Universität Basel

Advanced Studies

ADVANCED STUDIES

STUDY HANDBOOK

CERTIFICATE OF ADVANCED STUDIES

IN

PERSONALIZED MOLECULAR ONCOLOGY

30. October 2018

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1. General Description

Cutting-edge technologies, like next-generation-sequencing (NGS), combined with the development of targeted therapies are now revolutionizing clinical practice, bringing new complexity to the field of oncology. The Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology aims at providing a comprehensive and integrative view of the field, by covering (i) tumor biology and genetics, (ii) molecular pathology, (iii) clinical bioinformatics, and (iv) clinical oncology. First of its kind in Switzerland, it will focus on the methodologies used to generate, analyze and interpret patients' molecular profiles, also touching upon the associated technical, regulatory and ethical challenges. As an important outcome, it will establish a common language between the wide range of professionals involved in the personalized oncology process, from biologists, bioinformaticians, pathologists to clinicians, enabling an efficient and better informed use of e.g. genomic data for both routine clinical practice and clinical research. Moreover, it should empower professionals to develop a vision for their own institution, by critically evaluating the potential benefits and limitations of current and future developments in personalized oncology.

2. Target Audience

The Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology targets an interdisciplinary audience of professionals involved in personalized molecular oncology, including laboratory managers, biologists, bioinformaticians, pathologists, geneticists, clinicians and pharmaceutical company employees. Applicants will be selected on the basis of their CV and demonstrated interest and experience in personalized oncology, and are expected to hold a university degree.

3. Program Structure and Curriculum

a. Teaching and Learning Modes

- Lectures
- Group discussions
- Case working
- On-site lab visits
- Hands-on
- Selfstudies and Homework

b. Curriculum page 8FF

- Module 1: Tumor biology and genetics
- Module 2: Molecular pathology
- Module 3: Clinical bioinformatics
- Module 4: Clinical oncology

c. Degree

Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology

4. ASSESSMENT FORMATS

Online module exams
Homework
Written exam (CAS mini-thesis)

5. QUALITY ASSURANCE / QUALITY DEVELOPMENT

Quality is assured on the student's side with an anonymous online questionnaire of about 20 questions with the following topic blocks: content, organization, teaching & interaction, relevance and satisfaction. This questionnaire is sent after the end of each module. It also asks participants if they would agree to provide us with a private email to contact them again in the future to answer a long-term feedback form and thereby keep track of alumni. This is important to assess to what extent the Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology has an impact on their professional life. Participants and teachers are also encouraged to join the Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology LinkedIn group to network with their peers. This group is a simple and efficient way of keeping track of student's career paths, as most professionals nowadays keep their LinkedIn profile up to date.

An online questionnaire is also sent to teachers/speakers after their respective module, with the following blocks: organization, level and participation of the students.

The results of the questionnaires are communicated to the module coordinators and discussed with the Program Board before the start of every new session, thereby ensuring that content and format can be adjusted in due time as needed.

6. INSTITUTIONS

The Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology is organized jointly by (i) the University Hospital of Basel, which is the Swiss hospital sequencing the largest number of samples in oncology (~1500/year), (ii) the University Hospital of Lausanne, a major onco-hematology sequencing center in Switzerland, and (iii) the SIB Swiss Institute of Bioinformatics, an internationally recognized leader in bioinformatics.

7. PROGRAM BOARD

The program board is composed as follows:

Manager:
PD Dr. Sacha Rothschild
Senior Consultant in Oncology, Head of Center for lung tumors, Co-Chair of the Network Molecular Tumor Therapy
Tumor Center and Medical Oncology, University Hospital Basel
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Members:
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Clinical Bioinformatics Project Manager

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Director of the Cancer Genetic Unit
Clinical Hematology Service/Laboratory Dpt, Lausanne University Hospital
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8. Director of Studies / Program Coordinator

The CAS leadership is shared between a Director of Studies and a Program Coordinator.

- Director of Studies

  PD Dr. Sacha Rothschild
  Senior Consultant in Oncology, Head of Center for lung tumors, Co-Chair of the Network Molecular Tumor Therapy
  Tumor Center and Medical Oncology, University Hospital Basel
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- Program Coordinator

  Dr. Aitana Lebrand
  Clinical Bioinformatics Project Manager
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9. Teaching Faculty

Members of the program board are the main teachers of modules 1, 2 and 4. For module 3, SIB appoints teachers within its pool of scientists. For each module, external lecturers may also be invited as required, to present state-of-the-art techniques/methods/research.

Module 1: Tumor biology and genetics, Prof. Dr. Jacqueline Schoumans Pouw, internal/external lecturer(s).

Module 2: Molecular pathology, Prof. Luigi Terracciano, Dr. Luca Quagliata, PD Dr. Christian Ruiz, internal/external lecturer(s).

Module 3: Clinical bioinformatics, Dr. Aitana Lebrand, Mrs. Valérie Barbié, SIB scientists (NN), external lecturer(s).

Module 4: Clinical oncology, PD Dr. Andreas Wicki, PD Dr. Sacha Rothschild, internal/external lecturer(s).

10. Deregistration and Finances

- Cancellation prior to the enrollment closing date is not subject to any charge.
- Cancellation between the enrollment closing date and start of the Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology is charged CHF 600 to account for administrative fees.
- From the first day of training, the whole registration fee is due.

Requests for postponing or cancellation must be submitted by email to the Program Coordinator. Incomplete records will not be processed.

The minimum-maximum number of participants to run the Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology is set to 15-25 per session.

11. Organization

The tasks of the Director of Studies are shared with the Program Coordinator, as follows:

- The Director of Studies submits proposals to the Program Board, signs certificates, and is responsible for the cost coverage of the CAS.
- The Program coordinator has the operational responsibility of the CAS in cooperation with Advanced Studies, submits proposals to the Program Board, and implements quality assurance measures.
- A secretary provides support for logistics.

12. Contact

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13. ATTACHMENTS

Online module exams
Homework
Written exam (CAS mini-thesis)

3B CURRICULUM

Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology						
MODULES	CONTENT - LECTURER	LEARNING OBJECTIVES	DURATION	CONTACT HOURS (OPTIONAL)	WORKLOAD	ECTS
Module 1: Tumor biology and genetics	1) Basic cytogenetics and molecular genetics 2) Heriditary vs acquired genetics 3) Genetic recombination, DNA damage and repair 4) Solid tumors and hematological malignancies 5) Genetic predisposition to cancer 6) Diagnostic genetic testing 7) Tumor cell proliferation 8) Clonal evolution & tumor heterogeneity 9) Homework 10) Online module exam Module coordinator/teachers: Prof. Dr. Schoumans	- Describe the mechanisms yielding to genetic variation, and be familiar with the various types of genetic variants - Distinguish hereditary genetic anomalies from acquired genetic anomalies - Discuss the advantages and limitations of different genetic laboratory methodologies for diagnostic testing - Demonstrate how to interpret non-hotspot mutations using public databases and taking into account overall genomic aberrations and clonal evolution. - Be aware of ethical implications of incidental genetic findings	8 weeks	28h	60h	2
Module 2: Molecular pathology	1) Sample classification and preparation - Terracciano / Quagliata 2) Principles of nucleic acids	- Understand the basics (procedures and rules) of an accredited clinical laboratory - Gain knowledge about the different	8 weeks	28h	60h	2

	extraction - Ruiz 3) Sequencing platforms and setup - Quagliata 4) Understanding gene panels - Ruiz / Quagliata 5) Internal/External Quality controls - Terracciano 6) Laboratory accreditation - Terracciano 7) Reporting genomic variants - Quagliata 8) Interpreting a molecular profile - Quagliata / Terracciano 9) Homework 10) Online module exam Module coordinators/teachers: Prof. Dr. Terracciano, Dr Quagliata, PD Dr Ruiz	types of specimens (e.g. tissue biopsy, cytology, resections) - Get familiar with all the steps that lead from samples collection to final molecular report generation along with all possible bottlenecks - Have an overview about the currently used technological platforms in molecular diagnostics (comparison with the research setting) - Get familiar with the most common clinically relevant variants along with their interpretation and classification system				
Module 3: Clinical bioinformatics	1) Data pre-processing 2) Read mapping 3) Variant calling 4) Quality control 5) Variant annotation 6) Hardware, security, privacy 7) Artificial intelligence (AI) basics 8) AI current and future applications	- Communicate efficiently with bioinformaticians. - Describe a bioinformatics analysis pipeline to call mutations from NGS data. - Perform quality control at the run, read and variant levels. - Use off-the-shelf bioinformatics tools to annotate and support the interpretation of variants.	8 weeks	28h	60h	2

	9) Homework 10) Online module exam Module coordinators/teachers: Dr Lebrand Mrs Barbié SIB Trainers	- Consider hardware, security and privacy issues when managing omics data. - Understand how artificial intelligence contributes to and will further impact personalized oncology.				
Module 4: Clinical oncology	1) Tumor Physiology – Key signaling pathways and molecular aberrations in solid tumors 2) Tumor Immunology 3) Cancer Statistics and Epidemiology 4) Prognostic and Predictive Markers 5) Targeted Therapies in Clinical Oncology 6) Risks and probabilities for the interpretation of genetic results and genetic counseling - Discussion of example cases and practical exercises 7) Clinical Trials in Molecular Oncology – How to improve evidence 8) Molecular Tumor Board – Discussion of clinical cases 9) Homework 10) Online module exam	- Describe main intracellular signaling pathways in solid tumors and molecular aberrations hampering this signaling - Get detailed knowledge of immunological mechanisms and how these may be used to optimize therapeutic approaches - Get a basic understanding of the principles underlying the design and analysis of clinical trials in oncology - Understand the importance of predictive markers in molecular oncology - Get familiar with the most frequent molecular aberrations in solid tumors and routinely used targeted therapies - Learn about genetic counseling and its implications for patients and families	8 weeks	28h	60h	2

	Module coordinators/teachers: PD Dr Rothschild PD Dr Wicki					
			TOTAL	TOTAL	TOTAL	TOTAL
			32 WEEKS	**112H**	**240H**	**8**

ECTS=*European Credit Transfer and Accumulation System*

ASSESSMENT FORMATS	DURATION	CONACT HOURS (OPTIONAL)	WORKLOAD	ECTS
Written exam (CAS mini-thesis)	8 weeks	0h	60h	2
	TOTAL	TOTAL	TOTAL	TOTAL
	8 WEEKS	**0H**	**60H**	**2**

Certificate of Advanced Studies (CAS) in Personalized Molecular Oncology	DURATION	CONTACT HOURS (OPTIONAL)	WORKLOAD	ECTS
TOTAL	**40 WEEKS**	**112H**	**300H**	**10**

Homework

Homework will be done before and after each classroom event.

What – Homework will consist of, but is not limited to:
Reading of scientific articles; reading of professional guidelines; online tutorials; preparation of questions on a specific topic; viewing educational videos; identifying relevant literature.
In total, preparation work should consist of ~20h/module.

When – Homework is performed before the start of the module, and/or in-between module sessions, and/or after the module.

How – Homework is performed by students on their free time and is due by a date fixed by the module coordinator.

Online module exams

After each module, proof of achievement is provided within 2-4 weeks in the form of a written online examination.

Modules are evaluated individually. Exams are graded from 0 to 6, 6 being the best grade and 4 the minimum to pass the module.

What - Each exam consists of 30-50 multiple-choice questions (60-100% of the questions) and/or open questions (0-40% of the questions). The questions are related to topics covered during the class and homework assignments. In particular, considering that each module is spit in 8 major topics (see Curriculum), each topic of a module should be addressed by at least 5% of the questions of the corresponding exam.

How - The exam consists of an online questionnaire, powered by e.g. SIB-hosted Lime Survey platform. Participants complete the exam at home, with course material allowed. Completion time is recorded, but no time limit is set a priori. The aim is that participants can successfully complete the exam within 2h. Each student can access the exam form using a unique token specific to him/her.

When – Students should complete the online exam between 2-4 weeks after the end of each module. As such, the exam only becomes available online 2 weeks after the end of the module, to ensure that students take sufficient time to study and integrate the module program. After the 4 weeks deadline, the exam is no longer accessible and students who did not take the exam are considered as having failed the module (grade: 0/6).

Written exam (CAS mini-thesis)

Students write a written thesis at the end of their continuing education studies.

What – The Program Board proposes several study cases to the students. In addition, students may submit study cases proposals to the Program Board, before the end of the fourth module. All study cases must be endorsed by at least one member of the Program Board.
Working through the study case may involve using free, open-source bioinformatics tools.
The mini-thesis is the final written report (20-50 pages) that presents the study case, discusses all the analyses performed (or that would need to be undertaken and for what reason) and provides some conclusions on the case. A review of literature on a particular topic may also be part of a mini-thesis.

How – The students form small multi-disciplinary groups of 3-5 people. As much as possible, expertise should be distributed across the various groups (if possible, try having a bioinformatician, a pathologist, an oncologist, and a geneticist in each group). The students complete the mini-thesis at home, and may contact the endorsing Program Board member in case of questions (if needed, a phone/on-site meeting may be planned).

When – The students have 8-12 weeks to complete the mini-thesis, starting after the exam of the last module (i.e. starting 4 weeks after the end of the last module).