



Deliverable 13.6: Implementation of first training courses developed and implemented depending on the priorities identified and approved within the EJP

Work Package 13

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Executive Summary

The School of RWM acts as the executive body for all training and mobility activities that are organised within EURAD. It is the task of EURAD WP13 to ensure a uniform approach and quality throughout a needs-driven EURAD course portfolio. The main aim is to ensure that all training courses are: (i) of a consistent high quality level of all courses developed and (ii) that there are realistic expectations for newly developed training courses. Based on these criteria the School of RWM has organised its first training courses. This deliverable provides an overview of the first training courses that were organised by the School of RWM and the lessons learned for the organisation of future training courses.

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Glossary

ACED	Assessment of Chemical Evolution of ILW and HLW Disposal Cells
DONUT	Development and Improvement Of Numerical methods and Tools for modelling coupled processes
EJP	European Joint Programme
EURAD	European Joint Programme on Radioactive Waste Management
FTF	Face-to-face
FUTURE	Fundamental understanding of radionuclide retention
GAS	Mechanistic understanding of gas transport in clay materials
GBS	Goals Breakdown Structure
HITEC	Influence of temperature on clay-based material behaviour
IGD-TP	Implementing Geological Disposal of radioactive waste Technology Platform
KM	Knowledge Management
OECD-NEA	Organisation for Economic Co-operation and Development – Nuclear Energy Agency
PREDIS	The pre-disposal management of radioactive waste
ROUTES	Waste Management routes in Europe from cradle to grave
RWM	Radioactive Waste Management
SAT	Systematic Approach to Training
SITEX	Sustainable network for Independent Technical Expertise on radioactive waste management
SME	Subject Matter Expert
UMAN	Understanding of uncertainty, risk and safety
WP	Work Package

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1. Introduction

The main goal of European Joint Programme on Radioactive Waste Management (EURAD) Work Package (WP) 13 was to establish the 'School of Radioactive Waste Management (RWM)'. The School of RWM was successfully launched in 2019. It acts as the executive body for all training and mobility activities that are organised within EURAD. It responds to the training needs of organisation acting in RWM in Europe (D13.1). It takes into account the EURAD Roadmap (D1.7), which is used as a guide to map existing training (D13.2), prioritise trainings based on the identified training needs by the RWM community and publish an overview of past, current and newly developed training courses that are available to the RWM community, which includes the EURAD community (D.13.3). By linking its activities to the EURAD Roadmap, the School of RWM contributes directly to the strategic knowledge management (KM) objectives of EURAD, namely: (i) preservation of generated knowledge (in- and outside of EURAD), (ii) transfer of knowledge towards Member States and between generations and (iii) dissemination of knowledge (by organizing training courses based on identified training needs within RWM). In general, training courses within EURAD are organised by the School of RWM. This deliverable provides an overview of the first training courses that were organised by the School of RWM and the lessons learned for the organisation of future training courses.

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2. The School of Radioactive Waste Management

The School of RWM serves as an umbrella for a diverse portfolio of basic and specialised training courses created under EURAD. New training courses are developed by WP13 in close collaboration with all EURAD WPs - Research, Development and Demonstration, Strategic Studies and other KM WPs and also with external training providers for implementation in the School of RWM. These new training courses encompass different research fields and technologies in the field of RWM and are based on the training needs of the RWM community¹. As mentioned above, these training needs are linked to the Goals Breakdown Structure (GBS) of the EURAD Roadmap (EURAD Deliverable D1.7) (see also Deliverable D13.3, *currently in draft*). This way, the training needs and competences that are lacking can easily be identified. Additionally, courses that focus on specific competences can also easily be found via the GBS. In the long run, the populated EURAD Roadmap will provide a unified vision of the various training needs of the various Member States and will harmonise training opportunities implemented by the School of RWM with the training offered outside of EURAD in various business models by the mandated actors, members of EURAD or even by waste producers operating outside EURAD.

It is the task of WP13 to ensure a uniform approach and quality throughout a needs-driven EURAD course portfolio. Deliverable D13.5 describes the quality criteria and training specifications for the development of coordinated training courses in the field of RWM, which will be adhered to by the School of RWM, with following major outcomes in mind²:

- Consistent high quality level of all courses developed, and
- Realistic expectations for newly developed training courses.

Based on these criteria the School of RWM has organised its first training courses. The process of how training courses are developed and designed is described in the following section.

3. Applying the Systematic Approach to Training

3.1 Analysis

The School of RWM adheres to the International Atomic Energy Agency's Systematic Approach to Training (SAT)². This approach provides a methodology for the management of training programmes. It consists of five logical steps:

- **Analysis** of the training needs and the competences required;
- **Design** of the training keeping in mind the identified competences;
- **Development** of the training materials;
- **Implementation** of the training using the developed training materials;
- **Evaluation** of the training course, which generates feedback to be implemented in the other phases.

The analysis of training needs was performed previously through a survey launched by WP13 at the start of EURAD. Its results are listed in deliverable D13.1¹. In addition to this analysis, a mapping of all available training opportunities in the field of RWM (on a European scale) was also performed³. These two analyses resulted in a priority list (i.e. a list of topics on which training courses are either not readily available or that are in high demand from the RWM Community)⁴.

Based on these inputs WP13 gained insight in the training needs, potential target audiences, competences to be acquired, content topics and possible arrangement like expected training duration. These are used to design and develop training courses that will meet the end-users' needs. The next steps of the SAT, 'Design', 'Development' and 'Implementation', are discussed in the following sections. The 'Evaluation' will not be discussed here, but is implemented as described elsewhere².

3.2 Design

For each training course that is organised by the School of RWM, WP13 is designing the training course, in collaboration with experts in the subject. This is an important first step because it results in the following:

- Training aims;
- Target audience
- Learning outcomes;
- Pre-requisites (if any);
- Content outline;
- Delivery strategy.

This information is provided to potential participants (via the School's webpage: <https://euradschool.eu/events/category/eurad-training-course/>) and helps set the participants' expectations about the training course².

When designing new training courses, WP13 takes the following steps:

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1. WP13 starts each new training course with respecting the priority list (e.g. Safety Case, uncertainty management) of topics and/or main results from WP work, determining the overall content of the training course, the common thread throughout the training course while considering expected target audience and its needs. Based on the proposed content, WP13 contacts EURAD subject matter experts (SMEs), preferably from within EURAD, but external experts can also be considered.
2. WP13 organises a meeting with the SMEs to define the main training aims and learning outcomes. The delivery strategy is also discussed here as it is crucial in determining where, when and how the training course needs to be organised.
3. The SMEs further refine the proposed content to make sure it meets the defined aims, learning outcomes, and delivery strategy. In parallel, the most suitable location for the training course is determined. The location also determines the maximum number of participants that can participate. With respect to the SME/particular lecturers' availability, the date of training course is considered/proposed.
4. Finally, when all SMEs agree upon the aims, learning outcomes, content, and delivery strategy, they move to the next step: developing the training materials.

In parallel with these four steps, WP13 also takes into account the budget for the training course design, development, and implementation. WP13 assures that the budget is used efficiently and that economical aspects are considered. Although training courses organised by the School of RWM are free of charge, during the announcement (see 3.3 Development) participants are encouraged to apply for mobility grants to help relieve their personal costs. This also ensures that all interested participants are able to attend the training course, even when their financial resources are limited (e.g. students).

WP13 adhered to this approach for all training courses that were implemented (see '3.4 Implementation'). It is crucial to involve the SMEs from the start, as they provide crucial insights and can help adjust the training course design early on, which facilitates the later steps in the process. After the steps mentioned above, the next step for the SMEs is to develop the training course.

3.3 Development

Development of the training course is the third step in the SAT. WP13 leaves this step up to the SMEs, but do provide the necessary guidance and support. They provide feedback each step of the development process:

- Training schedule (i.e. programme);
- Training materials;
- Practical training sessions;
- (Assessment; standardised within EURAD, see deliverable D13.5²).

The first step is developing a realistic training programme, i.e. provide sufficient time for each content topic to be fully explained and provide regular breaks for the participants. WP13 uses the following rule of thumb: for an eight hour day there should be six hours of training (e.g. lectures, practical sessions) (maximum) and at least two hours of breaks (coffee breaks and lunch break). Based on this rule of thumb WP13 and the SMEs determine the length of the training course (i.e. number of hours/days). Finally, it is important to leave sufficient time for feedback from both lecturers and participants and a knowledge test at the end of the training course.

When a (preliminary) programme is available, WP13 starts preparing the registration process. WP13 publishes the course information on the EURAD School website (<https://euradschool.eu/events/category/eurad-training-course/>). This page contains all information that potential participants may need to set their expectations and to help decide if this course could be useful to them. This includes, but is not limited to:

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- Background information
- Training aims
- Learning outcomes
- Practical details (e.g. type, dates and location)
- Target audience
- Contact information
- (Preliminary) Programme
- Option to register.

An example of this can be found here: <https://euradschool.eu/event/eurad-training-course-on-uncertainty-management/>.

WP13 aims to open the registrations for a training course well in advance: three months prior to the start of the training course at the latest (whenever possible). This provides ample time for interested participants to apply for a (EURAD) Mobility Grant. For online training courses this period can be shorter, since no hotels, flights, etc. have to be booked by the participants.

At the same time, WP13 supports the organisation which will host the training course with its practical organisation: catering, renting lecture rooms, etc. The costs for the practical arrangements is covered by WP13's training budget.

In parallel with the two previously mentioned actions, the SMEs will prepare the training materials. These usually consist of slide decks and a syllabus, which describes the training course in more detail. The syllabus, however, is not a written textbook. To ensure that there is uniformity among the EURAD training courses WP13 provides templates for both the slide decks and the syllabus (Appendices A and B). WP13 requests the SMEs to send their materials at least one week before the start of the training course. This allows WP13 to make sure that all materials are available in due time. Now that the training course has been developed, the next phase is its implementation.

3.4 Implementation

After the three preparatory steps, it is now time to implement the training course in practice. This is the most important part given that the outcome of each training course is to build competences (i.e. knowledge, skills and attitudes) of the participants. Therefore, the previous steps in setting up a training course are so important: it is necessary to establish conditions, which allow participants to give maximum attention to the training process.

To help facilitate this, the lecturers should be SMEs, with documented experience in teaching/training. As discussed earlier, it is also important that all lecturers know what the other lecturers will cover: coordination among them is fundamental and ensured by WP13. In the end, trainers are responsible for ensuring that²:

- Their lectures meet the aims and learning outcomes and that the lectures are tailored to the largest possible extent background of the participants;
- Up to date information is provided;
- The presentation is consistent with the current regulations (if applicable);
- The lecture notes and oral presentations are clear, objective and easily understandable.
- Their lectures provide enough time to discuss the topics presented and interact with the participants.

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During the training itself, a representative of WP13 is present to take care of all practicalities. This way, WP13 ensures that the practical organisation of the training course runs smoothly.

To make sure that the training itself is effective, general adherence to the predefined schedule and lesson plans, as well as an adequate understanding of the learning process is required. Lecturers can supervise participants more effectively if they have a working knowledge of the learning process. Participant's motivation can be enhanced by providing an effective training environment, which can be achieved by adhering to the learning outcomes and by presenting the content in an organised and concise manner. During the lectures/practical sessions, lecturers should continuously monitor the participants' mastery of the learning outcomes².

At the end of the training course, the participants are asked to provide feedback (Kirkpatrick level I) and to complete a knowledge test (when applicable) (Kirkpatrick level II). This process is described in more detail in deliverable D13.5².

In the next section, an overview of all training courses organised by the School of RWM is given.

3.4.1 Overview of all training courses organised by the School of RWM

The *modus operandi* described in sections 3.1, 3.2, 3.3, and 3.4 is based on deliverable D13.5² and 'learning by doing' by WP13. All information provided in previous sections is therefore based on the experience of the WP13 partners, who are experienced in nuclear education and training, and on the lessons learned by WP13 when organising the first EURAD training courses. Table 1 provides an overview of all training courses organised by the School of RWM.

When available, the School of RWM will also publish recordings on the training courses. In order to view these recordings, the viewer has to register (for free). This way, WP13 keeps track on who views them. As such, the training is readily available for those who want to (re)visit it. However, WP13 does not plan to record each training course, only those where it is technically feasible (e.g. for practical sessions this is usually not feasible) and where it can provide a benefit if these recordings are made available (e.g. large interest to participate). It should be emphasized that the lecturers are experts in the fields of RWM and are not receiving extra money for their lecture's recording preparation and that training courses organisers are coming from EURAD community as volunteers and usually don't have their own professional equipment for high-quality lectures recording. As the training courses are free of charge for the participants, the organisers don't receive any additional budget to enable the recording of training courses by any external professional provider. All available recordings are published on <https://euradschool.eu/eurad-training-course-recordings/>.

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Table 1. Overview of all training courses organised by the School of Radioactive Waste Management

Course title	Date	Location	Organising partners [#]	Web link ^{##}
EURAD Training on Multiphysical couplings in geomechanics	22/01/2020 – 24/01/2020	Liège, Belgium	WP GAS, WP HITEC, WP13	Link
Introductory course on EURAD and Radioactive Waste Management	14/09/2020	Online	WP1, WP13	Link
Education & Training event on the scientific basis and safety relevant aspects of radionuclide transport and retention	17/11/2021	Online	WP FUTURE	Link
EURAD Training course on Safety Case Development and Review	28/11/2022 – 02/12/2022	Prague, Czech Republic	OECD-NEA*, IGD-TP**, SITEX.Network***, WP13	Link
Information session and discussion on the Spent Fuel State-of-Knowledge document	18/01/2023	Online	WP11, WP13	Link
Geochemical and Reactive Transport Modelling for Geological Disposal	06/02/2023 – 10/02/2023	Bern, Switzerland	WP ACED, WP DONUT, WP FUTURE, WP13	Link
EURAD Training course on Uncertainty Management	14/02/2023 – 16/02/2023	Brussels, Belgium	WP UMAN, WP13	Link
EURAD Training course on Multiphysics and multiscale coupled processes in geomaterials – Focus on thermal effects and gas transfer impact on the behaviour of geomaterials	28/08/2023 – 01/09/2023	Liège, Belgium	WP GAS, WP HITEC, WP13	Link
EURAD-PREDIS Summer School on Waste Acceptance Criteria	TBA	TBA	WP ROUTES, WP13, PREDIS****	TBA

[#] For an overview of the European Joint Programme on Radioactive Waste Management Work Packages, please consult: <https://ejp-eurad.eu/implementation>

^{##} For an overview of all of the School of Radioactive Waste Management's activities, please consult: <https://euradschool.eu>

* Organisation for Economic Co-operation and Development – Nuclear Energy Agency

** Implementing Geological Disposal of radioactive waste Technology Platform

*** Sustainable network for Independent Technical EXpertise on radioactive waste management

**** The pre-disposal management of radioactive waste; <https://predis-h2020.eu/>

4. Conclusion

The School of RWM acts as the executive body for all training and mobility activities that are organised within EURAD. It responds to the training needs of organisation acting in RWM in Europe and takes into account the EURAD Roadmap, which is used as a guide to map existing training, prioritise trainings, and publish an overview of past, current and newly developed training courses that are available to the RWM community, which includes the EURAD community.

It is the task of EURAD WP13 to ensure a uniform approach and quality throughout a needs-driven EURAD course portfolio. The main aim is to ensure that all training courses organised by the School of RWM are: (i) of a consistent high quality level of all courses developed and (ii) that there are realistic expectations for newly developed training courses. Based on these criteria the School of RWM has organised its first training courses. These are developed and designed based on IAEA's Systematic Approach to Training, a process of five important steps: analysis, design, development, implementation and evaluation. Using this approach, the School of RWM has, so far, organised eight training courses (one currently in preparation).

This deliverable provides an overview of the first training courses that were organised by the School of RWM and the lessons learned for future training courses.

Appendix A. EURAD Training materials template – Slides



TITLE OF THE TRAINING UNIT/LESSON

Sub-title

Author • WP XX



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Date

Training material



KEYWORDS.

HELP NOT
Keywords
Words used
online search

Date

Training material





CONTENTS

- Learning outcomes.
- Introduction.
- Title 1 level 1.
 - Title 1.1 level 2.
 - Title 1.2 level 2.
- Title 2 level 1.
 - Title 2.1 level 2.
-
- Title n level 1.
 - Title n.1 level 2.
 - Title n.2 level 2.
- Summary and conclusions.
- Bibliography and/or References.

Date

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LEARNING OUTCOMES.

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Training material

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INTRODUCTION



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- Level 2 - adulatorum oblatrantibus turmis, bellicosus sane milesque semper et militum ductor sed forensibus iurgiis longe discretus, qui metu sui discriminis anxius cum accusatores quaesitoresque subditivos.
- Level 3 - Sibi consociatos ex isdem foveis cerneret emergentes, quae clam palamve agitabantur, occultis Constantium litteris edocebat inplorans subsidia, quorum metu tumor notissimus Caesaris.
 - Level 4 - Inter has ruinarum varietates a Nisibi quam tuebatur accitus Vrsicinus, cui nos obsecuturos iunxerat imperiale praeceptum

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TITLE OF THE SLIDE

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 - Level 2 - adulatorum oblatrantibus turmis, bellicosus sane milesque semper et militum ductor sed forensibus iurgiis longe discretus
 - Level 3 - Sibi consociatos ex isdem foveis cerneret emergentes, quae clam palamve agitabantur
 - Level 4 - Inter has ruinarum varietates a Nisibi quam tuebatur accitus Vrsicinus



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SUMMARY AND CONCLUSIONS.

- Level 1 - Inter has ruinarum varietates a Nisibi quam tuebatur accitus Vrsicinus, cui nos obsecuturos iunxerat imperiale praeceptum, dispicere litis exitialis certamina cogebatur abnuens et reclamans.
- Level 2 - adulatorum oblatrantibus turmis, bellicosus sane milesque semper et militum ductor sed forensibus iurgiis longe discretus, qui metu sui discriminis anxius cum accusatores quaesitoresque subditivos.
- Level 3 - Sibi consociatos ex isdem foveis cerneret emergentes, quae clam palamve agitabantur, occultis Constantium litteris edocebat inplorans subsidia, quorum metu tumor notissimus Caesaris.
 - Level 4 - Inter has ruinarum varietates a Nisibi quam tuebatur accitus Vrsicinus, cui nos obsecuturos iunxerat imperiale praeceptum



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Appendix B. EURAD Training materials template – Syllabus



TRAINING COURSE: Title

SYLLABUS

This project has received funding from the European Union's Horizon 2020 research and innovation programme 2014-2018 under grant agreement N°847593



Training Module “X” “Training course title”

“Training Period”, “Host Organization”, “Location”

Introduction

Training aims.

Text

The aims of the training are determined by taking into account the training needs of all interested parties, which includes the regulatory requirements. The training aims could include one or more of the following:

- Identification of the content to be included in the training;
- Specification of the regulations, guides or other requirements relating to the topics covered;
- Explanation of the work practices, equipment usage and procedures for which the training is to be provided.)

Learning outcomes.

Text

After determining the aims of the training, the learning outcomes can be defined. Learning outcomes are described by the European Qualifications Framework (EQF) as statements of what a learner knows, understands and is able to do on completion of a learning process [2]. They are the knowledge, skills and attitudes (= competences) that the learners are expected to have attained and mastered upon successful completion of the training course. Typically, learning outcomes have measurable outcomes and can be assessed through some type of testing procedure. Therefore, a list of learning outcomes appears as a series of statements that can be described in a full sentence as follows:

“Upon successful completion of this training course, participants should be able to...”

This sentence is then usually followed by an action verb which is specific to the type of learning outcome in terms of knowledge and skills. Examples of these action verbs can be found in Bloom’s taxonomy, which is one of the best aids to writing good learning outcomes (see Appendix A-D13.5.Quality Criteria)

Training course description.

Text

- **Pre-requisites for the participants.** The entry-level requirements of the participants (see D13.5.Quality Criteria)
- **Delivery strategy.** Classroom-based training (face-to-face training), On the job training (OJT), Practical sessions (laboratory, mock-up and workshop training), Distance learning (Webinars and/or e-learning modules to deliver in an asynchronous way)
- **The number of participants** (taking into account the capacity of the training room and trainers, as well as the pedagogic efficacy).
- **Content outline and Lesson plans.** Developed to reflect the aims and learning outcomes of the training. The content may be divided into modules When preparing the training course:
- **Evaluation strategy.**

Timetable of the training module “X”: “Training course title”

	8:45-9:45	10:00-11:00	11:15-12:15	13:30-14:30	14:45-15:45	15:45 -17:00
A – Monday	A.1 “Lecture title” “Lecturer’s name”, “Organization”	A.2 “Lecture title” “Lecture’s name”, “Organization”		A.3 “Lecture title” “Lecture’s name”, “Organization”	A.4 “Lecture title” “Lecture’s name”, “Organization”	A.5 “Lecture title” “Lecture’s name”, “Organization”
B – Tuesday	B.1 “Lecture title” “Lecture’s name”, “Organization”	B.2 “Lecture title” “Lecture’s name”, “Organization”		B.3 “Lecture title” “Lecture’s name”, “Organization”	B.4 “Lecture title” “Lecture’s name”, “Organization”	B.5 “Lecture title” “Lecture’s name”, “Organization”
C – Wednesday	C.1 “Lecture title” “Lecture’s name”, “Organization”	C.2 “Lecture title” “Lecture’s name”, “Organization”	C.3 “Lecture title” “Lecture’s name”, “Organization”	C.4 “Lecture title” “Lecture’s name”, “Organization”	C.5 “Lecture title” “Lecture’s name”, “Organization”	C.6 “Lecture title” “Lecture’s name”, “Organization”
D – Thursday	D.1 “Lecture title” “Lecture’s name”, “Organization”	D.2 “Lecture title” “Lecture’s name”, “Organization”		D.3 “Lecture title” “Lecture’s name”, “Organization”	D.4 “Lecture title” “Lecture’s name”, “Organization”	D.5 “Lecture title” “Lecture’s name”, “Organization”
E – Friday	E.1 “Lecture title” “Lecture’s name”, “Organization”	E.2 “Lecture title” “Lecture’s name”, “Organization”		E.3 “Lecture title” “Lecture’s name”, “Organization”	E.4 “Lecture title” “Lecture’s name”, “Organization”	E.5 “Lecture title” “Lecture’s name”, “Organization”

Contents of the training module “X”: “Training course title”

- Day 1 – “Title”

Slot of time	
Lecture	A1. “Lecture title”
Name	“Lecturer’s name”
Affiliation	“Organization”
e-mail	
Tel	
Synopsis	
Transition to next talk	
Keywords	

Slot of time	
Lecture	A2. “Lecture title”
Name	“Lecturer’s name”
Affiliation	“Organization”
e-mail	
Tel	
Synopsis	
Transition to next talk	
Keywords	

Slot of time	
Lecture	A3. “Lecture title”
Name	“Lecturer’s name”
Affiliation	“Organization”

e-mail	
Tel	
Synopsis	
Transition to next talk	
Keywords	

- Day 2 – “Title”

Slot of time	
Lecture	B1. “Lecture title”
Name	“Lecturer’s name”
Affiliation	“Organization”
e-mail	
Tel	
Synopsis	
Transition to next talk	
Keywords	

Slot of time	
Lecture	B2. “Lecture title”
Name	“Lecturer’s name”
Affiliation	“Organization”
e-mail	
Tel	
Synopsis	
Transition to next talk	
Keywords	

Short career summary of the lecturers

“Lecturer’s name”, “Organization”

Text

“Lecturer’s name”, “Organization”

Text

“Lecturer’s name”, “Organization”

Text

“Lecturer’s name”, “Organization”

Text

“Lecturer’s name”, “Organization”

Text

Etc.

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