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| Course unit (module) title  | **Teaching in University Science Laboratories.** **Developing Best Practice**  |
| International Standard Classification of Education ISCED | 01/05 |
| Language of instruction | English |
| Course objectives | To improve effectiveness of laboratory classes. To support relatively inexperienced university teachers in order to improve their teaching skills for active learning university science laboratory courses. |
| Learning outcomes  | Participant when completed the course will be able to:* Identify the purposes of implementing laboratory classes in higher education.
* Compare different types of laboratory sessions with respect to their aim and expected learning outcomes.
* Provide strategies on how to increase student engagement.
* Develop strategies to cope with different levels of pre-knowledge and lab experience in one group.
* Develop effective questions to probe student understanding of laboratory practice.
* Create a rubric for assessing a student performing a lab activity and subsequent reports.
* Reflect on how this course can impact on your own teaching practice.
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| Type of course unit (compulsory/optional) | optional |
| Preliminary and additional requirements  | Some experience in teaching science laboratory classes and being an active lab teacher/teaching assistant.  |
| Mode of delivery (face-to-face, distance learning) | Blended learning |
| Delivery length | 8 weeks |
| Number of ECTS credits allocated | 2  |
| Estimation of the student workload needed in order to achieve expected learning outcomes | 6 on-line modules – 12 hours2 face to face meetings – 4 hoursReadings - 12Preparation of homeworks - 14Preparation of final essay - 10 |
| Teaching & learning methods | Readings, video, forum discussions, quizzes, written assignments  |
| Assessment methods and criteria; course grading | Peer-assessment, Quizzes, Case study (rubric) |
| Course topics/content  | The role of laboratory work in university chemistry .Laboratory Instruction StylesStrategies to increase student engagement during laboratory sessionsLearning outcomes of laboratory classesThreshold concepts in chemistryJohnstone's triangleImportant qualities of a laboratory instructor.Diversity in the classroomStudent and teacher preparation for a classGiving instructionAssessment – designing and teaching with scoring rubrics (criteria) |
| Recommended reading | * Reid ,N. & Shah, I. (2007) The role of laboratory work in university chemistry . Chem. Educ. Res. Pract., 8, 172-185 (DOI: 10.1039/B5RP90026C)
* Domin, S.A. (1999) Review of Laboratory Instruction Styles, J.Chem.Educ. 76 (4), 543-547 (DOI: 10.1021/ed076p543).
* Seery M. (2015) Putting chemistry in context, Education in Chemistry, available on https://eic.rsc.org/feature/putting-chemistry-in-context/2000106.article
* Kennedy, D., Hyland, A., Ryan, N. (2007). Writing and Using Learning Outcomes: a Practical Guide. available on http://www.tcd.ie/teaching-learning/academic-development/assets/pdf/Kennedy\_Writing\_and\_Using\_Learning\_Outcomes.pdf
* Cousin G., (2006) An introduction to threshold concepts, Planet No.17, available on https://www.ee.ucl.ac.uk/~mflanaga/Cousin%20Planet%2017.pdf
* Draper, S., (2008) The three types of knowledge in chemistry <http://www.psy.gla.ac.uk/~steve/best/alex.html>
* Herrington , D.G. & Nakhleh, M. B. (2003) "What Defines Effective Chemistry Laboratory Instruction?"
* Johnstone , A. (1997). Chemistry Teaching - Science or Alchemy? 1996 Brasted Lecture.  *J. Chem. Educ*., , 74 (3), p 262-268
* Goodrich Andrade, H. (2005).Teaching with Rubrics: The Good, the Bad, and the Ugly, College Teaching, Vol. 53, No. 1 pp. 27-30, available on https://e-learn.sdu.dk/bbcswebdav/courses/E-learn\_Support\_Center/Andrade\_2005\_good\_bad\_ugly.pdf
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