overview of specific methods and techniques (e.g. Delphi), as well as to the tools and instruments facilitating the application by industry, governments and public bodies.	5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136487-	
IV-R16	**LCA: Life Cycle Analysis**	Principles and practical application of the life cycle analysis (LCA) as a technique for accessing the environmental aspects and potential impacts associated with a product, by (a) compiling an inventory of relevant inputs and outputs of a product system, (b) evaluating the potential environmental impacts associated with those inputs and outputs, and (c) interpreting the results of the inventory analysis and impact assessment phases in relation with to the objective of the study. The course will provide overview of the techniques and the tools needed for the analysis, with practical examples from primarily from process industry and relevant products, covering the environmental aspects and potential impacts throughout a product's life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal, with a particular attention focused onto resource use, human health and ecological consequences.	5	2	2	K, TA, [PSA]	1.5	3	3

Modul (Modulteil/Schwerpunktinhalte) Modules / Courses			Days			LNW		Gew. Note	CP
			S	SL	TR	Type	h		
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136488-	
IV-R17	**EM-Risks: EMERGING RISKS**	Issues of early recognition, classification and monitoring of emerging risks. As "emerging" are considered primarily risks previously not recognized as such, such as risks due to new processes, new technologies, new ways of working or social or organizational change (e.g. risks liked to nanotechnologies, bio-technology, new chemicals, outsourcing, globalization…). In addition also the known risks emerging due to the change in public perception or new scientific knowledge are considered, The methodology for to deal with these risks require new tools and these are presented at the course, concentrating in particular onto the use of concepts like UML (unified modeling language), indicators and modern IT tools, including the application of data mining. Examples and results from the current EU and other research will be highlighted and explained in detail to the course participants.	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136489-	
IV-R18	**REM-SI: Risk Engineering and Management – Special I**	Several candidates are already available; they will/can be activated according to the needs of the clients. Examples of the candidates are the courses on (3 of the courses assumed for the calculation of the CPs): • "Use of KPIs in engineering risk assessment and management" • "Risks related to cultural differences in operation of multinational companies, with a particular emphasis on operation in European projects" • "Data management and IT support systems in industrial risk engineering and management" or • "Legal aspects of risk in industry"	5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136494-	
IV-R19	**REM-SII: Risk Engineering and Management – Special II**		5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136495-	
iV-R20	**REM-SIII: Risk Engineering and Management – Special III**		5	2	0	K, [PSA]	1.5	2	2
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136490-	
V-R90	**REM-PSA**	SPO: AI-44a	0	0	29	PSA	1	0	9
Risk Engineering & Management / focus / compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136491-	
EPF1	**Supplementary compulsory**	SPO: AI-45a	0	0	0	0	0	0	0
Risk Engineering & Management / supplementation / facultative / SPO M.Eng. II / Advanced Risk Technologies								REM-136492-	
EF1	**Trends and niches management/technologies**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	0	0	0	0	0
		Total existing courses	**105**	**42**	**53**				**62**
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136493-	
VI	**Elective/Additional topics**		50	20	10	0	0	0	23
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136494-	
VI-R21	**SRA: Safety and Reliability Analysis**	Definition and discussion of basic concepts related to reliability and risk analysis. Functional analysis and identification and evaluation of faults and hazards. System analysis based on FMECA, reliability block diagrams and fault trees. Quantification of reliability and availability of technological systems. Measures for reliability importance. Analysis of repairable systems by Markov methods. Analysis of safety-critical systems (IEC 61508). Analysis of systems with common cause failures. Estimation of failure rates. Survey of reliability data sources.	6			K, [PSA]	1.5		7.5
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136495-	
VI-R22	**MaMa: Maintenance Management**		5		0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136496-	
VI-R23	**New 3**		5	2	0	K, [PSA]	1.5	3	2

Modul (Modulteil / Schwerpunktinhalte) Modules / Courses			Days			LNW		Gew. Note	CP
			S	SL	TR	Type	h		
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136497-	
VI-R24	**New 4**		5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136498-	
VI-R25	**New 5**		5	2	0	K, [PSA]	1.5	3	2
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136499-	
VI-R24	**New 6**		5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136500-	
VI-R25	**New 7**		5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136501-	
VI-R26	**New 8**		5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136502-	
VI-R27	**New 9**		5	2	2	K, TA, [PSA]	1.5	3	3
Risk Engineering & Management / focus / optional compulsory / SPO M.Eng. II / Advanced Risk Technologies								REM-136503-	
VI-R28	**New 10**		5	2	2	K, TA, [PSA]	1.5	3	3
		Total courses	**155**	**62**	**63**				**87**
		Total study	**155**	**62**	**263**				**147**

NOTE:

60 ECTS CPs for the Modules per student is the target (minimum).

Annex II Example of the detailed description of ESPRiT courses

A.II.1 *Example of course plans & contents: Single round of courses*

The application of the curriculum within the projects requires the elaboration of the respective plans of courses, generally containing plans for single "rounds". An example of such a plan is shown for the 1st round of ESPRiT courses on Figure 7.

Plan of ESPRiT courses, first round November 2008 - June 2009

Time	Location	Responsible partner	
November 2008			
Course # 5: RCM and RCFA Reliability Centered Maintenance and Root Cause Failure Analysis **See general data of the course.**	November 3-7, 2008	FTN Novi Sad	R-Tech
February 2009			
Course # 1: INTRO Introduction to Risk and Safety Management in Industry **See general data of the course.**	February 9-13, 2009	NIS a.d. Belgrade	R-Tech
Course # 3: POWER Risk Analysis in Power Industries **See general data of the course.**	February 17-20, 2009	EPS Obrenovac, TENT B	R-Tech
Course # 2: PETROL Risk Analysis in Chemical/ Petroleum Industries **See general data of the course.**	February 23-27, 2009	RPK Pančevo Pančevo	R-Tech
March 2009			
Course # 10: REACH Risk analysis of chemicals **See general data of the course.**	March 2-6, 2009	NIS a.d. Pančevo	DEKRA
Course # 8 : FIRE Fire protection **See general data of the course.**	March 9-13, 2009	FSS Belgrade	vfdb
Course # 11: ADR Transport of dangerous materials **See general data of the course.**	March 16-20, 2009	RPK Pančevo Pančevo	DEKRA
Course # 4b: RBI Risk Based Inspection - Power **See general data of the course.**	March 23-27, 2009	EPS Belgrade	R-Tech
Course # 6: HSE and HSSE Health, Safety, Security and Environment including use of PPE and equipment for monitoring **See general data of the course.**	March 30-April 3, 2009	NIS a.d. Novi Sad	R-Tech/ vfdb
April 2009			
Course # 12: OSHA Occupational Safety and Health **See general data of the course.**	April 6-10, 2009	FSS Belgrade	DEKRA
May 2009			
Course # 9: ExP Explosion protection **See general data of the course.**	Preliminary date May 4-8, 2009, canceled. New date ytbd	FTN Novi Sad	R-Tech
Course # 7: CoF Accident and Consequences Modeling **See general data of the course.**	May 11-15, 2009	FME Belgrade	R-Tech
June 2009			
Course # 4a: RBI Risk Based Inspection - Petrol **See general data of the course.**	June 17-19, 2009	NIS-Petrol, Refinery Pancevo Pancevo	R-Tech
Course # 13: Business Business continuity risks & Insurance **See general data of the course.**	June 22-26, 2009	FME Belgrade	R-Tech

Figure 7: Example of the curriculum implementation in ESPRiT project

A.II.2 ***Lecturers***

The list of lecturers is given in Table 6.

Table 6: List of lecturers, as in ESPRiT project
(Course coordinator for all the courses Prof. Jovanovic, Steinbeis)

Course		Steinbeis Lecturer(s)	External Lecturer(s)
#R1	**INTRO** Introduction to Risk and Safety Management in Industry	• Prof. A. Jovanovic	• Dr Gerbec, Josef Stefan Institute, Slovenia
#R2	**PETRO** Risk Analysis in Chemical/ Petroleum Industries	• Prof. A. Jovanovic • Dr.-Ing. D. Balos	• Dr. Giovanni Uguccioni, D'Appolonia, Italy
#R3	**POWER** Risk Analysis in Power Industries	• (Prof. A. Jovanovic) • Dr.-Ing. D. Balos • Dr. J. Bareiß • P. Auerkari	
#R4a	**RBI-Petro** Risk Based Inspection - Petro	• (Prof. A. Jovanovic) • Dr.-Ing. D. Balos	
#R4b	**RBI-Power** Risk Based Inspection - Power	• Prof. A. Jovanovic • Dr.-Ing. D. Balos	
R5	**RCM and RCFA** Reliability Centered Maintenance and Root Cause Failure Analysis	• Prof. A. Jovanovic • Dr.-Ing. D. Balos	Dipl.-Ing. S. Eremic, NIS Petroleum Industry of Serbia
#R6	**HSE and HSSE** Health, Safety, Security and Environment	• Prof. A. Jovanovic • Dr.-Ing. D. Balos	• Dr. L. Breedveld, 2B Consulenza Ambientale, Italy • Prof. P. Stanojevic, NIS Petroleum Industry of Serbia
#R7	**CoF** Accident and Consequences Modeling	• Prof. A. Jovanovic • Dr.-Ing. D. Balos	• Prof. Dr.-Ing. U. Krause, BAM, Germany • Dr. C. van Wingerden, Gexcon AS, Norway
#R8	**FIRE** Fire protection	• N.N.	• Prof. Dr.-Ing. U. Krause, BAM, Germany
#R9	**ExP** Explosion protection	• Prof. A. Jovanovic	• Dr. C. van Wingerden • Gexcon AS, Norway
#R10	**REACH** Risk analysis of chemicals	• Dr. med. S. Jovanovic	• J. Freek, DEKRA Akademie GmbH
#R11	**ADR** Transport of dangerous materials	• N.N.	• J. Freek, DEKRA Akademie GmbH
#R12	**OSHA** Occupational Safety and Health	• Dr. med. S. Jovanovic	• J. Freek, DEKRA Akademie GmbH
#R13	**Business** Business continuity risks & Insurance	• Prof. D. Linowski	

NOTE: Overall contribution of external lecturers is envisaged to remain below 25%.

A.II.3 ***Example of course plans & contents: Single round of courses***

#R1 INTRO

Overview	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.
Target profile of attendees	Engineers (university level), managers, inspectors, legislators and other professionals dealing with risk and safety in industry.
Course contents (divided in units)	1. Unit: Introduction to industrial chemical safety issues (process safety, occupational safety, environmental protection, consumer safety) • Explanation on different aspects of the term safety • topics of REACH, Occupational safety and health, including Atex, ADR and Seveso 2. Unit: Historical overview and Introduction to safety in industry • overview of infamous industrial accidents with hazardous substances • lessons learnt, • major accident hazards • response of the society, legislation introduced (explanation of obligations) 3. Unit: Introduction to obligations within Seveso II directive • lower & upper tier establishment • MAPP, SMS - on all 7 demands • Safety report - its operational use • emergency planning (internal/external) • land use planning requirements • information to the public • roles of the competent authorities (CAs) 4. Unit: Introduction to the process of the process safety risk assessment - overview of the main steps • understanding of the process under analysis • required site and surroundings data, relevant properties of the hazardous substances (including R and S phrases) • hazard identification methods and tools • hazard classification approaches • scenarios elaboration • assessment of consequences (source term conditions elaboration, modeling, domino potential evaluation) • assessment of scenario's likelihood (introduction to probabilities, how to consider branching of events and safety measures ...) 5. Unit: Review of main course issues, preparation for the final exam and the exam.
Course duration	5 days
Certification	The course includes certification exam
Special remarks, warnings	n/a

#R2 PETRO

Overview	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. This course will present current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.
Target profile of	Engineers (university level), managers, inspectors, legislators and other

attendees	professionals dealing with risk and safety in petrochemical industries.
Course contents (divided in units)	Unit 1: Risks aspects in petrochemical industries • overview • links to the applied methods, standards and codes • HSE (Health, Safety, Environment) analyses and studies as a support to design and operation Unit 2: Brief introduction to "Risk" • origin, measure • the "Risk Analysis" document Unit 3: Hazard identification in petrochemical industries • HAZOP analysis • Brief examples of application Unit 4: Probability Analysis • Calculation of probability • Elementary probability theory • Fault Tree Analysis technique Unit 5: Workshop - Application of Fault Tree Analysis • identification of accident sequences • calculation of probability of an accident • ranking of sequences Unit 6: The assessment of consequences of accidents • „Source Term“ – Identification of release cases • Evolution of a release: accident scenarios and Event Tree analysis • Models for assessment of fires, dispersion, explosion • Brief workshop - analysis of a typical accident by computer modeling Unit 7: Assessment of risk • Models to assess the vulnerability of people and equipment • Qualitative and Quantitative risk criteria Unit 8: Health, safety, environment issues • environment impacts • accident prevention • implementation of HSE management system, • regulatory expectations Unit 9: Review of the course main issues and preparation for final exam Unit 10: Final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R3 POWER

Overview	This course will provide knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It will present the regulatory basis and requirements, elaborate commonly used methods through number of examples.
Target profile of attendees	Engineers (university level), managers, inspectors, legislators and other professionals dealing with risk and safety in power industry. Staff mostly dealing with maintenance work in power industries and power and steam generation utilities.
Course contents (divided in units)	1. Unit: CEN Work Shop Agreement CWA 15740, The Basics 2. Unit: Material behavior and damage mechanisms (focus on high temperature components) • Creep, fatigue, creep – fatigue, corrosion • Failure example and life assessment 3. Unit: Inspection • Inspection techniques, inspection effectiveness (POD) • NDT programs and results • Compare results of NDT with RLA

	• NDT concept 4. Unit: On-line monitoring • Remaining life assessment • Exhaustion-calculation (TRD code), effect of uncertainties of input data 5. Unit: Case study RBI • Requirements from legislation • PoF determination based on creep and fatigue exhaustion • Results of RBI application, multilevel risk analysis • Risk-optimized inspection plan • Economic impact 6. Unit: RLM new power plants • New steels for plants with steam outlet temperature >600 °C • Enhanced RLM (strains, displacement, forces) 7. Unit: Quality Assurance • Introduction, problems • Quality inspection plan • Risk (new materials, fabrication problem, effects of global sourcing 8. Unit: Principles of life and risk assessment • background information: initial and historical data, target setting • NDT and monitoring of damage mechanisms • modeling and measuring damage for required inputs • preliminary analysis, condition review: principles and examples • principles of risk assessment in power plants (ref. CWA 15740) • discussion on example cases with short review of the lesson 9. Unit: Condition and life assessment: risk view • life assessment of hot end components, inspection and maintenance optimization: principles • application on examples: superheaters, steam piping, turbines (ref. RIMAP Power Workbook) • views on expected benefits and economical impact • discussion on applications with a short review of the lesson 10. Unit: Review of the course main issues and preparation for final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R4a RBI-Petro

Overview	The course explains principles of risk based inspection, existing approaches and gives links to applied codes and standards. The focus is given to API 581. Levels of analysis and usage of analysis results will be elaborated and illustrated with examples.
Target profile of attendees	law makers, staff from inspection and insurance companies, inspection and maintenance staff from industry, consultants
Course contents (divided in units	1. Unit: Principles of risk-based inspection • current risk-based approaches • codes and standards with special reference to API • API 581 approach 2. Unit: API 581, Qualitative and semi-quantitative analysis • qualitative analysis (level I), unit based o methodology o case study • qualitative analysis (level I) component based o methodology

	o case study 3. Unit: API 581, Semi-quantitative analysis • introduction to semi-quantitative (level II) approach • types of necessary data • case study 4. Unit: API 581, Semi-quantitative analysis, consequences and likelihood calculation • consequences calculation • likelihood calculation • case studies 5. Unit: API 581, quantitative analysis • modification factors 6. Unit: Software tools • Overview • examples of application 7. Unit: Application of RBI results on inspection planning 8. Unit: Review of the main course issues, preparation for final exam and exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R4b RBI-Power

Overview	The course has to increase knowledge of risk based approaches currently applied in power generation industries to the wide range of individuals involved in different activities in conventional power generation.
Target profile of attendees	Engineers (university level), managers, inspectors, legislators and other professionals dealing with risk and safety in industry
Course contents (divided in units	1. Unit: <u>Risk, , sources of risk, risk identification, risk perception</u> This unit gives overall view on risks, their sources and basic principles of risk management process. It will provide links to the applied methods, standards and codes 2. Unit: <u>Introduction to the qualitative assessment approach</u> This unit gives the basic principles of qualitative risk assessment techniques: Definition and agreement of common scale Necessary expertise and background knowledge Results evaluation and consensus building Basics of AHP approach and its implementation to the Risk assessment Workshop: Application of expert assessment and AHP on risk assessment of power plant components 3. Unit: <u>Introduction to the quantitative and semi-quantitative risk assessment</u> This units gives basics of semi-quantitative and quantitative approach to risk assessment Necessary data and background knowledge 4. Unit: <u>Modeling of consequences – qualitative and expert approach</u> This unit gives the basics of qualitative and expert approach to risk assessment, and how this approach can be used in semi-quantitative and quantitative analysis Event tree and event consequence modeling Workshop: Assessment of different scenarios for power plant components 5. Unit: <u>Modeling of consequences – quantitative approaches</u> This unit gives the basics of quantitative release and consequence modeling „Source Term“ – Identification of release cases. Evolution of a release: accident scenarios and Event Tree analysis Models for the assessment of fires, dispersion, explosion. 6. Unit: <u>Likelihood assessment – statistical and API581 approach</u> This unit gives the basics of statistical and data based approach towards likelihood assessment. The second part gives the basics of API 581 approach to likelihood assessment7. Unit: Application of RBI results on inspection planning. 7. Unit: <u>Likelihood assessment – physical modeling based on damage</u>

	mechanisms This unit gives a basic description of approaches used for physical modeling for likelihood assessment. Brief workshop: physical modeling of likelihood of failure for selected power plant components. 8. Unit: Basic Damage mechanisms This unit gives a brief introduction to the most common damage mechanisms present in power plants. Creep, thermal and mechanical fatigue, corrosion, erosion, oxidation and their effects on different power plant components. 9. Unit: Inspections and inspection effectiveness In this unit different inspection and monitoring strategies and their effectiveness is discussed and their effects on the risk reduction shown. 10. Unit: Defects and their probability of detection This unit links damage, damage manifestation and damage mechanisms with the corresponding inspection techniques, and briefly discusses the link between likelihood of failure, inspection technique, its effectiveness and capabilities with the risk assessment process. 11. Unit: Risk Based Inspection planning and inspection results evaluation This unit gives the overall picture of the risk based approach and gives the guidelines how to use risk assessment technique to optimize inspection planning and how to include the inspection results in the risk management process of a power plant. 12. Unit: Review of the main course issues, preparation for final exam and exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R5 RCM / RCFA

Overview	This course presents Reliability Centered Maintenance (RCM) and Root Cause Failure Analysis (RCFA) as methodologies used for logical decision-making process for analysis and definition of the equipment maintenance requirements, as well as for accident prevention. The focus will be given to the damages mechanisms appearing in different industries, Number of well elaborated examples are included.
Target profile of attendees	staff mostly dealing with maintenance work in process, power and petroleum industries
Course contents (divided in units)	1. Unit: Maintenance Strategies and Risk-Based approaches • Maintenance Strategy Review (MSR), general approach • Functional analysis, case studies. Criticality assessment and example • CEN CWA 15740:2008 Risk-Based Inspection and Maintenance Procedures for European Industry (RIMAP) • RIMAP Damage mechanisms – Application to risk assessment in industry. Mechanical and Metallurgical Failure Mechanisms 2. Unit: Introduction to the RCM and RC(F)A approaches • RCM methodology: function, functional failure, failure classification, failure mode and effect, failure characteristic analysis • RCM methodology: consequences, maintenance strategy selection, preventive tasks, proactive tasks • RC(F)A Methodology, link to RIMAP methodology • RCFA Principles. RCA examples. 3. Unit: General damage mechanisms – all industries • Uniform or Localized Loss of Thickness, High Temperature Corrosion • Environment – Assisted Cracking • Examples. Damage mechanisms in Thermal Power plants. 4. Unit: Refining industry damage mechanisms • Uniform or Localized Loss in Thickness Phenomena. • Environment – Assisted Cracking. • Other mechanisms • Refining industry damage mechanisms. Process units' overview.

	5. Unit: Overview of NDT Reliability data analysis • Overview of NDT Reliability data analysis • POD(a) From Signal Response - Data analysis or POS analysis • Sources of Generic POD Data 6. Unit: Review and conclusions of the course • preparation for the final exam • final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R6 HSE / HSSE

Overview	The course will give an overview of EU regulation in the field of HSE and HSSE (health, safety, security and environment), explain the objectives and requirements, explain state-of-the art in application including constraint and advantages, and elaborate used techniques on a number of examples.
Target profile of attendees	HSE and HSSE engineers and personnel involved in the HSSE activities of companies
Course contents (divided in units)	1. Unit Introduction to industrial chemical safety issues (process safety, occupational safety, environmental protection, consumer safety) • topics of Seveso, IPPC, Occupational safety and health • Explanation on different aspects of the term safety 2. Unit: Introduction to the IPPC (Integrated pollution prevention and control) • Mandatory environmental conditions: use all appropriate pollution-prevention measures, namely the best available techniques (which produce the least waste, use less hazardous substances, enable the recovery and recycling of substances generated, etc.); prevent all large-scale pollution; prevent, recycle or dispose of waste in the least polluting way possible; use energy efficiently; ensure accident prevention and damage limitation; return sites to their original state when the activity is over. • permit requirements: emission limit values for polluting substances (with the exception of greenhouse gases if the emissions trading scheme applies); any soil, water and air protection measures required; waste management measures; measures to be taken in exceptional circumstances (leaks, malfunctions, temporary or permanent stoppages, etc.); minimization of long-distance or transboundary pollution; release monitoring; all other appropriate measures. • Permit applications: information required and consultation procedure • Administrative and monitoring measures 3. Unit: Major Accident Prevention Policy MAPP as required by Seveso Directive 4. Unit: Human Factor Aspects • Philosophy • Organizational and personal factors • Risk analysis • Control system • Emergency concept • Quality Management 5. Unit Security aspects • Security concept Hazard analysis Threat analysis Good Security practice

	Security management 6. Unit: Key performance indicators in the HSSE area • leading and lagging indicators • indicator definition, selection, aggregation and calculation • use of indicators and interpretation of the results 7. Unit: Review of the main course issues and preparation for the final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R7 CoF

Overview	The course will present general techniques for accident modeling and explain different models of explosion. It will elaborate gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course will include as well modeling of fire and present current models.
Target profile of attendees	Who should attend this event? • Engineers from the Private and the Public sector • regulators • Health, Safety and Environmental practitioners • Academics and Researchers from Industry • Design/Operations/Maintenance staff from all sectors • Project Management • SHE/Risk assessment/Safety consultants
Course contents (divided in units)	1. Unit: Modeling of Gas Explosions • Explosion mechanisms • Modeling explosion venting: Simple models; Phenomenological models; CFD models; Probabilistic analysis • Modeling of blast generated by vapor cloud explosions TNT ME-method/Baker-Strehlow CFD models Probabilistic analysis 2. Unit: Modeling of Gas Dispersion • Emission: Two-phase flow Vessel blowdown Vessel rupture Vaporization • Dispersion: &Jets and plumes Dense gas dispersion CFD models 3. Unit: Consequences of fire and fire protection in industry • determination of fire load • heat release in industrial fires • fire load on structures (EuroCodes) • risk analysis • protective measures (design, application) • application examples 4. Unit: Modeling of Fire • Plume models • Zone models • CFD models • Smoke ventilation • Egress modeling

	5. Unit: Summary and test
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R8 FIRE

Overview	The course will start with theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.
Target profile of attendees	• Engineers from the Private and the Public sector • Regulators • Health, Safety and Environmental practitioners • Academics and Researchers from Industry • Design/Operations/Maintenance staff from all sectors • Project Management • SHE/Risk assessment/Safety consultants
Course contents (divided in units)	1. Unit Fire Protection in Industry (Fundamentals) • Structural Fire Protection • Theory of Fire • Fire Protection Installations • Risks of Fire • Theory of Extinguishment • Sources of Risks • Behavior 2. Unit Personal protection equipment 3. Unit Use of sensor systems 4. Unit Fire Safety concepts • Legal background and requirements • Structure and content • Example case for a building • Excursus: Fire Safety concepts for technical installations and machines 5. Unit Summary and test
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R9 ExP

Overview	ATEX directive will be presented in details and principles of explosion prevention and protection
Target profile of attendees	Engineers from the Private and the Public sector Regulators Health, Safety and Environmental practitioners Academics and Researchers from Industry Design/Operations/Maintenance staff from all sectors Project Management SHE/Risk assessment/Safety consultant
Course contents (divided in units)	1. Unit: ATEX-Directives Explosion characteristics • Safety Characteristics of flammable gases, liquids and dusts • Classification of dangerous substances • Chemically unstable gases • Hybrid mixtures

	• Area classifications 2. Unit: Explosion Prevention and Protection • Basic principles • Preventive measures • Constructional measures • Risk assessment at occupational safety • Explosion protection document and SMS 3. Unit: Case Studies of Accidents caused by Dust Explosions • Protection Measures and Technology (Overview of Solutions) • Electrostatic hazards basics and prevention, • Live Dust Explosion Demo 4. Unit: Application basics • Basics – sources of ignition, temperature classes, ignition energy • Marking of ATEX-products acc. to directive and standards • Functional principles and particularities of the types of protection – gas (Ex-d, e, q, m, o, p, i, n) • Installation requirements acc. to EN 60079-14 (general requirements, temperature classes, gas groups, potential equalization, electrostatics, emergency shutoff, converter fed motors, cables, wiring systems) 5. Unit: Special issues • Intrinsic safety – verification of intrinsic safety and common misunderstandings, installation requirements (cables, terminals, marking, separation etc.) • Particularities of combustible dusts • Functional principles and marking of types of protection – dust (tD, mD, pD, iD) • Non-electrical explosion protection – basics, assessment of ignition risks, types of protection etc • the course summary and test
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R10 REACH

Overview	This course will mainly present Decree EC Nr. 1907/2006 (REACH). REACH means registration, evaluation and authorization of chemicals. The purpose of this Regulation of the European Community is to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the internal market while enhancing competitiveness and innovation. The course will explain principles and obligations for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment.
Target profile of attendees	REACH is concerned with people who manufacture, place on the market or use substances that may adversely affect human health or the environment, thus this course is dedicated to the professionals involved in these processes e.g. manufacturer, importer, downstream user or distributor placing on the market a substance or a mixture.
Course contents (divided in units)	1. Unit: Introduction • What is REACH? • What is GHS? • What do GHS and REACH have to do with each other? 2. Unit: Decree EC Nr. 1907/2006 (REACH) • Table of contents • Applicability • Registration of substances

	• Obligation of pre-registration of phase-in-substances • Registration: information to be provided • Information in the supply chain • Downstream users • Authorization • Restrictions 3. Unit: Classification, labeling and packaging of substances and mixtures (GHS-regulation) • Scope • General obligation to classify, label and package • Hazard classification • Hazard communication by labeling • Packaging • Evaluation – Labeling – Packaging: Example • Harmonization of classification and labeling substances • Obligation to maintain information • Amendment to regulation (EG) Nr. 1907/2006 [REACH] • Transitional provisions 4. Unit: Review of the course main issues, preparation for final exam
Course duration	5 days
Certification	The course includes certification exam
Special remarks, warnings	**Previous knowledge needed:** General "everyday" knowledge about chemicals and possible hazards for humans and the environment; general understanding of legal reasoning. **Special remarks:** The course details the legal procedures. It is not about chemicals as such and the hazards they may represent.

#R11 ADR

Overview	The course presents international and EU policies and legislative requirements related to the transport of dangerous materials and explains the European Agreement concerning the International Carriage of Dangerous Goods. It will elaborate the main issues from ADR 2009 as well as safety measures and procedures in case of accidents.
Target profile of attendees	Each undertaking, the activities of which include the carriage, or the related packing, loading, filling or unloading, of dangerous goods by road shall appoint one or more safety advisers for the carriage of dangerous goods, responsible for helping to prevent the risks inherent in such activities with regard to persons, property and the environment (ADR 1.8.3.)
Course contents (divided in units)	1. Unit: <u>Introduction</u> • Classification of dangerous goods • General packing provisions, provisions for tanks and tank container • Marking and labeling and orange plates marking • Particulars in transport documents 2. Unit: <u>Methods I</u> • Methods of consignment and restrictions on dispatch • Transport of passengers • Prohibitions and precautions to mixed loading • Segregation of goods 3. Unit: <u>Methods II</u> • Limitation of the quantities carried and quantity exemptions • Handling and stowage • Cleaning and/or degassing before loading or after unloading • Crews, vocational training 4. Unit: <u>Application</u> • Vehicle documents • Instructions in writing • Supervision requirements • Traffic regulations and restrictions

	• Operational discharges or accidental leaks of pollutants • Requirements relating to transport equipment 5. Unit: Exam • Review of the course main issues • Preparation for final exam • Final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	n/a

#R12 OSHA

Overview	The course will present regulations in the field of safety and health of workers at work. It will explain general principles concerning the prevention of occupational risks, the protection of safety and health, the elimination of risk and accident factors, the informing, consultation, balanced participation in accordance with national laws and/or practices and training of workers and their representatives, as well as general guidelines for the implementation of the said principles. The EU member states are obliged to integrate these matters into their national regulations. Where appropriate this is exemplified with regulations from Germany.
Target profile of attendees	The regulations state obligations for the employer. He is the main target. The workers are obliged to follow his instructions and support his efforts.
Course contents (divided in units)	1. Unit: Introduction 2. Unit: Directive 89/391/EC: Overall Directive „occupational safety • Object and Scope • Employers' Obligations • General obligations o Personnel implementation o Measures concerning serious and imminent danger o Training, consultation and participation of employees o Instruction of employees o Preventive medical surveillance • Employee's obligations • Separate directives 3. Unit: Separate directive in terms of Article 16 of Directive 89/391/EC • Index • Workplaces • Use of work equipment • Example for implementation of the work equipment directives into national legislation: Ordinance of Safety and Health (Germany) • Use of personal protective equipment • Example for the implementation the directives on personal protective equipment: Personal Protective Equipment Usage Ordinance (PSA - Germany) • Working with visual display units • Manual handling of loads • Example for implementation of European Council Directives: „ Handling of loads" in the German Labour Protection Laws • Carcinogens, chemical and biological working materials o Endangerment by carcinogens o Endangerment by chemical working materials o Example for the implementation of European Council Directives: Hazardous Substances Law (Germany) o Endangerment by biological working materials o Example for the implementation of Council Directives: Biological agents ordinance (Germany) • Endangerment by physical agency o Vibration o Noise o Example fort he implementation of European Council Directives: Noise and vibration (Germany) o Electromagnetic fields o Artificial optical radiation o Explosive atmospheres

	o Example for the implementation of Council Directives: Explosive atmospheres (Germany) • Safety and Health signs at work • Miscellaneous 4. Unit: <u>Special personnel for occupational safety: Example Germany</u> • Specialists for occupational safety / work doctor / Safety representative Occupational medics and first-aid-helpers 5. Unit: <u>Review</u> of the course main issues, preparation for final exam and final exam
Course duration	5 days
Certification	The course includes certification exam.
Special remarks, warnings	**Previous knowledge needed:** General "everyday" knowledge about workplaces and hazards at the workplace; general understanding of legal reasoning. **Special remarks:** The course details the legal procedures. Although some regulations are quite technical and detailed, the actual "How to do it?" is left to the employer. He is free to choose a technical/organizational solution to achieve what is required.

#R13 BUSINESS

Overview	The course is intended to complement the series of 13 other ESPRiT courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.
Target profile of attendees	BSc/MSc engineering, environmental sciences, finances, working in industry, academia, banks, insurance companies, government and other stakeholders dealing with risks in industry.
Course contents (divided in units)	1. Unit: <u>Introduction, Fundamentals of Corporate Finance</u> • Introduction in ESPRiT and course #13 • Introduction in Corporate Finance o The Value of Money: Time and Risk o Net Present Value Rules o Alternative Decision Rules (IRR, BE, FV) o Quantifying Risk and Expected Return o Excursus: Sensitivity Analyses 2. Unit: <u>Intro Quantitative Risk Management</u> • Scenarios and the Derivation of Statistical Measures • Risk-Return Optimization • Value at Risk • Excursus: Basel II 3. Unit: <u>Modeling and Estimating of Risk: Insurance vs. Financial Hedging</u> • Insurable and Non-insurable Events • Premiae and the Law of Large Numbers • Motivation: Computation of premiae for life insurance • Liability and Commercial Property Insurance • Reinsurance • Excursus: Underwriting and Insurance Contracts • Excursus: Solvency II • Case studies in Serbia: • External example (will be brought in directly by industry): Insurance of industrial objects in Serbia -examples 4. Unit: <u>Financial Hedging of Commodity and Currency Risks</u> • Toward an Integrated Risk Model • Binomial Models and Black-Scholes Approach to Value Options in an Arbitrage-Free-World

	• Excursus: Markowitz Optimization with Integer Constraints • Excursus: Real Options 5. Unit: Review of the course main issues, additional issues, preparation for final exam and final exam • Analysis of Munich Re's: Environmental Report – Perspectives – "Today's ideas for tomorrow's world" • ISO-25999-2
Course duration	5 days
Certification	The course includes certification exam
Special remarks, warnings	References: • Brealey/Myers: Principles of Corporate Finance • Ross/Westerfield/Jaffe: Corporate Finance • Benninga: Principles of Finance with Excel • Dorfman: Introduction to Risk Management and Insurance • Rejda: Principles of Risk Management and Insurance • McDonald: Derivative Markets

A.II.4 *Certification requirements*

The certification requirements are to be specified, and can be specified independently in specific projects, as per project needs and requirements. An example of the specification done in project ESPRiT is shown in Table 7.

The candidate for Master study (5 candidates as defined in the main contract with DEG) were selected between ESPRiT courses participants which have fulfilled the requirements set in Table 7 and collected up to 25 CPs.

Table 7: Certification levels between "single course exam" and Master of Risk Engineering (option: PhD "Bologna")

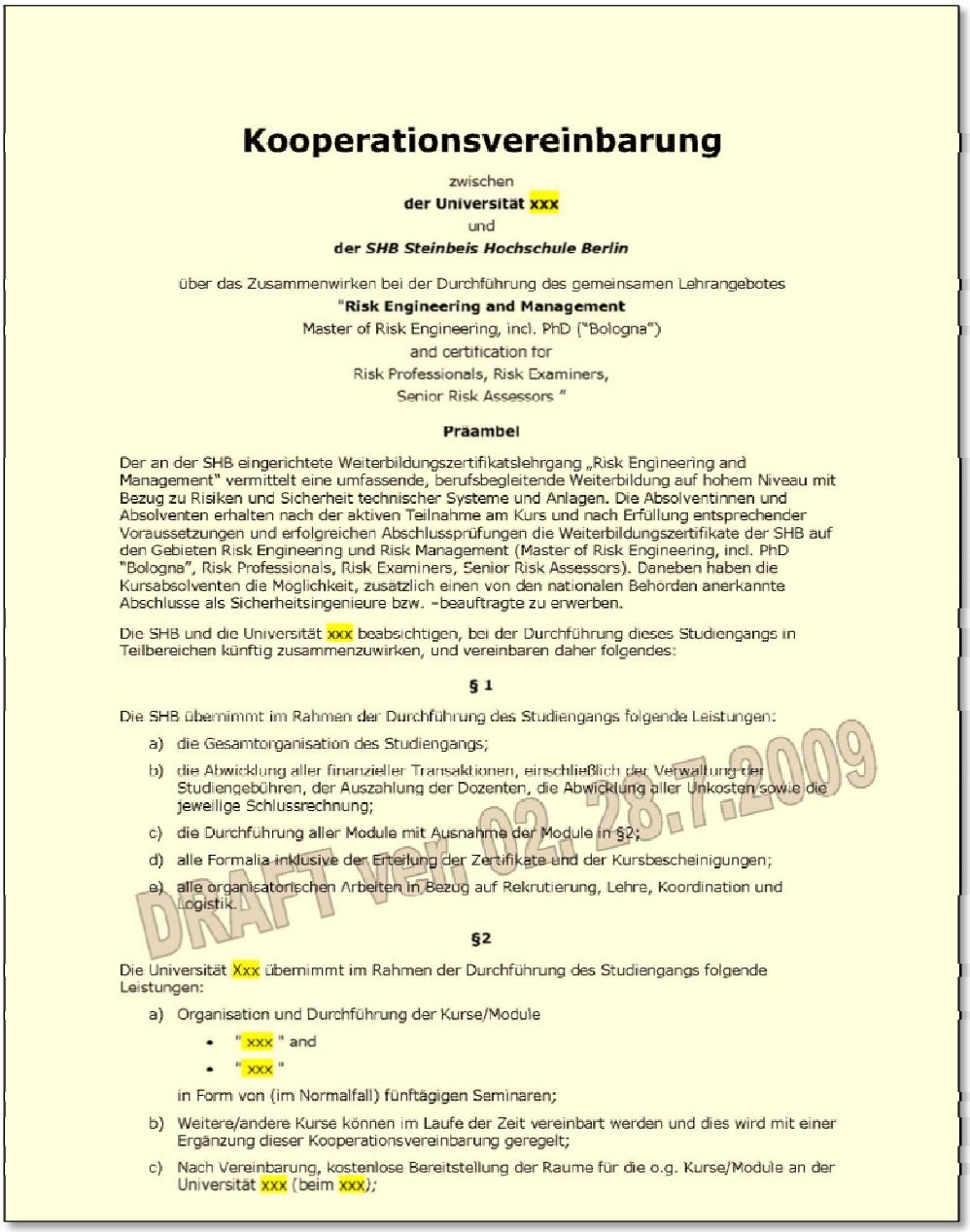
Title:	**(ESPRiT) RISK PROFESSIONALS**	**(ESPRIT) RISK EXAMINERS**		**(ESPRIT) SENIOR ASSESSORS**		**MASTER OF RISK ENGINEERING (Option: PhD "Bologna")**
Track:	**n/a**	**HSE**	**ASSET**	**HSE**	**ASSET**	**n/a**
Min. number of courses	1	4	4	6	6	8
Compul-sory courses (basic)	any	#R1, #R6	#R1, #R4a or #4b	#R1, #R6, #R12	#R1, #R4a or #4b, #R5	#R1 and #R13
Elective courses	any	2 of: #R2, #R3, #R7, #R8, #R9, #R10, #R11, #R12, #R13	2 of: #R2, #R3, #R5, #R7, #R8, #R9, #R13	3 of: #R2, #R3, #R7, #R8, #R9, #R10, #R11, #R13	3 of: #R2, #R3, #R7, #R8, #R9, #R13	6 of: #R2, #R3, #R4a/b, #R5, #R6, #R7, #R8, #R9, #R10, #R11, #R12
Additi-onal re-quire-ments	none	1: at least 1 assisted case in the track sub-jects	1: at least 1 assisted case in the track sub-jects	1+1: at least 1 assisted and 1 self-per-formed case in the track subjects, participation in the short on-the-job training	1+1: at least 1 assisted and 1 self-per-formed case in the track subjects, participation in the short on-the-job training	2+1: at least 2 assisted and 1 self-performed case in the track subjects, participation in the on-the-job training MSc thesis (option: PhD

						"Bologna"; terms and conditions of the participating University apply)
Certification exam	none	yes	yes	yes	yes	yes, Master (option: PhD Bologna)
Post-qualification requirements	none	1: Participation in at least 1 application studies in 2 years	1: Participation in at least 1 application studies in 2 years	2+1: Participation in at least 2 application studies in 2 years and lead at least 1 in 2 years	2+1: Participation in at least 2 application studies in 2 years and lead at least 1 in 2 years	none
Validity	permanent	2 years	2 years	3 years	3 years	permanent

NOTE: Steinbeis-Hochschule Berlin has established official rules for certification process which came into force September 1, 2009. Based on this, the procedure for qualification and certification within ESPRiT project will be updated.

Annex III **Example of agreements with supporting parties**

A.III.1 ***Example of agreements made with supporting universities***



Kooperationsvereinbarung

zwischen
der Universität xxx
und
der SHB Steinbeis Hochschule Berlin

über das Zusammenwirken bei der Durchführung des gemeinsamen Lehrangebotes
"**Risk Engineering and Management**
Master of Risk Engineering, incl. PhD ("Bologna")
and certification for
Risk Professionals, Risk Examiners,
Senior Risk Assessors "

Präambel

Der an der SHB eingerichtete Weiterbildungszertifikatslehrgang „Risk Engineering and Management" vermittelt eine umfassende, berufsbegleitende Weiterbildung auf hohem Niveau mit Bezug zu Risiken und Sicherheit technischer Systeme und Anlagen. Die Absolventinnen und Absolventen erhalten nach der aktiven Teilnahme am Kurs und nach Erfüllung entsprechender Voraussetzungen und erfolgreichen Abschlussprüfungen die Weiterbildungszertifikate der SHB auf den Gebieten Risk Engineering und Risk Management (Master of Risk Engineering, incl. PhD "Bologna", Risk Professionals, Risk Examiners, Senior Risk Assessors). Daneben haben die Kursabsolventen die Möglichkeit, zusätzlich einen von den nationalen Behörden anerkannte Abschlusse als Sicherheitsingenieure bzw. -beauftragte zu erwerben.

Die SHB und die Universität xxx beabsichtigen, bei der Durchführung dieses Studiengangs in Teilbereichen künftig zusammenzuwirken, und vereinbaren daher folgendes:

§ 1

Die SHB übernimmt im Rahmen der Durchführung des Studiengangs folgende Leistungen:

a) die Gesamtorganisation des Studiengangs;
b) die Abwicklung aller finanzieller Transaktionen, einschließlich der Verwaltung der Studiengebühren, der Auszahlung der Dozenten, die Abwicklung aller Unkosten sowie die jeweilige Schlussrechnung;
c) die Durchführung aller Module mit Ausnahme der Module in §2;
d) alle Formalia inklusive der Erteilung der Zertifikate und der Kursbescheinigungen;
e) alle organisatorischen Arbeiten in Bezug auf Rekrutierung, Lehre, Koordination und Logistik.

DRAFT Ver 02, 28.7.2009

§2

Die Universität Xxx übernimmt im Rahmen der Durchführung des Studiengangs folgende Leistungen:

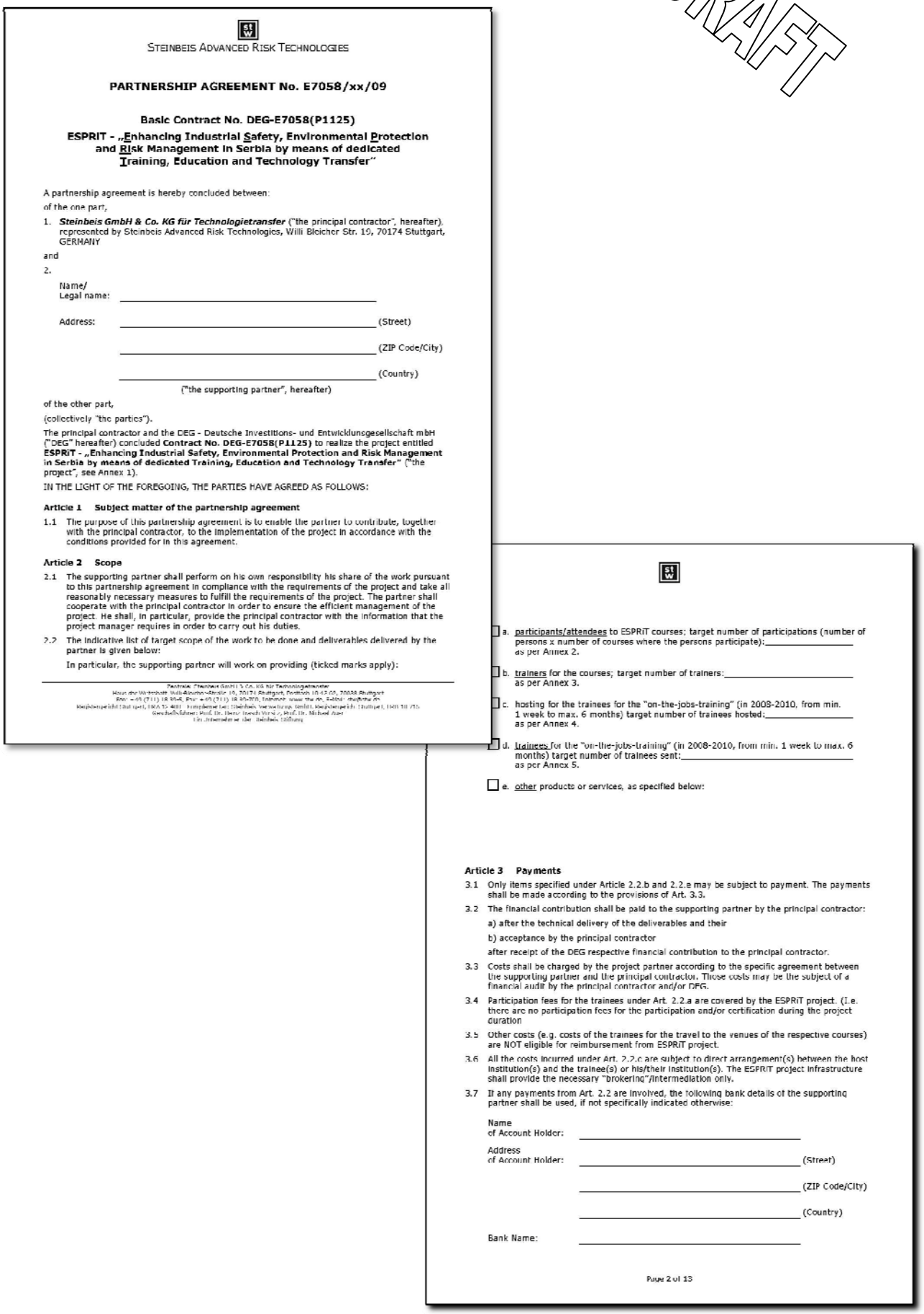
a) Organisation und Durchführung der Kurse/Module
   - " xxx " and
   - " xxx "

   in Form von (im Normalfall) fünftägigen Seminaren;
b) Weitere/andere Kurse können im Laufe der Zeit vereinbart werden und dies wird mit einer Ergänzung dieser Kooperationsvereinbarung geregelt;
c) Nach Vereinbarung, kostenlose Bereitstellung der Raume für die o.g. Kurse/Module an der Universität xxx (beim xxx);

A.III.2 *Template for agreements with supporting industry*

DRAFT

(Annexes excluded)



STEINBEIS ADVANCED RISK TECHNOLOGIES

PARTNERSHIP AGREEMENT No. E7058/xx/09

Basic Contract No. DEG-E7058(P1125)

ESPRIT - „Enhancing Industrial Safety, Environmental Protection and Risk Management in Serbia by means of dedicated Training, Education and Technology Transfer"

A partnership agreement is hereby concluded between:

of the one part,

1. ***Steinbeis GmbH & Co. KG für Technologietransfer*** ("the principal contractor", hereafter), represented by Steinbeis Advanced Risk Technologies, Willi Bleicher Str. 19, 70174 Stuttgart, GERMANY

and

2.

Name/
Legal name: _____

Address: _____ (Street)

_____ (ZIP Code/City)

_____ (Country)

("the supporting partner", hereafter)

of the other part,

(collectively "the parties").

The principal contractor and the DEG - Deutsche Investitions- und Entwicklungsgesellschaft mbH ("DEG" hereafter) concluded **Contract No. DEG-E7058(P1125)** to realize the project entitled **ESPRIT - „Enhancing Industrial Safety, Environmental Protection and Risk Management in Serbia by means of dedicated Training, Education and Technology Transfer"** ("the project", see Annex 1).

IN THE LIGHT OF THE FOREGOING, THE PARTIES HAVE AGREED AS FOLLOWS:

Article 1 Subject matter of the partnership agreement

1.1 The purpose of this partnership agreement is to enable the partner to contribute, together with the principal contractor, to the implementation of the project in accordance with the conditions provided for in this agreement.

Article 2 Scope

2.1 The supporting partner shall perform on his own responsibility his share of the work pursuant to this partnership agreement in compliance with the requirements of the project and take all reasonably necessary measures to fulfill the requirements of the project. The partner shall cooperate with the principal contractor in order to ensure the efficient management of the project. He shall, in particular, provide the principal contractor with the information that the project manager requires in order to carry out his duties.

2.2 The indicative list of target scope of the work to be done and deliverables delivered by the partner is given below:

In particular, the supporting partner will work on providing (ticked marks apply):

☐ a. participants/attendees to ESPRIT courses; target number of participations (number of persons x number of courses where the persons participate):_____ as per Annex 2.

☐ b. trainers for the courses; target number of trainers:_____ as per Annex 3.

☐ c. hosting for the trainees for the "on-the-jobs-training" (in 2008-2010, from min. 1 week to max. 6 months) target number of trainees hosted:_____ as per Annex 4.

☐ d. trainees for the "on-the-jobs-training" (in 2008-2010, from min. 1 week to max. 6 months) target number of trainees sent:_____ as per Annex 5.

☐ e. other products or services, as specified below:

Article 3 Payments

3.1 Only items specified under Article 2.2.b and 2.2.e may be subject to payment. The payments shall be made according to the provisions of Art. 3.3.

3.2 The financial contribution shall be paid to the supporting partner by the principal contractor:

a) after the technical delivery of the deliverables and their

b) acceptance by the principal contractor

after receipt of the DEG respective financial contribution to the principal contractor.

3.3 Costs shall be charged by the project partner according to the specific agreement between the supporting partner and the principal contractor. Those costs may be the subject of a financial audit by the principal contractor and/or DEG.

3.4 Participation fees for the trainees under Art. 2.2.a are covered by the ESPRIT project. (I.e. there are no participation fees for the participation and/or certification during the project duration

3.5 Other costs (e.g. costs of the trainees for the travel to the venues of the respective courses) are NOT eligible for reimbursement from ESPRIT project.

3.6 All the costs incurred under Art. 2.2.c are subject to direct arrangement(s) between the host institution(s) and the trainee(s) or his/their institution(s). The ESPRIT project infrastructure shall provide the necessary "brokering"/intermediation only.

3.7 If any payments from Art. 2.2 are involved, the following bank details of the supporting partner shall be used, if not specifically indicated otherwise:

Name
of Account Holder: _____

Address
of Account Holder: _____ (Street)

_____ (ZIP Code/City)

_____ (Country)

Bank Name: _____

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Annex IV Additional SHB regulations and information related to the curriculum and its application in projects

A.IV.1 *Framework Regulation for Certification at Steinbeis University Berlin - Rahmenzertifizierungsordnung (RZO) der Steinbeis-Hochschule Berlin (SHB)*

This document is attached in its German original as a separate document (the German text legally applicable). The document covers:

- § 1. Scope of applicability - Geltungsbereich
- § 2. Exam Committee - Prüfungsausschuss (PAS)
- § 3. Exams - Leistungsnachweise
- § 4. Qualification exams - Eignungsprüfung
- § 5. Final exams - Abschlussprüfung
- § 6. Evaluation of an exam - Bewertung der Leistungsnachweise
- § 7. Marks and credit points - Prüfungsnoten und Leistungspunkte
- § 8. Repetition of an exam - Wiederholung eines Leistungsnachweises
- § 9. Failure to comply, absences, cancellations of enrollment - Versäumnis, Fernbleiben, Rücktritt
- § 10. Irregularities (attempts of fraud), disrespect of rules or regulations - Täuschungsversuch, Verstoß gegen die Ordnung
- § 11. Loss of right to study - Verlust des Anspruchs zur Leistungserbringung
- § 12. Filing and access to files - Aufbewahrung von Unterlagen und Akteneinsicht
- § 13. Certificates - Urkunden
- § 14. Awards - Auszeichnung
- § 15. Application - Inkrafttreten

A.IV.2 *Main reference document 134250-RZO*

The excerpt from the original SHB document 134250-2009-05-06-RZO / Rahmenzertifizierungsordnung Steinbeis-Hochschule Berlin / 1/6 ("134250-RZO.pdf" in German) is given below:

§ 1 Geltungsbereich

Diese RZO legt die Grundsätze für die Gestaltung aller Zertifikatslehrgänge der SHB fest. Sie wird durch die Grundordnung (GO), Rahmenstudienordnung (RSO), Rahmenprüfungsordnung (RPO) sowie der Studien- und Prüfungsordnungen (SPO) der jeweiligen Lehrgänge ergänzt.

§ 2 Prüfungsausschuss (PAS)

(1) Für jeden Lehrgang wird mindestens ein PAS eingerichtet oder ein geeigneter bereits bestehender PAS genutzt. Für einzelne Vertiefungsrichtungen bzw. Bereiche können spezielle Prüfungsausschüsse gebildet werden.

(2) Der PAS besteht aus drei Lehrkräften (in Abweichung zur RPO: neben- oder hauptberuflich). Der PAS wird von den Leitern der am Lehrgang verantwortlich beteiligten Steinbeis-Transfer- Institute für die Dauer von zwei Jahren bestellt. Eine Wiederbestellung ist zulässig. Andere Lehrkräfte können vom PAS beratend hinzugezogen werden. Mitglieder des Hochschulrats können an den Sitzungen des PAS teilnehmen.

(3) Der PAS wählt einen der Lehrkräfte für die Dauer der Bestellung zum Vorsitzenden und eine weitere Lehrkraft zu seinem Stellvertreter.

(4) Der Vorsitzende beruft den PAS ein und vollzieht die Beschlüsse. Der PAS ist beschlussfähig, wenn zwei Mitglieder anwesend sind. Die Beschlüsse werden mit einfacher Mehrheit gefasst. Bei Stimmengleichheit entscheidet die Stimme des Vorsitzenden. Über die Sitzungen ist ein Ergebnisprotokoll zu fertigen, das vom Vorsitzenden unterzeichnet wird. Beschlüsse können auch im (fern-) schriftlichen Verfahren herbeigeführt werden.

(5) Der PAS trifft mehrheitlich die im Rahmen dieser Ordnung und jeweiligen SPO erforderlichen Entscheidungen. Insbesondere bestellt er die Prüfer und beschließt die SPO für Zertifikatslehrgänge. Einzelne Aufgaben können dem Vorsitzenden zur Erledigung übertragen werden.

(6) Der PAS ist zur grundsätzlichen Geheimhaltung aller als vertraulich eingestuften Informationen verpflichtet.

§ 3 Leistungsnachweise

(1) Arten der Leistungsnachweise: Klausuren, mündliche Prüfungen, Präsentationen, Referate, Cases (Fallstudien), schriftliche Ausarbeitungen (Studien-, Transfer-, Projektstudienarbeit, Transferdokumentation und -report), Projektarbeit, Thesis, Abschlussprüfung.
(2) Die einzelnen Leistungsnachweise werden in den jeweiligen Studien- und Prüfungsordnungen der Lehrgänge oder Studiengänge (Lehrgang ist Teil eines Studiengangs) dokumentiert. Machen Teilnehmer durch ein ärztliches Zeugnis glaubhaft, dass sie wegen einer Behinderung oder einer chronischen Erkrankung den Leistungsnachweis ganz oder teilweise nicht in der vorgegebenen Form ablegen können, hat der Vorsitzende des verantwortlichen Prüfungsausschusses die Erbringung gleichwertiger Leistungsnachweise innerhalb einer verlängerten Bearbeitungszeit oder in einer anderen Form zu gestatten.
(3) Leistungsnachweise aus bereits absolvierten Studien- bzw. Ausbildungsgängen sowie Weiterbildungsmaßnahmen und Projektarbeit können auf schriftlichen Antrag des Teilnehmers im Rahmen einer Einzelfallentscheidung anerkannt werden, soweit die Gleichwertigkeit mit dem Lehrgangsmodul des vorliegenden Lehrgangs vom PAS festgestellt wurde, der Teilnehmer über eine uneingeschränkte Zugangsberechtigung verfügt und die Gültigkeit im Rahmen der Eignungsprüfung festgestellt wurde.

§ 4 Eignungsprüfung

(1) Die Eignung jedes Bewerbers wird überprüft.
(2) Die Prüfer und die lehrgangsspezifischen Kriterien sowie spezifische Prüfmethoden (insbesondere zur Überprüfung von in bereits absolvierten Studien-/Ausbildungsgängen sowie Weiterbildungsmaßnahmen und Projekten erworbenen Fähigkeiten und von Festlegungen für Lehrgangsmodulergänzungen) legt der für den Lehrgang bzw. eine Vertiefungsrichtung verantwortliche PAS im Einvernehmen mit der jeweils verantwortlichen Institutsleitung unter Zugrundelegung der Gütekriterien Objektivität, Zuverlässigkeit und Gültigkeit unter Berücksichtigung eines gegebenenfalls zu erfolgenden Nachteilsausgleichs für Bewerber mit attestierter Behinderung bzw. chronischer Erkrankung fest. In Abweichung zur RPO sind bei reinen Lehrgängen nicht grundsätzlich zwei Prüfer erforderlich.

§ 5 Abschlussprüfung

(1) In Abweichung zur RPO kann die Kommission auch ausschließlich mit nebenberuflichen Lehrkräften besetzt sein.
(2) Ebenfalls in Abweichung zur RPO wird der Vorsitz im Falle der projektarbeitsspezifischen Abschlussprüfung vom PAS bestellt.

§ 6 Bewertung der Leistungsnachweise

(1) Originalität und Qualität sollen als Bewertungsmaßstab stets Vorrang vor Quantität haben.
(2) Jeder Leistungsnachweis wird von mindestens zwei Prüfern bewertet.
(3) Weichen die Bewertungen der Prüfer um nicht mehr als eine ganze Note voneinander ab, so gilt der Durchschnitt als Note. Bei größeren Abweichungen setzt der PAS die Note fest.

§ 7 Prüfungsnoten und Leistungspunkte

(1) Ein Leistungsnachweis ist erbracht, wenn er mindestens mit der Note „ausreichend“ bewertet wurde. Die Fachnote wird aus dem arithmetischen Mittel der zugehörigen Noten gebildet. Die Gesamtnote wird aus dem gewichteten Durchschnitt der Noten errechnet.
(2) Werden Leistungspunkte vergeben, dann ist das „European Credit Transfer System“ (ECTS) Grundlage für die Vergabe von Leistungspunkten.
(3) Den Lehrgang hat erfolgreich abgeschlossen, wer alle Leistungsnachweise mit mindestens der Note „ausreichend“ erbracht hat.
(4) Grundlage für die Bewertung:

Noten für einzelne Leistungsnachweise und Abschluss:	**Zusätzliche Abschlussnote (ECTS-Skala): - Sofern erforderlich und möglich.**
1,0 - 1,4 = sehr gut	A = die besten 10%
1,5 - 2,4 = gut	B = die nächsten 25%
2,5 - 3,4 = befriedigend	C = die nächsten 30%
3,5 - 4,4 = ausreichend	D = die nächsten 25%
4,5 = mangelhaft, nicht bestanden	E = die nächsten 10%

§ 8 Wiederholung eines Leistungsnachweises

(1) Wurde ein einzelner Leistungsnachweis nicht erbracht, so kann er einmal wiederholt werden.
(2) Die Wiederholung eines erbrachten Leistungsnachweises ist nicht zulässig.
(3) Auf schriftlichen Antrag (mit Begründung) an den PAS ist eine zweite Wiederholung im Härtefall möglich.

§ 9 Versäumnis, Fernbleiben, Rücktritt

(1) Ein Leistungsnachweis gilt als nicht erbracht, wenn der Teilnehmer ohne wichtigen Grund zu dem Termin nicht erscheint, einen zur Erbringung oder Abgabe eines Leistungsnachweises festgelegten Termin versäumt oder nach Beginn der Leistungserbringung ohne wichtigen Grund zurücktritt.
(2) Der für das Versäumnis oder den Rücktritt geltend gemachte wichtige Grund muss dem PAS unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. Bei Krankheit ist dem PAS ein ärztliches Zeugnis vorzulegen. Über die Anerkennung der Gründe entscheidet der PAS. Werden wichtige Gründe anerkannt, so gilt der Leistungsnachweis als nicht unternommen.
(3) Hat sich der Teilnehmer in Kenntnis einer gesundheitlichen Beeinträchtigung oder eines anderen Rücktrittsgrundes eines Leistungsnachweises unterzogen, so kann ein nachträglicher Rücktritt wegen dieses Grundes nicht anerkannt werden.
(4) Entscheidungen des PAS nach den Abs. 1 bis 3 sind dem Teilnehmer unverzüglich schriftlich mitzuteilen und zu begründen.

§ 10 Täuschungsversuch, Verstoß gegen die Ordnung

(1) Unternimmt es ein Teilnehmer, das Ergebnis seines Leistungsnachweises oder das Ergebnis eines anderen Teilnehmers durch Täuschung oder Benutzung nicht zugelassener Hilfsmittel zu beeinflussen, oder führt er nach Bekanntgabe der Aufgabe nicht zugelassene Hilfsmittel mit sich, so gilt der betreffende Leistungsnachweis als nicht erbracht. Die Feststellung trifft der PAS auf Antrag des zuständigen Prüfers.
(2) Wer sich eines erheblichen Verstoßes gegen die Ordnung des Leistungsnachweises schuldig macht, kann von dem jeweiligen Prüfer von der Fortsetzung des betreffenden Leistungsnachweises ausgeschlossen werden; in diesem Falle gilt dieser als nicht erbracht.
(3) Stellt sich nachträglich heraus, dass eine der Voraussetzungen des Abs. 1 oder 2 vorlag, so kann der PAS die entsprechende Note zum Nachteil des Teilnehmers abändern oder den Leistungsnachweis ganz oder teilweise für nicht erbracht erklären, wenn seit Erbringen des Leitungsnachweises nicht mehr als zwei Jahre vergangen sind.
(4) Entscheidungen des PAS nach den Abs. 1 bis 3 sind dem Teilnehmer unverzüglich schriftlich mitzuteilen und zu begründen.

§ 11 Verlust des Anspruchs zur Leistungserbringung

Der Anspruch erlischt 24 Monate nach Beginn des Lehrgangs.

§ 12 Aufbewahrung von Unterlagen und Akteneinsicht

Schriftliche Leistungsnachweise und deren Bewertung werden bis zum Ablauf von drei Jahren seit Aushändigung des Zeugnisses aufbewahrt. Der Teilnehmer kann die Einsichtnahme in seine Leistungsnachweise und deren Bewertung schriftlich beim Leiter des für die Prüfung verantwortlichen Instituts beantragen.

§ 13 Urkunden

(1) Über das Ergebnis aller Leistungsnachweise wird dem Teilnehmer ein Zeugnis der SHB ausgestellt. In diesem Zeugnis werden die einzelnen Noten sowie die Gesamtnote aufgeführt. Es wird vom Präsidenten der SHB und dem Lehrgangsleiter unterschrieben.
(2) Dem Teilnehmer wird eine Urkunde ausgestellt. Sie wird vom Präsidenten und Lehrgangsleiter unterschrieben. Liegt ein Zeugnis vor, so trägt die Urkunde das Datum des Zeugnisses, ansonsten das Datum der Ausstellung. Mit der Urkunde kann ein Titel verliehen werden, der in der SPO dokumentiert ist, sich deutlich von einem akademischen Grad unterscheiden muss und der entsprechend der Regelungen in der SPO auch nur für einen bestimmten Zeitraum seine Gültigkeit besitzt, bzw. dessen Gültigkeit an bestimmte Kriterien gebunden ist.

§ 14 Auszeichnung

Dem Absolventen mit der besten Gesamtnote eines Jahrgangs eines Lehrgangs kann eine Auszeichnung (Preis) verliehen werden. Der Name der Auszeichnung kann vom Prüfungsausschuss in Anerkennung besonderer Leistungen für den Lehrgang bzw. für die SHB festgelegt werden.

§ 15 Inkrafttreten

Diese Rahmenzertifizierungsordnung tritt am 01.06.2009 in Kraft.

A.IV.3 *Tuition Fees*

Currently there are no fees in the ESPRiT supported courses and no particular (course-related fees) fees for the courses at the University of Stuttgart. Fees are envisaged for the post-project courses and the issue will be regulated in due course.

A.IV.4 *Financial Support*

All candidates asking for scholarship must submit their applications before January 31st of the preceding school year.

The European Commission offers scholarships to third-country students through the Erasmus Mundus programme which is shortly presented in A.V.1. In addition, a limited number of grants offering total or partial support to cover the course tuition fees as well as other, e.g. project-based

support, is envisaged, welcomed and expected to be available as per Annex IX. Details of the grant selection procedure will be provided in each particular case.

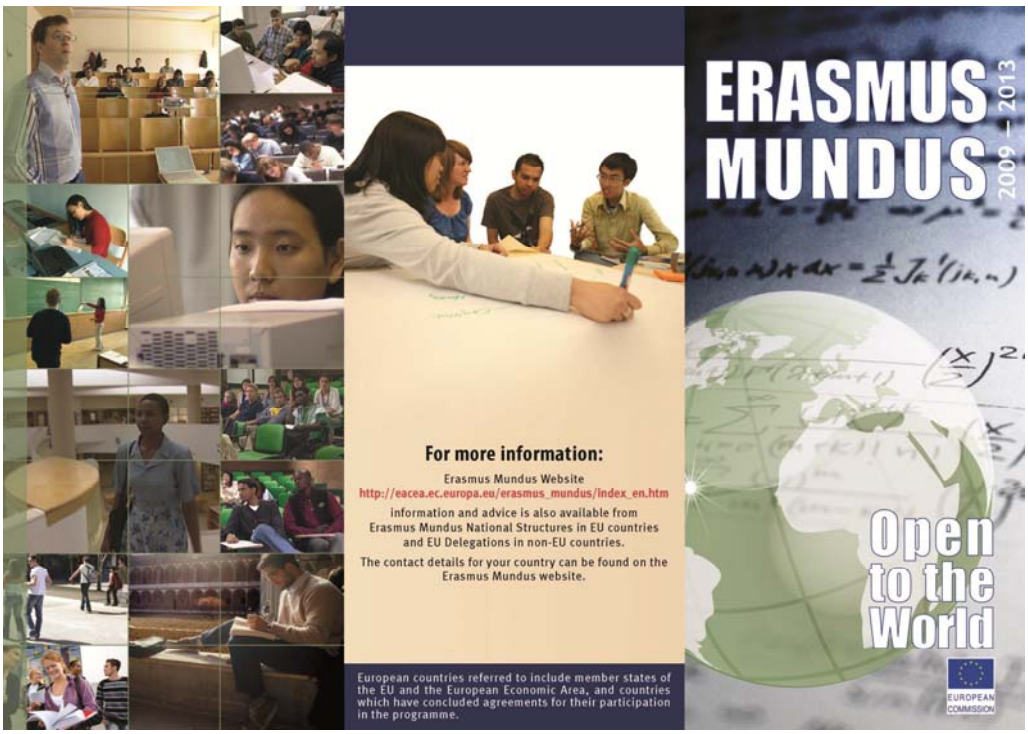
Other scholarships in Europe financed through means of national, regional or other funds may also be available. Such scholarship and funding opportunities can be explored by:

- consulting the "Study in Europe" website which provides a range of useful information for students and links to courses, universities and national agencies – http://ec.europa.eu/education/study-in-europe/index_en.html;
- visiting the following website that brings together information on scholarships offered by national and regional authorities, as well as private sources of financing: http://www.scholarshipportal.eu.

DRAFT

Annex V **Information about organization involved**

A.V.1 ***Erasmus Mundus basic data (2011)***



What is Erasmus Mundus?

The Erasmus Mundus Programme supports academic excellence and the attractiveness of Europe's higher education worldwide, and fosters cooperation with targeted third countries with the objective of contributing to their development.

The programme offers:

- Joint masters and doctoral programmes between European and non-European universities
- Mobility flows of students and academics between European and non-European higher education institutions (HEI)
- Promotion of excellence and attractiveness of European higher education systems worldwide

How does it work?

The European Commission informs potential applicants about funding opportunities through a programme guide and regular calls for proposals published on the Erasmus Mundus Website at http://eacea.ec.europa.eu/erasmus_mundus/index_en.htm

- HEI, research centres and other organisations active in the field of higher education should submit proposals in accordance with the programme guide and calls
- Students and academics should apply directly to the selected Erasmus Mundus universities

Support is provided through three actions:

Action 1

Joint masters and doctoral programmes including a scholarship scheme

Joint programmes of outstanding academic quality are designed and implemented by a consortium of European universities from at least 3 different countries. Consortia may also include universities from other parts of the world. Scholarships / fellowships are open to higher education students and academics from all over the world. Programmes include obligatory study and research periods, in at least two universities, and award recognised double, multiple or joint degrees.

Who can participate?

- Higher Education Institutions (HEI) and research centres from European and non-European countries
- Masters students, doctoral candidates and academics from European and non-European countries

Action 2

Partnerships with non-European Union higher education institutions (HEI) including scholarships (former External Cooperation Window)

Partnerships are the basis for enhancing academic cooperation and exchanges of students and academics, contributing to the socio-economic development of non-EU countries targeted by EU external cooperation policy. Consortia must include a minimum of 5 HEI from at least 3 European countries and a number of HEI from targeted non-European regions. Special attention is given to disadvantaged groups and populations in a vulnerable situation.

Who can participate?

- Higher Education Institutions (HEI) and research centres from European and non-European countries
- European and non-European higher education students and academics (from bachelor to post-doctoral)

Action 3

Promotion of European higher education

Projects enhance the attractiveness, profile, image and visibility of European higher education worldwide. Activities concern the international dimension of all aspects of higher education, such as promotion, accessibility, quality assurance, credit recognition, mutual recognition of qualifications, curriculum development and mobility.

Who can participate?

- Higher Education Institutions (HEI) and research centres from European and non-European countries
- Any other organisations active in the field of higher education from European and non-European countries

The total programme budget for the period 2009-2013 is approximately 1 billion Euros.

Erasmus Mundus scholarships and fellowships (2011)

The Erasmus Mundus Programme 2009-2013 is a cooperation and mobility programme in the field of higher education for:

- the enhancement of quality in European higher education;
- the promotion of the European Union as a centre of excellence in learning around the world;
- the promotion of intercultural understanding through coopera-tion with Third Countries as well as for the development of Third Countries in the field of higher education.

The programme is implemented through the following three actions:

Action 1: Erasmus Mundus joint programmes of outstanding quality at masters and doctoral levels including scholarships/fellowships to participate in these programmes;

Action 2: Erasmus Mundus Partnerships between European and Third Country higher education institutions including scholarships and fellowships for mobility at all academic levels;

Action 3: Promotion of European higher education through projects to enhance the attractiveness of Europe as an educational destination and a centre of excellence at world level.

Therefore, the Erasmus Mundus programme provides support to:

- higher education institutions that wish to implement joint programmes at postgraduate level (Action 1) or to set-up inter-institutional cooperation partnerships between universities from Europe and targeted Third-Countries (Action 2);
- individual students, doctoral candidates, teachers, researchers and university staff (academic and/or administrative) from any part of the world who wish to spend a study/ research/ teaching period in the context of one of the above mentioned joint programmes or cooperation partnerships (Action 1 and Action 2);
- any organisation active in the field of higher education that wishes to develop projects aimed at enhancing the attractiveness, profile, visibility and image of European higher education worldwide (Action 3).

In view of the above, the funding opportunities for prospective students and academics are as follows:

- students in higher education can receive scholarships for:
  - Undergraduate studies (Action 2);
  - Masters studies (Actions 1 and 2);
- doctoral candidates can receive fellowships for:
  - Doctoral studies (Actions 1 and 2);
  - Post-doctoral studies (Action 2);
- teachers and researchers can receive fellowships for:
  - Teaching and research periods (Actions 1 and 2);
- other academic staff can receive scholarships/ fellowships under Actions 1 and 2.

Regular Calls for Proposals are published for the specific Programme Actions to detail the activities, application criteria and the budgetary allocations relevant to the call concerned. Applicants should read the Programme Guide (http://eacea.ec.europa.eu/erasmus_mundus/programme/documents/2011/em_programmeguide_1612_en.pdf) in conjunction with the specific Call for Proposals to which they intend to apply.

The Programme Guide applies for the entire duration of the programme and aims to assist all those interested in implementing joint cooperation activities, or receiving individual scholarships/ fellowships within the Erasmus Mundus programme. It contains all the general information about the programme as well as necessary information on the specific funding application conditions and the criteria corresponding to each of the three Programme Actions (e.g. types of activities that can be supported, conditions under which this support can be granted, etc.). A full account of eligible beneficiaries and participants per Action is also included in the guide.

Grant selection procedure

To apply for an Erasmus Mundus scholarship/ fellowship, students and academics should address their applications directly to the selected Erasmus Mundus masters/ doctoral programmes (Action 1) or to the selected Erasmus Mundus partnerships (Action 2), in accordance with the application conditions defined by the selected consortium/partnership. In addition, they should also visit the website of the Masters course, joint Doctorate or partnership in which they are interested.

Scholarship amounts may vary according to the level of studies/teaching/research, the duration (from three months up to three years) and the grantee's nationality (scholarships for non-EU individuals are higher than that for EU individuals).

	Step	
Action 1 • Erasmus Mundus Masters Courses (EMMC) • Erasmus Mundus Joint Doctorates (EMJD) Programmes offered by consortia of higher education institutions with study/research periods in at least two European countries. *PLUS* Scholarships for students and doctoral candidates to attend these programmes. **Who can apply?** • Students and doctoral candidates from all over the world	1	**Action 2** Erasmus Mundus Partnerships Partnerships of higher education institutions from Europe and from a range of countries or regions across the world. *PLUS* Scholarships for students and academics to study/research/teach in one of the partner institutions. Scholarships cover a range of academic levels. **Who can apply?** • Students (undergraduates to post-docs) and staff (administrative and academic). *Are you from a country outside the EU?* *Are you from an EU country?* If you are registered at one of the European partner higher education institutions, you may be able to apply for a scholarship to visit one of the third-country institutions (depending on the region).
Select the course that interests you.	2	Visit the partnership website to see which courses are available in which disciplines.
Apply direct to the consortium via its website.	3	Apply direct to the partnership via its website. If you are registered at one of the partner institutions, you should contact your International Office.
• The next application round is for courses starting in the academic year 2012/2013. Apply during the last quarter of 2011: see the consortium website for exact dates.	**When?**	• For applications for mobility starting as of September 2011. Check the updated list, and visit the partnership website for application dates and conditions.

Source: *http://eacea.ec.europa.eu/erasmus_mundus/funding/scholarships_students_academics_en.php*

A.V.2 *EU-VRI – EUROPEAN VIRTUAL INSTITUTE FOR INTEGRATED RISK MANAGEMENT*

The European Virtual Institute for Integrated Risk Management (EU-VRi, http://www.eu-vri.eu), is the European organization which provides professional service, consulting, information and education needed in the broad area of modern integrated risk management and, in particular, in management of emerging risks. EU-VRi has been legally established in Nov. 2006 by BZF, INERIS, Steinbeis, Technologica, University of Stuttgart started its operation in 2007. EU-VRi is organized as a European Economic Interest Grouping (EEIG) and its purpose is to facilitate or develop the economic activities of its members by a pooling of resources, activities or skills. The activities of the EEIG are related to the economic activities of its members and its main goal is to promote, enhance and add value to the businesses of EU-VRi members. EU-VRi provides services to industry, research community and/or public authorities and connects individual industrial companies or networks of companies – often acting as a research and knowledge broker developing and performing education and training programs. Intensive activities in the area of academic and professional education for risk engineering and management are one of the strategic priorities clearly highlighted both in the EU-VRi-plans and in its annual report.

A.V.3 *UNIVERSITY OF STUTTGART, ZIRN*

The University of Stuttgart stands for "technology, knowledge and education for the people". For the University of Stuttgart, a sustained pursuit of this objective, requires a strict orientation to the following highest principles:

- The commitment of all sciences to truth and
- The adequacy of technical solutions (referring to the context of utilization by considering ecological and social risks)

These requirements were met by

- An integration of natural sciences, engineering, social sciences and humanities in one common profile
- Innovative solutions at the highest level and on the basis of intercultural competence according to the global challenges.
- Productive collaboration with industry and political institutions and an effective knowledge and technology transfer, by taking the diversity of demands and cultural premises into account.

In this application the University of Stuttgart is represented by ZIRN, the "Interdisciplinary Research Unit on Risk Governance and Sustainable Technology Development" (http://www.zirn-info.de). ZIRN is part of IZKT, the "International Center for Cultural and Technological Studies" of the University of Stuttgart. In cooperation with the Institute for Social Sciences at the University of Stuttgart, ZIRN gives lectures dedicated to the academic education.

A.V.4 ***Norwegian University of Science and Technology, Faculty of Engineering Science and Technology*** *(yet to be added)*

A.V.5 ***Other universities*** *(yet to be added)*

Annex VI **Regulation, modules and examination for certification program at SHB**

Study and Examination Regulation (SPO)

for Certification Training Program (ZLG)

at Steinbeis University Berlin (SHB)

§ 1
Scope

This document regulates the certification training program in the field of "**Advanced Risk Technologies, Engineering and Management**" within the framework of certification regulation of SHB.

§ 2
Duration and Structure of the Program

(1) The certification training program is laid out as residential course, supplemented by self-studies and project work. Duration of the training is detailed in Annex I.

(2) Events, deadlines and locations as well as additional offers are specified in the respective student study contract (study plan).

(3) Study plan structure and specific admission requirements are given in Annex I.

§ 3
Modules, Credits, Examinations

(3) Required training modules are specified in Annex II.

(4) Credits and examinations for required modules are also specified in the Annex II.

§ 4
Commencement

This study and examination regulation comes into effect on

Annex I: **SPO ZLG ARTEM**

Field: **Advanced Risk Technologies, Engineering and Management (ARTEM)**

Major Subject: **Risk Examination (RE) - Hazard Oriented Risk Engineering and Management in industry (HSSE)**

Titel obtained: **Risk Examiner - HSSE**

Valid: **2 years**

1. Duration

The certification training program includes modules/courses which are to be completed in 8 months.

2. Structure of the study plan

	Min.-	-days	-hours (h)	-CP
a	**Modules (courses and transfer)**	20	180	16
b	**Self-studies**	20	180	s.a
	Total study time	**40**	**360**	**16**

3. Specific admissions requirements

3.1 As a minimum high school diploma or equivalent vocational qualification.

3.2 Professional experience in the field would be an advantage

4. Modules: Definitions and annotations

4.8 Transfer:

-

4.9 Basics:

A candidate has to select 2 courses (compulsory: 1.1)

4.10 Focus:

43a A candidate has to select 2 courses.

4.11 Optional Compulsory:

-

4.12 Supplementation compulsory:

45a In case the admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses

45b In order to maintain the title, the successful candidate has to participate in at least 1 application study (PSA) in 2 years after the certification exam.

4.13 Supplementation facultative:

46a Add-on courses, specified in the educational contract.

4.14 General annotations:

A I (A II)	Annex I (Annex II)
C	Case
CP	Credit Point (ECTS, European Credit Transfer System, basis: 30h/CP))
EF	Supplementation facultative
EPF	Supplementation compulsory
Gew.	Weighting
h	Hour (basis 9 h/day)
K	Written examination
LNW	Examination
Note	Grade

PK	Project
PSA	Project Study Paper
SPO	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer Paper
Tage	Days
TR	Transfer

5. Modules / courses:

See annex II.

Annex I: **SPO ZLG ARTEM**

Field: **Advanced Risk Technologies, Engineering and Management (ARTEM)**

Major Subject: **Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT)**

Titel obtained: **Risk Examiner - EQUIPMENT**

Valid: **2 years**

1. Duration

The certification training program includes modules/courses which are to be completed in 8 months.

2. Structure of the study plan

Min.-	-days	-hours (h)	-CP
a **Modules (courses and transfer)**	20	180	16
b **Self-studies**	20	180	s.a
Total study time	**40**	**360**	**16**

3. Specific admissions requirements

3.1 As a minimum high school diploma or equivalent vocational qualification.

3.2 Professional experience in the field would be an advantage

4. Modules: Definitions and annotations

4.1 Transfer:

-

4.2 Basics:

A candidate has to select 2 courses (compulsory: 1.1)

4.3 Focus:

43a A candidate has to select 2 courses.

4.4 Optional Compulsory:

-

4.5 Supplementation compulsory:

45a In case the admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses

45b In order to maintain the title, the successful candidate has to participate in at least 1 application study (PSA) in 2 years after the certification exam.

4.6 Supplementation facultative:

46a Add-on courses, specified in the educational contract.

4.7 General annotations:

A I (A II)	Annex I (Annex II)
C	Case
CP	Credit Point (ECTS, European Credit Transfer System, basis: 30h/CP))
EF	Supplementation facultative
EPF	Supplementation compulsory
Gew.	Weighting
h	Hour (basis 9 h/day)
K	Written examination
LNW	Examination
Note	Grade

PK	Project
PSA	Project Study Paper
SPO	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer Paper
Tage	Days
TR	Transfer

5. Modules / courses:

See annex II.

Annex I: **SPO ZLG ARTEM**
Field: **Advanced Risk Technologies, Engineering and Management (ARTEM)**
Major Subject: **Risk Governance (RG)**
Titel obtained: **Risk Governance Specialist**
Valid: **2 years**

1. Duration

The certification training program includes modules/courses which are to be completed in 8 months.

2. Structure of the study plan

	Min.-	-days	-hours (h)	-CP
a	**Modules (courses and transfer)**	30	270	24
b	**Self-studies**	19	171	s.a.
	Total study time	**49**	**441**	**24**

3. Specific admissions requirements

3.1 As a min. bachelor's degree (Bachelor of Arts, Bachelor of Science).

3.2 Professional experience in the field would be an advantage.

4. Modules: Definitions and annotations

4.1 Transfer:

-

4.2 Basics:

-

4.3 Focus:

-

4.4 Optional Compulsory:

-

4.5 Supplementation compulsory:

45a In case the admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses

45b In order to maintain the title, the successful candidate has to participate in at least 1 application study (PSA) in 2 years after the certification exam.

4.6 Supplementation facultative:

46a Add-on courses, specified in the educational contract.

4.7 General annotations:

A I (A II)	Annex I (Annex II)
C	Case
CP	Credit Point (ECTS, European Credit Transfer System, basis: 30h/CP))
EF	Supplementation facultative
EPF	Supplementation compulsory
Gew.	Weighting
h	Hour (basis 9 h/day)
K	Written examination
LNW	Examination
Note	Grade

PK	Project
PSA	Project Study Paper
SPO	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer Paper
Tage	Days
TR	Transfer

5. Modules / courses:

See annex II.

Annex I: **SPO ZLG ARTEM**

Field: **Advanced Risk Technologies, Engineering and Management (ARTEM)**

Major Subject: **Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE)**

Titel obtained: **Senior Risk Assessor - HSSE**

Valid: **3 years**

1. Duration

The certification training program includes modules/courses which are to be completed in 8 months.

2. Structure of the study plan

Min.-	-days	-hours (h)	-CP
a **Courses and transfer**	31	279	25
b **Self-studies**	27	243	s.a
Total study time	**58**	**522**	**25**

3. Specific admissions requirements

3.1 As a min. bachelor's degree (Bachelor of Arts, Bachelor of Science).

3.2 At least 1 assisted case in HSSE.

4. Modules: Definitions and annotations

4.1 Transfer:

-

4.2 Basics:

A candidate has to select 3 courses (compulsory: 1.1)

4.3 Focus:

43a A candidate has to select 3 courses.

43b A candidate has to have 5 days on-the-job training.

4.4 Optional Compulsory:

-

4.5 Supplementation compulsory:

45a In case the admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses

45b In order to maintain the title, the successful candidate has to participate in at least 1 application study (PSA) in 3 years after the certification exam.

4.6 Supplementation facultative:

46a Add-on courses, specified in the educational contract.

4.7 General annotations:

A I (A II)	Annex I (Annex II)
C	Case
CP	Credit Point (ECTS, European Credit Transfer System, basis: 30h/CP))
EF	Supplementation facultative
EPF	Supplementation compulsory
Gew.	Weighting
h	Hour (basis 9 h/day)
K	Written examination
LNW	Examination

Note	Grade
PK	Project
PSA	Project Study Paper
SPO	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer Paper
Tage	Days
TR	Transfer

5. Modules/courses:

See annex II.

Annex I: **SPO ZLG ARTEM**

Field: **Advanced Risk Technologies, Engineering and Management (ARTEM)**

Major Subject: **Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT)**

Titel obtained: **Senior Risk Assessor - EQUIPMENT**

Valid: **3 years**

1. Duration

The certification training program includes modules/courses which are to be completed in 8 months.

2. Structure of the study plan

	Min.-	-days	-hours (h)	-CP
a	**Modules (courses and transfer)**	31	279	25
b	**Self-studies**	27	243	s.a
	Total study time	**58**	**522**	**25**

3. Specific admissions requirements

3.1 As a min. bachelor's degree (Bachelor of Arts, Bachelor of Science).

3.2 At least 1 assisted case in EQUIPMENT.

4. Modules: Definitions and annotations

4.1 Transfer:

-

4.2 Basics:

A candidate has to select 3 courses (compulsory: 1.1)

4.3 Focus:

43a A candidate has to select 3 courses.

43b A candidate has to have 5 days on-the-job training.

4.4 Optional Compulsory:

44a

4.5 Supplementation compulsory:

45a In case the admission tests document a lack of prior education that potentially could lead to study failure or a lack of Credit Points, SHB reserves the right to prescribe individual study plans that would include supplementary courses

45b In order to maintain the title, the successful candidate has to participate in at least 1 application study (PSA) in 3 years after the certification exam.

4.6 Supplementation facultative:

46a Add-on courses, specified in the educational contract.

4.7 General annotations:

A I (A II)	Annex I (Annex II)
C	Case
CP	Credit Point (ECTS, European Credit Transfer System, basis: 30h/CP))
EF	Supplementation facultative
EPF	Supplementation compulsory
Gew.	Weighting
h	Hour (basis 9 h/day)
K	Written examination
LNW	Examination

Note	Grade
PK	Project
PSA	Project Study Paper
SPO	Study and Examination Regulations (Educational and Examination Regulations)
SL	Self-study
TA	Transfer Paper
Tage	Days
TR	Transfer

5. Modules/courses:

See annex II.

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / certificate / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

VT: **Risk Examination (RE) - Hazard Oriented Risk Engineering and Management in industry (HSSE)**	*	20	20	14	4K, TA, PSA	*	16	16

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE1: **Basics**	*	10	4	2	2K, TA, [PSA]	*	*	5

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE1.1: **INTRO: Introduction to Risk and Safety Management in Industry**	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE1.2: **HSE / HSSE: Health, Safety, Security and Environment**	Overview of EU regulation in the field of HSE and HSSE (health, safety, security and environment), explain the objectives and requirements, explain state-of-the art in application including constraint and advantages, and elaborate used techniques on a number of examples	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2: **Focus**	SPO: AI-43a	10	4	*	2K, [PSA]	*	*	4

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.1: **PETRO: Risk Analysis in Chemical/Petroleum Industries**	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. Current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.2: **POWER: Risk Analysis in Power Industries**	Knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.3: **CoF: Accident and Consequences Modeling**	General techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.4: **FIRE: Fire protection**	Theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection	5	2	*	K, [PSA]	1,5	*	2

	measures in industry will be shown as well as legal background and requirements and applied safety concepts.							

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.5: **ExP: Explosion protection**	EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.6: **REACH: Risk analysis of chemicals**	Principles of the EU regulation in the area of registration, evaluation and authorization of chemicals – REACH (EC Nr. 1907/2006). The course explains principles and obligations for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.7: **ADR: Transport of dangerous materials**	International and EU policies and legislative requirements related to the transport of dangerous materials and explains the European Agreement concerning the International Carriage of Dangerous Goods. It elaborates the main issues from ADR 2009 as well as safety measures and procedures in case of accidents.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.8: **OSHA: Occupational Safety and Health**	Regulations in the field of safety and health of workers at work. It will explain general principles concerning the prevention of occupational risks, the protection of safety and health, the elimination of risk and accident factors, the informing, consultation, balanced participation in accordance with national laws and/or practices and training of workers and their representatives, as well as general guidelines for the implementation of the said principles. The EU member states are obliged to integrate these matters into their national regulations. Where appropriate this is exemplified with regulations from Germany.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

RE-HSSE2.9: **BUSINESS: Business continuity risks & insurance**	Complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

EPF: **Supplementary compulsory (EPF)**	SPO: AI-45a	0	0	*	*	*	*	0

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

EPF1: **Project work**	SPO: AI-45b	0	12	12	PSA	1	*	7

Risk Examination - Hazard Oriented Risk Engineering and Management (in industry) HSSE / supplementation / facultative / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-HSSE-xxxxxx-2011-08-23

EF: **Supplementation facultative (EF)**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	*	*	*	*	0

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / certificate / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

VT: **Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT)**	*	20	20	14	4K, TA, PSA	*	16	16

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU1: **Basics**	*	10	4	2	2K, TA, [PSA]	*	*	5

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU1.1: **INTRO: Introduction to Risk and Safety Management in Industry**	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU1.2a: **RBI-Petro: Risk Based Inspection - Petro**	Principles of risk based inspection, existing approaches and gives links to applied codes and standards. The focus is given to API 581. Levels of analysis and usage of analysis results will be elaborated and illustrated with examples.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU1.2b: **RBI-Power: Risk Based Inspection - Power**	The state-of-the art knowledge of risk based approaches currently applied in power generation industries to the wide range of professionals involved in different activities in conventional power generation.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2: **Focus**	SPO: AI-43a	10	4	*	2K, [PSA]	*	*	4

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.1: **PETRO: Risk Analysis in Chemical/Petroleum Industries**	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. Current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.2: **POWER: Risk Analysis in Power Industries**	Knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.3: **RCM / RCFA: Reliability Centered Mainte-nance and Root Cause Failure Analysis**	Reliability Centered Maintenance (RCM) and Root Cause Failure Analysis (RCFA) as methodologies used for logical decision-making process for analysis and definition of the equipment maintenance requirements, as well as for accident prevention. The focus of the course is on the damage mechanisms appearing in different industries. A large number of well elaborated examples is included.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.4: **CoF: Accident and Consequences Modeling**	General techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.5: **FIRE: Fire protection**	Theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.6: **ExP: Explosion protection**	EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

RE-EQU2.7: **BUSINESS: Business continuity risks & insurance**	Complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.	5	2	*	K, [PSA]	1,5	*	2

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

EPF: **Supplementary compulsory (EPF)**	SPO: AI-45a	0	0	*	*	*	*	0

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

EPF1: **Project work**	SPO: AI-45b	0	12	12	PSA	1	*	7

Risk Examination (RE) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / facultative / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RE-EQU-xxxxxx-2011-08-23

EF: **Supplementation facultative (EF)**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	*	*	*	*	0

Risk Governance / certificate / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

VT:	**Risk Governance (RG)**	*	30	19	30	4K, TA, PSA	*	24	24

Risk Governance / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG1:	**Risk Gov: Risk Governance**	Principles of modern risk governance including its main elements (ef. IRGC framework): a- pre-assessment, b- risk appraisal, c- risk characterization and evaluation d- risk management and e- risk communication. Apart from the general concept and the items to be considered under each of the elements (e.g. under "Risk Assessment": hazard identification and estimation, exposure and vulnerability assessment, risk estimation, risk perceptions, social concerns, socio-economic impacts) the examples from the industrial practice will be shown and explained. A separate part of the course will be dedicated to the overview of specific methods and techniques (e.g. Delphi), as well as to the tools and instruments facilitating the application by industry, governments and public bodies.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Governance / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG2:	**iCSR & Sustainability: integrated Corporate Social Responsibility in industry**	Basic elements of the concept of Corporate (Social) Responsibility (CSR) and its practical application in industry. The course which focuses onto the following topics: • Key elements of the CSR and how these elements function as an integrated system • How CSR should be practically embedded into corporate and/or country business strategy and daily practice (CSR methodologies and tools) • The technology related aspects as a part of the modern practices of industry (HSE, HSSE) • Analysis/comparison of the practices in the EU, US and other countries • Relevant data and information on best practices world-wide, including a number of relevant case studies from the key industries and references to main sources of relevant data and information • Examples and projects using interactive and on-line course materials, also from external sources (e.g., the World Bank, GRI …). A particular unit of the course is dedicated to new ISO 260000 standard.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Governance / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG3:	**LCA: Life Cycle Analysis**	Principles and practical application of the life cycle analysis (LCA) as a technique for accessing the environmental aspects and potential impacts associated with a product, by (a) compiling an inventory of relevant inputs and outputs of a product system, (b) evaluating the potential environmental impacts associated with those inputs and outputs, and (c) interpreting the results of the inventory analysis and impact assessment phases in relation with to the objective of the study. The course will provide overview of the techniques and the tools needed for the analysis, with practical examples from primarily from process industry and relevant products, covering the environmental aspects and potential impacts throughout a product's life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal, with a particular attention focused onto resource use, human health and ecological consequences.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Governance / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG4:	**REM-SI: Risk Engineering and Management – Special I**	3 of the courses assumed for the calculation of the CPs:"Use of KPIs in engineering risk assessment and management"/"Risks related to cultural differences in operation of multinational companies, with a particular emphasis on operation in European projects"/"Data management and IT support systems in industrial risk engineering and management" or/"Legal aspects of risk in industry"	5	2	2	K, TA, [PSA]	1.5	*	3

Risk Governance / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG4:	**REM-SII: Risk Engineering and**	3 of the courses assumed for the calculation of the CPs:"Use of KPIs in engineering risk assessment	5	2	2	K, TA,	1.5	*	3

	Management – Special II	and management"/"Risks related to cultural differences in operation of multinational companies, with a particular emphasis on operation in European projects"/"Data management and IT support systems in industrial risk engineering and management" or/"Legal aspects of risk in industry"				[PSA]			

Risk Governance / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

RG4:	**REM-SIII: Risk Engineering and Management – Special III**	3 of the courses assumed for the calculation of the CPs:"Use of KPIs in engineering risk assessment and management"/"Risks related to cultural differences in operation of multinational companies, with a particular emphasis on operation in European projects"/"Data management and IT support systems in industrial risk engineering and management" or/"Legal aspects of risk in industry"	5	2	0	K, [PSA]	6		2

Risk Governance / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

EPF:	**Supplementary compulsory (EPF)**	SPO: AI-45a	0	0	*	*	*		0

Risk Governance / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

EPF1:	**Project work**	SPO: AI-45b	0	7	18	PSA	1	*	7

Risk Governance / supplementation / facultative / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RG-xxxxxx-2011-08-23

EF:	**Supplementation facultative (EF)**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	*	*	*	*	0

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / certificate / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

VT: **Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE)**	*	31	27	26	6K, 3TA, PA, C, PSA	*	25	25

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE1: **Basics**	*	15	6	6	3K, 3TA, [PSA]	*	*	9

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE1.1: **INTRO: Introduction to Risk and Safety Management in Industry**	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE1.2: **HSE / HSSE: Health, Safety, Security and Environment**	Overview of EU regulation in the field of HSE and HSSE (health, safety, security and environment), explain the objectives and requirements, explain state-of-the art in application including constraint and advantages, and elaborate used techniques on a number of examples	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE1.3: **OSHA: Occupational Safety and Health**	Regulations in the field of safety and health of workers at work. It will explain general principles concerning the prevention of occupational risks, the protection of safety and health, the elimination of risk and accident factors, the informing, consultation, balanced participation in accordance with national laws and/or practices and training of workers and their representatives, as well as general guidelines for the implementation of the said principles. The EU member states are obliged to integrate these matters into their national regulations. Where appropriate this is exemplified with regulations from Germany.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2: **Focus**	SPO: AI-43a	16	11	5	3K, PA, C, [PSA]	*	*	9

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.1: **PETRO: Risk Analysis in Chemical/Petroleum Industries**	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. Current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.2: **POWER: Risk Analysis in Power Industries**	Knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.3: **CoF: Accident and Consequences Modeling**	General techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas	5	2	*	K, [PSA]	1,5	*	2

	dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.							

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.4: **FIRE: Fire protection**	Theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.5: **ExP: Explosion protection**	EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.6: **REACH: Risk analysis of chemicals**	Principles of the EU regulation in the area of registration, evaluation and authorization of chemicals – REACH (EC Nr. 1907/2006). The course explains principles and obligations for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.7: **ADR: Transport of dangerous materials**	International and EU policies and legislative requirements related to the transport of dangerous materials and explains the European Agreement concerning the International Carriage of Dangerous Goods. It elaborates the main issues from ADR 2009 as well as safety measures and procedures in case of accidents.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.8: **BUSINESS: Business continuity risks & insurance**	Complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

RA-HSSE2.9: **On-the-job Training**	SPO: AI-43b	1	5	5	PA, C	1,5	*	3

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

EPF: **Supplementary compulsory (EPF)**	SPO: AI-45a	0	0	*	*	*	*	0

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

EPF1: **Project work**	SPO: AI-45b	0	10	15	PSA	1	*	7

Risk Assessment (RA) - Hazard Oriented Risk Engineering and Management in industry (HSSE) / supplementation / facultative / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-HSSE-xxxxxx-2011-08-23

EF: **Supplementation facultative (EF)**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	*	*	*	*	0

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / certificate / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

VT: **Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT)**	*	31	27	26	6K, 3TA, PA, C, PSA	*	25	25

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU1: **Basics**	*	15	6	6	3K, 3TA, [PSA]	*	*	9

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU1.1: **INTRO: Introduction to Risk and Safety Management in Industry**	General introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU1.2a: **RBI-Petro: Risk Based Inspection - Petro**	Principles of risk based inspection, existing approaches and gives links to applied codes and standards. The focus is given to API 581. Levels of analysis and usage of analysis results will be elaborated and illustrated with examples.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU1.2b: **RBI-Power: Risk Based Inspection - Power**	The state-of-the art knowledge of risk based approaches currently applied in power generation industries to the wide range of professionals involved in different activities in conventional power generation.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / basic / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU1.3: **RCM / RCFA: Reliability Centered Maintenance and Root Cause Failure Analysis**	Reliability Centered Maintenance (RCM) and Root Cause Failure Analysis (RCFA) as methodologies used for logical decision-making process for analysis and definition of the equipment maintenance requirements, as well as for accident prevention. The focus of the course is on the damage mechanisms appearing in different industries. A large number of well elaborated examples is included.	5	2	2	K, TA, [PSA]	1,5	*	3

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU2: **Focus**	SPO: AI-43a	16	11	5	3K, PA, C, [PSA]	*	*	9

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU2.1: **PETRO: Risk Analysis in Chemical/Petroleum Industries**	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. Current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU2.2: **POWER: Risk Analysis in Power Industries**	Knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management
RA-EQU-xxxxxx-2011-08-23

RA-EQU2.3: **CoF: Accident and Consequences Modeling**	General techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

RA-EQU2.4: **FIRE: Fire protection**	Theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

RA-EQU2.5: **ExP: Explosion protection**	EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

RA-EQU2.6: **BUSINESS: Business continuity risks & insurance**	Complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.	5	2	*	K, [PSA]	1,5	*	2

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / focus / optional compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

RA-EQU2.7: **On-the-job Training**	SPO: AI-43b	1	5	5	PA, C	1,5	*	3

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

EPF: **Supplementary compulsory (EPF)**	SPO: AI-45a	0	0	*	*	*	*	0

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / compulsory / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

EPF1: **Project work**	SPO: AI-45b	0	10	15	PSA	1	*	7

Risk Assessment (RA) - Plant Oriented Risk Engineering and Management in industry (EQUIPMENT) / supplementation / facultative / SPO ZLG-ARTEM / Advanced Risk Technologies, Engineering and Management RA-EQU-xxxxxx-2011-08-23

EF: **Supplementation facultative (EF)**	SPO: AI-46a, Special courses: technology trends, management trends, industries and niches, current scientific topics.	0	0	*	*	*	*	0

Annex VII **Contribution of partners in WP 4.10 in iNTeg-Risk project**

A.VII.1 ***Template for course profile***

This template is to be used for description of new courses proposed to be included in the curriculum for European Master of Risk Engineering and Management and respective Professional Certification Program.

Course Profile

Note:

An example of filled form is provided as guidance in A.VII.2

1. Basic data

1.	Study and Examination Regulation	European Master of Risk Engineering and Management
2.	Module	V Module: Elective/Additional topics
3.	Title of the course	
4.	Applicability	
5.	Language	
6.	Duration (h) (<Contact time>; <self-learning>; <transfer time>)	
7.	Workload in CPs	
8.	Type of examination (oral, written, project work…)	
9.	Entry requirement – Prerequisites (Specific knowledge /skills needed or link to other course which is a pre-condition to proceed to the course in case)	
10.	Topics/Short description (max. 1000 characters)	

2. Qualification goal (max. 600 characters)

3. Content (max 2800 characters)

4. Teaching- and Learning-Methods (e.g. ex-cathedra lecturing, exercise, case study…)

A.VII.2 ***Example of a course profile***

A.VII.3 ***Training infrastructure for academic education European Master of Risk Engineering and Management – draft contribution of NTNU to the iNTeg-Risk task T4.10.2***

NTNU

Norwegian University of Science and Technology
Faculty of Engineering Science and Technology
Department of Production and Quality Engineering

Date 23.8.2011

DRAFT

Memo

To:	iNTeg-Risk task participants (T4.10.2)
Copy to:	
From:	Mary Ann Lundteigen, Stein Haugen, Knut Øien
Signature:	

T4.10.2 Training infrastructure for academic education – European Master of Risk Engineering and Management Subtask 3a: Identify and describe relevant risk and reliability courses and programs at European Universities

1. Introduction

The purpose of this memo is to summarize the results from subtask 3a: Identify and describe relevant risk and reliability courses and programs at European Universities/institutions. The results are used as basis/input for the development of a European Master program in risk engineering and management.

The **identification** has been based on the following information sources:

- The web sites of all the university partners in the project have been visited
- Web sites of universities and institutions with known activities within risk and reliability have been visited
- Web searches using terms like MSc, Master combined with Risk, Reliability, Safety, etc. have been performed

The European master program aims to offer a selection of courses over a 2-year program. It is not expected that one university alone is able to offer all courses. Mobilization of students among the selected universities is therefore required. For the identification of relevant courses and programs, we have therefore made the following **limitations**:

- Only courses that are taught in English have been included
- Only regular master courses have been included (i.e. continuing education courses are not included)
- Focus has been on general risk and reliability analysis courses within the engineering field, that has a focus on accident risk
- Only European institutions are included

For those universities and institutions where relevant courses have been identified, we have included the following information (from the web-pages):

- Course description, e.g., learning objectives and course material / syllabus
- University that gives the course
- Credit points
- Which semester it is lectured

The information has also been circulated for review among iNTeg-Risk participants (Spring 2011).

2. Screening

The results from a first screening/review of available courses and master programs in risk and reliability are as follows.

1. University partners:

Address person	Org. no. 974 767 880	Location	Phone	Contact
NO-7491	Email:	S.P.Andersens vei 5	+ 47 73 59 38 00	
Trondheim	iipk-instituttkontor@ivt.ntnu.no	Lerkendal/Valgrinda	**Fax**	
Norway	http://www.ivt.ntnu.no/ipk/		+ 47 73 59 71 17	Phone: + 47

a. Universität Stuttgart (ZIRN) – 1 course
b. Technical University of Crete – no relevant courses in English found
c. Technical University of Denmark – 3 courses
d. Vysoka Skola Banska - Technicka Univerzita Ostrava – no relevant courses in English found
e. Technical University of Kosice – included but specific course description not provided in English
f. University of Novi Sad - Faculty of Technical Sciences – no relevant courses in English found
g. Alma Mater Studiorum Università di Bologna – no relevant courses in English found
h. University of Padua – no relevant courses in English found
i. University of Pisa – no relevant courses in English found
j. Josef Stefan International Postgraduate School (IPS) – 1 course

2. Third parties in iNTeg-Risk (or working through a main partner):
   - Erasmus University Rotterdam – no relevant courses in English found
   - Otto-von-Guericke-Universität Magdeburg, Institut für Mechanik – no relevant courses in English
   - University of Bristol, Artificial Intelligence Group – no relevant courses in English found
   - Norwegian University of Science and Technology (NTNU) – 7 courses
   - Steinbeis University Berlin (Art. 10 Partner of EU-VRi) – 18 courses
3. Other European universities offering relevant courses (not partners in iNTeg-Risk):
   - Aberdeen University – 3 courses
   - University of Sheffield – 4 courses
   - University of Strathclyde – 1 course
   - Edinburgh University – 1 course
   - Heriot Watt University – 1 course
   - Cranfield University – 3 course
   - Loughborough University – several (?)
   - Chalmers University of Technology – 1 course
   - Luleå University of Technology – 2 courses
   - Lund University – 1 course
   - KTH – Royal Institute of Technology – 2 courses
   - TU Delft – 1 course

3. Detailed review

The following tables summarize the detailed information about the identified courses and master programs.

1. University partners
   a. Universität Stuttgart (ZIRN) – Germany, Table 8
   b. Technical University of Denmark – Denmark, Table 9
   c. Technical University of Kosice (TUKE) – Slovakia,
   d. Josef Stefan International Postgraduate School (IPS) – Slovenia, Table 10

Table 8: Universität Stuttgart (ZIRN) – relevant courses

Course	Course description – learning objectives	Credit points	Semester
CSR			

Table 9: Technical University of Denmark – relevant courses

Course	Course description – learning objectives	Credit points	Semester
System Safety and Reliability Engineering	The overall objective of the course is to introduce the students to quantitative reliability and safety assessment methodologies that are commonly used by industries, consultants, and authorities to improve the safety of new	*5*	

Course	Course description – learning objectives	Credit points	Semester
	developed and established infrastructures, production systems and products. The students will get a generic basis for identifying, quantifying, assessing, evaluating and mitigating risks to enhance the safety level of various man-made systems. They will also learn legislative basis in the EU and national differences with respect to safety assessment requirements as well as international standards.		
Risk Assessment in Chemical and Biochemical Industry	To learn methods and tools, which are useful during the preparation of a safety report. Such a report is required by the Seveso II Directive on the control of major-accident hazards involving dangerous substances, as found in pharmaceutical, biochemical, chemical and petrochemical industries.	*5*	
Risk Management	The overall purpose of this course is to provide students with skills and insights for them to relate in a qualified manner to existing and future debates of risk. The objectives are 1) to enable students to undertake a simple risk assessment, 2) to outline the components and principles of a basic risk management programme, and 3) provide students with key insights so they know some pitfalls and limitations for the application of 1) and 2). This is an introductory course that favours qualitative aspects of risk management over quantitative approaches.	*5*	

a. Technical University of Kosice (TUKE)

MSc in Safety of Technical Systems: Program provides the overview of OSH legislation, prevention procedures and rules of good practice. The study is oriented more at technical safety, solutions of machine – man – environment systems, designing of technical systems, designing of prevention measures, prevention plans and emergency systems, fire protection. Specific course descriptions are not provided in English.

Table 10: Jožef Stefan International Postgradute School (IPS) – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Risks with Hazardous Materials in Industry	The goal is to train the students for risk identification, assessment and management with a view to dealing with emergencies involving hazardous substances (e.g., accidents in the chemical and related industries). Emphasis will is to be laid on terminology, risk identification, risk assessment methods, guidelines and statutory provisions, as well as software tools in the process of risk management. Note: this is an optional course of choice for postgraduate students. Details: http://www.mps.si/splet/studij.asp?lang=eng&main=1&left=4&id=361&m=4	*6*	

2. Third parties in iNTeg-Risk (or working through a main partner)
   a. The Norwegian University of Science and Technology (NTNU) – Norway, Table 11
   b. Steinbeis University Berlin – Germany

Norwegian University of Science and Technology

Table 11: The Norwegian University of Science and Technology (NTNU)
(*The courses are part of a 2-year RAMS International Master Program*)

Course	Course description – learning objectives	Credit points	Semester
TPK 5160 Risk analysis	Definition and discussion of basic concepts of risk analysis. Risk metrics. Risk acceptance criteria. Qualitative and quantitative methods for risk analysis, like preliminary hazard analysis, HAZOP, fault tree analysis, and event tree analysis. Analysis of human errors and organizational factors. Barrier analysis. Data sources and uncertainties. Rules, standards, and guidelines. Risk reduction and cost/benefit analysis. Survey of how risk analyses are performed within different industries and applications.	*7.5*	
TPK 4120 Safety and reliability analysis	Definition and discussion of basic concepts related to reliability and risk analysis. Functional analysis and identification and evaluation of faults and hazards. System analyses based on FMECA, reliability block diagrams and fault trees. Quantification of reliability and availability of technological systems. Measures for reliability importance. Analysis of repairable systems by Markov methods. Analysis of safety-critical systems (IEC 61508). Analysis of systems with common cause failures. Estimation of failure rates. Survey of reliability data sources.	*7.5*	
TPK 5115 Risk Management in Projects	Terminology related to risk and uncertainty in projects. Main elements of risk management to deal with risk and uncertainty in projects. Review of central practical methods for identification and analysis of risk and uncertainty. Quantitative modelling of schedule and time in project. Decision theory. Cost analysis in a life time perspective.	*7.5*	
TPK 5165 RAMS Engineering and Management	Reliability, availability, maintainability, and safety (RAMS) requirements during the whole life cycle of a product or a system. RAMS management in product development. RAMS requirements and specification. Analytic qualification and acceptance testing. Collection and utilization of experience data. Assessment of production regularity and life cycle cost/profits.	*7.5*	
TMR 4130 Risk Analysis and Safety Management of Maritime Transport	The risk concept. What is an accident? Risk picture. Accident statistics. Preventive and ameliorating measures. Safety management - monitoring of the risk level. Risk objectives and data. Statistical analysis of safety oriented decision alternatives. Maritime traffic models. Probability of grounding and collision. Risk analysis methods: Hazard analysis, FTA, ETA, FMECA, HazOp. Formal safety assessment (FSA). Cost-benefit analysis of safety measures. Analysis and modelling of ship casualties. Benefit-cost analysis of controls. Analysis and modelling of ship accidents. Human reliability and error mechanisms. Catastrophe behaviour, evacuation and rescue. Training, drills and human-machine simulation. Regulation and official control of maritime safety. National and international control authorities. Safety and quality management. ISO standards. Auditing. Safety Case.	*7.5*	

Course	Course description – learning objectives	Credit points	Semester
TIØ 4200 Safety Management	A main issue is the term "risk" related to the understanding of risk, risk communication, decisions, ethics and acceptance criterion. Economical issues related to safety are discussed as well. Another part deals with society's framework and regimes for safety management and organisational perspectives on safety management in companies. Safety management strategies deals with coping with changes related to the framework given by authorities and the market, as well as adjustments to changes in technological, economical and political terms for safety management. This links to a review of important theoretical positions in safety science, e.g. resilience engineering. Furthermore, the course enlightens risk management in dynamical, complex socio-technical systems, vulnerability analysis and emergency handling. Threats related to intentional and malicious acts (security) are included. Human, technological and organisational aspects of information security are described. The scope of the course is broad: from natural disasters, major accidents in industry and transportation, to ICT safety and security.	*7.5*	
TIØ4205 Safety, Health and Environment - Methods and Tools in SHE Practice	The subject presents principles and methods for the identification and analysis of accident risks and for the development and implementation of effective counter-measures through experience feedback and learning. It focuses on the prevention of occupational accidents, but examples from applications in the fields of major accidents and accidental environmental pollution are also discussed. A theoretical part of the subject deals with accident theories and models, barrier philosophies for accident prevention and feedback and learning mechanisms within an organisation. Organisational and individual obstacles to an efficient learning from experiences on accidents and errors are highlighted. The subject presents and evaluates methods and tools in the areas of accident and near-accident reporting and investigations, workplace inspections, HSE information and decision support systems, HSE performance monitoring and methods for job safety analysis and risk assessments of machinery. Auditing methods are emphasised and practised. A module deals specially with human factors and safe behaviour in complex socio-technical systems.	*7.5*	

Table 12: Steinbeis University Berlin
(Steinbeis Institute: Advanced Risk Technologies,
Curriculum "Risk Engineering and Management")
(The courses are part of a 2-year International Master Program)

Course	Course description – learning objectives	Credit points	Semester
INTRO: Intro-duction to Risk and Safety Management in Industry	The course represents a general introduction to the topics of risks related to the general use of the chemicals by a modern society and related industrial sectors (chemical/process, oil & gas, power generation, heating, etc.). Hazards, related risks, and due legislative safety measures will be outlined considering acute (accidents) and chronic (pollution) risks within life cycle of chemicals (hazardous materials) and will be presented in units 1 and 2. Units 3 and 4 aim to provide introduction to major accidents prevention (EU legislative obligations) and related process safety risk assessment methodology. Where applicable, related EU directives are briefly mentioned.	*2*	

Course	Course description – learning objectives	Credit points	Semester
PETRO: Risk Analysis in Chemical/ Petroleum Industries	The petroleum industry is changing rapidly, challenging many organizations and individuals to keep pace and distinguish opportunity from risk. This course will present current global and regional happenings in the upstream, midstream, downstream and in petrochemical industries. It will increase understanding of the industry's strengths and weaknesses and the risk issues.	*2*	
POWER: Risk Analysis in Power Industries	This course provides knowledge of risk analysis applied specifically in power industry, starting with advantages and effectiveness of its application. It presents the regulatory basis and requirements, and elaborate commonly used methods through number of examples.	*2*	
RBI-Petro: Risk Based Inspection - Petro	The course explains principles of risk based inspection, existing approaches and gives links to applied codes and standards. The focus is given to API 581. Levels of analysis and usage of analysis results will be elaborated and illustrated with examples.	*3*	
RBI-Power: Risk Based Inspection - Power	The course presents the state-of-the art knowledge of risk based approaches currently applied in power generation industries to the wide range of professionals involved in different activities in conventional power generation.	*3*	
RCM / RCFA: Reliability Centered Maintenance and Root Cause Failure Analysis	This course presents Reliability Centered Maintenance (RCM) and Root Cause Failure Analysis (RCFA) as methodologies used for logical decision-making process for analysis and definition of the equipment maintenance requirements, as well as for accident prevention. The focus of the course is on the damage mechanisms appearing in different industries. A large number of well elaborated examples are included.	*3*	
HSE / HSSE: Health, Safety, Security and	The course gives an overview of EU regulation in the field of HSE and HSSE (health, safety, security and environment), explain the objectives and requirements, explain state-of-the art in application including constraint and advantages, and elaborate used techniques on a number of examples.	*3*	
CoF: Accident and Consequences Modeling	The course presents general techniques for accident modeling and explains different models of explosion. It elaborates gas and vapor explosion, as well as gas dispersion modeling, using examples for applied methods. The course includes modeling of fire and presents current models.	*3*	
FIRE: Fire protection	The course will start with theory of fire and extinguishment and explain sources of risk and fire protection installations. Through number of example fire protection measures in industry will be shown as well as legal background and requirements and applied safety concepts.	*2*	
ExP: Explosion protection	The course deal primarily with the EU directive ATEX which is presented in details, along with the principles of explosion prevention and protection adopted in this directive. Its practical application in the industrial plants is explained on a series of real life examples.	*2*	
REACH: Risk analysis of chemicals	This course presents the principles of the EU regulation in the area of registration, evaluation and authorization of chemicals – REACH (EC Nr. 1907/2006). The course explains principles and obligations for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment.	*3*	
ADR: Trans-	The course presents international and EU policies and	*2*	

Course	Course description – learning objectives	Credit points	Semester
port of dangerous materials	legislative requirements related to the transport of dangerous materials and explain the European Agreement concerning the International Carriage of Dangerous Goods. It elaborates the main issues from ADR 2009 as well as safety measures and procedures in case of accidents.		
OSHA: Occupational Safety and Health	The course presents regulations in the field of safety and health of workers at work. It will explain general principles concerning the prevention of occupational risks, the protection of safety and health, the elimination of risk and accident factors, the informing, consultation, balanced participation in accordance with national laws and/or practices and training of workers and their representatives, as well as general guidelines for the implementation of the said principles. The EU member states are obliged to integrate these matters into their national regulations. Where appropriate this is exemplified with regulations from Germany.	*2*	
BUSINESS: Business continuity risks & insurance	The course is intended to complement other courses devoted to technical and engineering issues of risk management in industrial plants (petrochemical plants, process industry, power plants, etc.). Technical risks in the above plants can be a cause or a contributing factor in/for the business continuity and the final outcome of the technical/engineering activities is practically always to be seen on the background of business implications and implications/impacts to the business activities of a company. The insurance aspects are the most relevant practical aspect linking the engineering and business side of the company operation and asset management: therefore these will be tackled, too.	*2*	
iCSR & Sustainability: integrated Corporate Social Responsibility in industry	The course provides basic elements of the concept of Corporate (Social) Responsibility (CSR) and its practical application in industry. The course which focuses onto the following topics: • Key elements of the CSR and how these elements function as an integrated system • How CSR should be practically embedded into corporate and/or country business strategy and daily practice (CSR methodologies and tools) • The technology related aspects as a part of the modern practices of industry (HSE, HSSE) • Analysis/comparison of the practices in the EU, US and other countries • Relevant data and information on best practices world-wide, including a number of relevant case studies from the key industries and references to main sources of relevant data and information • Examples and projects using interactive and on-line course materials, also from external sources (e.g., the World Bank, GRI …). A particular unit of the course is dedicated to new ISO 260000 standard.	*3*	
Risk Governance: Risk Governance	The course deals with and explains the principles of modern risk governance including its main elements (ef. IRGC framework): a- pre-assessment, b- risk appraisal, c- risk characterization and evaluation d- risk management and e- risk communication. Apart from the general concept and the items to be considered under each of the elements (e.g. under “Risk Assessment”: hazard identification and estimation, exposure and vulnerability assessment, risk estimation, risk perceptions, social concerns, socio-economic impacts) the examples from the industrial practice	*3*	

Course	Course description – learning objectives	Credit points	Semester
	will be shown and explained. A separate part of the course will be dedicated to the overview of specific methods and techniques (e.g. Delphi), as well as to the tools and instruments facilitating the application by industry, governments and public bodies.		
LCA: Life Cycle Analysis	The course covers the principles and practical application of the life cycle analysis (LCA) as a technique for accessing the environmental aspects and potential impacts associated with a product, by (a) compiling an inventory of relevant inputs and outputs of a product system, (b) evaluating the potential environmental impacts associated with those inputs and outputs, and (c) interpreting the results of the inventory analysis and impact assessment phases in relation with to the objective of the study. The course will provide overview of the techniques and the tools needed for the analysis, with practical examples from primarily from process industry and relevant products, covering the environmental aspects and potential impacts throughout a product's life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal, with a particular attention focused onto resource use, human health and ecological consequences.	*3*	
EMERGING: Emerging Risks	The course on emerging risks concentrates on the issues of early recognition, classification and monitoring of emerging risks. As "emerging" are considered primarily risks previously not recognized as such, such as risks due to new processes, new technologies, new ways of working or social or organizational change (e.g. risks liked to nanotechnologies, bio-technology, new chemicals, outsourcing, globalization…). In addition also the known risks emerging due to the change in public perception or new scientific knowledge are considered, The methodology for to deal with these risks require new tools and these are presented at the course, concentrating in particular onto the use of concepts like UML (unified modeling language), indicators and modern IT tools, including the application of data mining. Examples and results from the current EU and other research will be highlighted and explained in detail to the course participants	*3*	

3. III. Other European universities offering relevant courses (not partners in iNTeg-Risk)
   a. Aberdeen University - UK, Table 13
   b. University of Sheffield – UK, Table 14
   c. University of Strathclyde – UK, Table 15
   d. Edinburgh University – UK, Table 16
   e. Heriot Watt University – UK
   f. Cranfield University – UK, Table 17
   g. Loughborough University - UK
   h. Chalmers University of Technology – Sweden, Table 18
   i. Luleå University of Technology – Sweden, Table 19
   j. Lund University – Sweden, Table 20
   k. KTH – Royal Institute of Technology – Sweden, Table 21
   l. TU Delft – Netherlands, Table 22

a. Aberdeen University

Courses are part of a master program in Safety and Reliability Engineering. Individual course descriptions are not provided, but the program aims to provide education and training at postgraduate level for graduate engineers in the general area of safety engineering, reliability engineering, and loss prevention. The Programme provides an integrated approach to safety and reliability issues across most of the traditional branches of engineering, and allows students to

specialise in offshore engineering, technical safety, reliability, legislations and regulations or human factors. The Programme also requires a final individual project, providing an opportunity for personal research and giving a deeper insight into particular safety and reliability problems.

Table 13: Aberdeen University – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Advanced Methods for Risk & Reliability Assessment		*15*	
Applied Risk Analysis & Management		*15*	

b. University of Sheffield

Courses are part of a master program in Process Safety and Loss Prevention. The program covers a range of courses, only those considered most relevant are listed.

Table 14: University of Sheffield - relevant courses

Course	Course description – learning objectives	Credit points	Semester
Introduction to Hazard Analysis and Risk Assessment	Topics: Safety legislative framework in the UK, Qualitative Risk Assessment, Process terminology, Project life-cycle, Past incidents, Safety Management Systems (SMS), Introduction to hazard identification, HAZOP, Fault Tree Analysis (FTA), Event tree analysis, Risk predictions.		
Process plant reliability and maintainability	Topics: Availability, Reliability block diagrams, Reliability, Availability and Maintainability (RAM) improvement, RAM requirements, Tools that can be used to improve RAM, Failure distributions, How to analyse and interpret failure data, Maintainability, Fault detection & failure location.		
Human Error and human behaviour	Topics: Human factors, Human and system-induced error, Rules, procedures and violations, Learning lessons from accidents, Addressing systematic causes, Communication and shift hand-over, CARMAN, Task Error Assessment Methods, Human error quantification.		
Process Safety Management and Loss Prevention	Topics: Risk assessment and land use planning, RISKPLOT, Management measures to prevent major accidents, SMS and COMAH Safety Reports, Successful health and safety management, Lessons from losses in oil, gas and petrochemical industries, Insuring major chemical hazards, The need to manage safely, Policy, organisation and safety culture, How to audit effectively, Risk ranking techniques, Integrating risk assessments and safety management systems.		

c. University of Strathclyde

Offers a part-time master degree program in Safety and Risk Management but it is not possible to identify what courses are given as part of this program.

Table 15: University of Strathclyde - relevant courses

Course	Course description – learning objectives	Credit points	Semester
Research Methodology in Risk and Reliability	Course objectives: To produce graduates with: • In depth understanding of the theory and practice of risk and reliability analysis • Sophisticated research skills relevant to modern industrial challenges Course structure • Philosophy of Research		

	• Research Methods • Foundations of Risk • Quantitative Risk Analysis for ALARP Decision Making • Goal-oriented Assessment of Reliability and Maintainability

Table 16: Edinburgh University – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Safety, Risk and Reliability Engineering	The course aims to provide students with an understanding of safety, risk and reliability engineering in both a qualitative and quantitative manner, and to develop the skills to apply this understanding; the course will also introduce students to recent developments in analytical techniques, e.g. computer modeling of risk, reliability and safety problems.		

d. Heriot Watt University

Offers a distance learning MSc in Safety and Risk Management and also in Safety, Risk and Reliability Engineering. Potentially relevant modules from these two programs include:

- Risk Assessment and Safety Management
- Human Factors
- Learning from Disasters
- Systems Reliability

More details not found.

Table 17: Cranfield University – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Risk Management	The Risk Management option focuses on the key techniques used in the offshore industry. It addresses both qualitative and quantitative methodologies, and explains which techniques are appropriate to different applications.	*?*	
Reliability engineering and Asset risk management	• Advanced reliability prediction techniques: stress-strength interference modelling stochastic design principles, component reliability, 'burn-in', application of FMECA and FTA in design. Bayesian estimation, design reviews • Maintainability/Availability: renewal theory, planned maintenance. Age and block maintenance, Glasser's charts. Availability simulation • Project Risk Management, Financial Risk Management and Asset Risk Management: Concepts of risk, safety, health, assets and loss. Principles and best practice. Risk management in business, reduction and control. Legal aspects, EC and UK legislation	*?*	
Safety, Risk and Reliability offshore	Concept of risk, ALARP criteria, and reliability engineering • Advanced reliability prediction techniques: stress-strength interference modelling stochastic design principles, component reliability, 'burn-in', application of FMECA and FTA in design. Bayesian estimation, design reviews • FMECA and HAZOPS • Reliability data: types, data collection methods and data sources. • Human reliability analysis and accident causation. HEART and THERP • Offshore safety case and formal safety assessments	*?*	

Course	Course description – learning objectives	Credit points	Semester
	• Pipeline corrosion risk analysis • Statistics and probability distributions • Systems' reliability techniques: reliability block diagrams and networks. Estimation of cut sets and tie sets • Availability modelling: system availability and impact of maintenance strategy and component reliability. • Review of major accidents offshore • Diving bell risk analysis workshop • Introduction to structural reliability analysis		

e. Loughborough University

The university apparently offers courses in system reliability, reliability engineering and risk analysis, but most information is very difficult to find from their website.

Table 18: Chalmers University of Technology – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Environmental risk assessment in engineering	The course gives initially an overview of soil and water contamination issues as a background and motivation of the rationale using risk assessment as a basis for decisions regarding protective and remedial actions. The course focuses on risk assessment on soil and water contamination with the application of specific tools for identifying, estimating and evaluating environmental risks.	*7.5*	

Table 19: Luleå University of Technology – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Safety I	After the course the student can use and understand system safety analysis, safety requirements, safety management and disaster recovery planning, with emphasis on safety critical systems. Contents: - Principals for critical systems - Requirement and safety aspects of design of critical systems - Safety analysis and management safety - Fault tolerant architecture and integration - Lifecycle models and standard *Comment: Focus is on information security and knowledge of computer science is required as a basis*	*7.5*	
Safety II	The course gives knowledge about using and modelling complex problems and give abilities to discover, track and investigate incidents and intrusions which are causing problems in an organization.	*7.5*	

f. Lund University

At LUCRAM (Lund University Centre for Risk Assessment and Management) they offer an MSc in Risk Management & Safety Engineering. However, no details of this are found. Two other masters are described:

- MSc in Fire Safety Engineering (jointly with Ghent University and University of Edinburgh)
- Master of Disaster Management (jointly with University of Copenhagen)

Few courses relevant for this overview seem to be offered.

Table 20: Lund University – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Risk Assessment	The aim of the course is that, in combination with earlier courses, the students gain the capability of utilizing tools	*8.0*	

	for decision making in matters of risk management within the field of Fire Safety Engineering. Furthermore, the course is aimed at providing a foundation for continuing studies in the risk management field.

g. KTH Royal Institute of Technology

KTH has a number of courses in basic reliability theory and reliability theory applied in relation to software, railway signaling systems, and the nuclear industry. This list may therefore be complemented after having had a more detailed review of the available courses.

Table 21: KTH Royal Institute of Technology – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Risk Management	The course is an introduction to risk assessment. Risk assessment is broadly defined to include risk characterization, risk analysis, risk communication, risk management, and policy relating to risk. After you have passed the course you should be able to: • Explain methods for risk assessment and know when they are applicable • Outline an accident investigation in terms of man-machine-organization causes • Explain the principles for an integrated SHE management system • Explain principles for communicating results of risk analyses to stakeholders • Define principles for inherent safety design in the processes industry • Utilize the principles for setting up criteria for risk evaluation and risk communication	*6.0*	
Risk in Technical systems	The course is based on two fundamental ideas. The first is that there is no absolutely safe technique, but it can be made safer. The second leading idea is that the technical systems which are associated with risks at the same time involve advantages. The course will give the students an understanding of fundamental principles of risk analysis and ability to judge various kinds of social risks.	*7.5*	
Safety in complex systems (new course?)	To a high degree, the management of nuclear industry safety involves knowledge areas pertaining to the roles of the individual, the organization, and the culture - as risk contributors and as prospects of functioning safety management. The aim of the present course is to give an overview of models, technologies, experiences etc. that are used today to analyze and manage risks associated with human actions and the way organization, culture, etc., interact with human activities in the development and maintenance of nuclear technology.	*7.5*	

Table 22: TU Delft – relevant courses

Course	Course description – learning objectives	Credit points	Semester
Safety in Transportation	• System description of different transport modes using safety models • Measures to prevent and/or control unsafe situations • Consequences of human behaviour for safety in transportation • The concept of risk in relation to transport systems • Specific measures to control risk: design & implementation	*?*	

Course	Course description – learning objectives	Credit points	Semester
	• Control of risk during the life-cycle of a transportation system and possible government interventions • Research methods, including: accident analysis, observation studies, risk identification, statistics, casuistic and simulation		

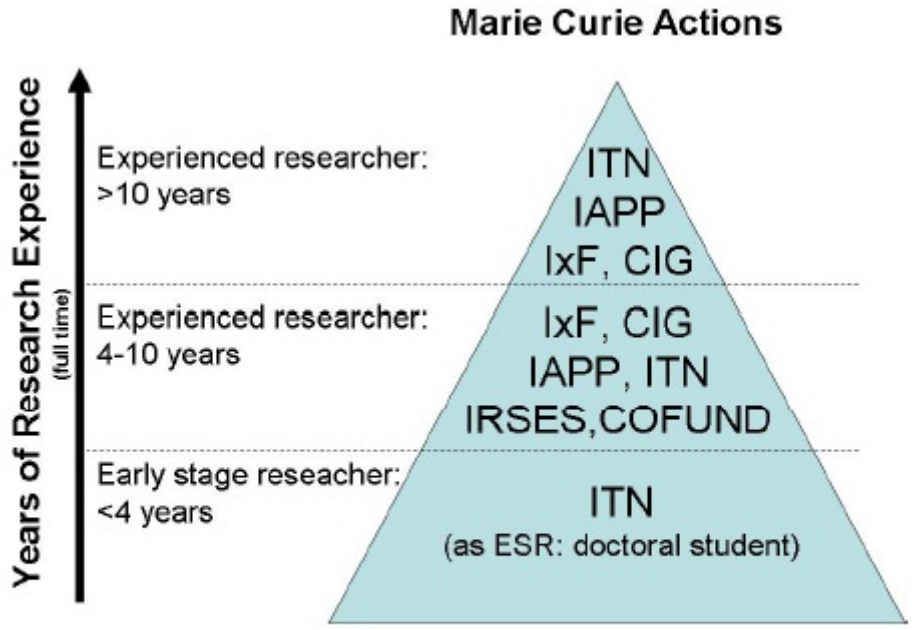
Annex VIII **(Optional) Fees**

To be defined for each instance in a separate document

Annex IX **Marie Curie Fellowships and Grant**

Marie Curie Programme basic data (2011)

In 7th Framework Programme for Research & Development of the European Union (FP7), Marie Curie Actions have been regrouped under the Work Programme PEOPLE 2012. This programme aims to increase the trans-national mobility of researchers and encourage European researchers to stay in Europe as well as attract to Europe researchers from the entire world. More information on the PEOPLE programme can be found at – ftp://ftp.cordis.europa.eu/pub/fp7/docs/wp/people/m-wp-201201_en.pdf.



IxF: Individual Fellowships (IEF, IOF, IIF)

Source: http://www.euresearch.ch/fileadmin/documents/PdfDocuments/R_D_Guides/R_DPeople_2011_FZ.pdf

There are four categories of Marie Curie Actions:

- Life-long training: Actions aiming at supporting experienced researchers in acquiring new skills thank to stays abroad: Intra-European Fellowship (IEF), Career Integration Grant (CIG) and COFUND.
- International dimension: Actions aiming at increasing the co-operation with third countries: International Outgoing Fellowship (IOF), International Incoming Fellowships (IIF) and International Research Staff Exchange Scheme (IRSES).
- Initial training: The Initial Training Network (ITN) aims to improve early-stage researchers' career perspectives in both public and private sectors.
- Industry-Academia: The Industry-Academia Partnerships & Pathways scheme (IAPP) aims to increase the co-operation between private & private sectors.

Individual-driven actions

IEF: Intra-European Fellowship	To help *experienced researchers* to get new skills. Mobility rule applies: researchers have to move from an MS/AC to another MS/AC. No nationality restriction
IOF: International Outgoing Fellowship	To reinforce the *international dimension* in the career of European researchers willing to acquire new skills in a top research institution based in a third country. Mobility rule applies: 2 years in a third country + 1 year in an MS/AC. Nationals of third countries are eligible if active in Europe for the last 5 years
IIF: International Incoming Fellowship	To attract top-class *researchers currently active in a third country* and make them undertake research in Europe. Mobility rule applies: 1-2 year in an MS/AC. No nationality restriction
CIG: Career Integration Grant	To encourage researchers establish themselves in a stable position in a MS/AC, after a period of mobility. No nationality restriction

Host-driven actions

IAPP: Industry-Academia Partnerships & Pathways	Consortium that aims to foster cooperation between public research organisations and private sector, in particular SMEs. Mobility rule applies to seconded staff. No nationality restriction
ITN: Initial Training Networks	Consortium that aims to improve *career perspective* of early-stage researchers in both public & private sectors. Mobility rule applies to recruited staff. No nationality restriction
COFUND Cofunding of national programmes	Mono-beneficiary action addressed to public R&D organisations that finance and manage fellowship programmes. Mobility rule applies to recruited staff. No nationality restriction
IRSES: International Research Staff Exchange Scheme	Consortium that aims at strengthening research partnerships through *staff exchanges* between Europe and third countries. Mobility rule applies to seconded staff. No nationality restriction

Source: http://www.euresearch.ch/fileadmin/documents/PdfDocuments/R_D_Guides/R_DPeople_2011_FZ.pdf

The Marie Curie Actions are cross cutting (i.e. they cover any scientific topic). In addition, they follow a bottom-up approach (i.e. research topics/fields are chosen freely by the applicants). Therefore, all disciplines/ domains of research are eligible. However, please note that those research fields with military applications or within EURATOM programme (nuclear fission and fusion) may not be eligible for funding. Moreover, research projects with ethical implications will be subject to ethical review. Researchers raising ethical issues can check matters on the website of

CORDIS (http://cordis.europa.eu/fp7/ethics_en.html#ethics_sd) or read the document Ethics for Researchers (ftp://ftp.cordis.europa.eu/pub/fp7/docs/ethics-for-researchers.pdf) for a quick overview.

Grant selection procedure

Source: http://www.euresearch.ch/fileadmin/documents/PdfDocuments/R_D_Guides/R_DPeople_2011_FZ.pdf

For practical reasons, proposals will be classified under seven major areas of science (see the list below); hereafter known as panels. Applicants will choose the panel in the proposal submission form (form A1) and additional keywords can be used to define sub-disciplines. The panels will then guide the European Commission in the selection of experts.

Panels

1. Economics and Social Sciences
2. Engineering sciences
3. Environmental and geo-sciences
4. Life sciences
5. Mathematics and information sciences
6. Physics
7. Chemistry

In applying this bottom-up approach, no quota will be applied to the disciplines in advance of the selection process, selection being carried out on the basis of scientific excellence criteria and on the pertinence with respect to the objectives of the specific Marie Curie action chosen by the proposer.

Calls are published annually, and close with deadlines some months later. All calls are in the Work Programme 2011; find the current open calls here: http://cordis.europa.eu/fp7/calls.