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## **R2.4. BioS course Catalogue for the programme “*Digital skills on computational biology for healthcare professionals*”**

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**WP2: BioS Curricula design**

Authoring Partner: P11 HiDucator

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### **Prepared by**

Name: Martti Tolvanen  
Authoring Partner(s): P11 HiDucator  
Position:  
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### **Approved on behalf of BioS**

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External Evaluation: Anastasia Papadavid (Hygeia Hospital, Greece)  
Member of External Advisory Board  
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# Executive Summary

<b>Dissemination Level</b>		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including Commission services and project reviewers)	
<b>CO</b>	Confidential, only for members of the consortium (including EACEA and Commission services and project reviewers)	

## Table of Contents

<b>Executive Summary .....</b>	<b>3</b>
<b>Table of Contents.....</b>	<b>4</b>
<b>1. Institution Information.....</b>	<b>5</b>
<b>2 Information on the BioS VOOC course.....</b>	<b>5</b>
<b>2.1 General description.....</b>	<b>5</b>
<b>2.2 Description of individual course modules.....</b>	<b>8</b>
<b>2.2.1 Module 1: Introduction to Bioinformatics.....</b>	<b>8</b>
<b>2.2.2 Module 2: Computational Statistics for clinical doctors .....</b>	<b>9</b>
<b>2.2.3 Module 3: Commercial personalized genomics services in patient care</b>	<b>10</b>
<b>2.2.4 Module 4: Quality Improvement in Healthcare .....</b>	<b>11</b>

**No table of figures entries found.**

## 1. Institution Information

The program “Digital skills on computational biology for healthcare professionals” is developed by the BioS consortium.

Program structure: HiDucator Ltd, Finland

Educational content: Bioinformatics Barcelona Association (BIB), Spain

Institute delivering the program<sup>1</sup>:

- Name and address of the institute:
- Academic calendar:
- General description of the institution (including type and status):
- List of programmes offered:
- General admission requirements:
- General registration procedures:
- ECVET credits:

Arrangements for training guidance.

## 2 Information on the BioS VOOC course

### 2.1 General description

Present curricula, “Digital skills on computational biology for healthcare professionals” provide medical doctors with knowledge, skills, and competences which will allow them to tackle effectively concurrent challenges in EU healthcare systems, services, and policies, in benefit of the health of EU citizens.

- Qualification awarded:

Specialization

- Level of qualification:

EQF Level 5

- Specific admission requirements:

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<sup>1</sup> This section should be filled by the institute delivering the programme

A finished degree in health care professional training programme at the minimum of EQF level 6, such as medical doctor degree or BSc in Health and Safety

- Qualification requirements and regulations:

None applicable

- Profile of the training programme:

The main aim of this programme is to provide skills which will enable understanding and utilization of large biomedical data sets, especially genomic sequence data, to enhance patient care through improved diagnostic sensitivity and more precise therapeutic targeting.

- Key learning outcomes:
  - The learner has a better understanding of and more confidence in data from modern-day high-throughput sequencing;
  - Making more use of such data in clinical decision-making;
  - Quicker and more relevant diagnoses of diseases with an assumed genetic component.
- Occupational competences of trainees with examples:

Medical doctor; Veterinary doctor; Clinical geneticist

- Access to further studies:

Not available.

- Course structure diagram with ECVET credits:

Introduction to Bioinformatics, 4 credits	Computational Statistics for clinical doctors, 4 credits	Commercial personalized genomics services in patient care, 4 credits	Quality Improvement in Healthcare, 2 credits
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- Examination regulations, assessment and grading:

To be determined by the organizing entity, based on a separate BioS guideline document (in preparation)

- Mode of study:

Recommended: part-time, asynchronous e-learning sessions; to be determined by the organizing entity

- Career prospects:

This specialization enables the learner to get started with the use of genomic sequence data to enhance patient care through improved diagnostic sensitivity and more precise therapeutic targeting. These skills allow the learner to take up tasks related to analyses and

interpretation of genomic sequence data, either as a doctor treating the patient or as a consulting professional.

## 2.2 Description of individual course modules

TBA = to be announced (by the course organizing entity)

This document shows selected learning outcomes of each module. For a full description, see the document “BioS modular curricula”.

### 2.2.1 Module 1: Introduction to Bioinformatics

• type of course module (compulsory, optional): compulsory

- level of course module: EQF Level 5
- semester/trimester when the course module unit is delivered: TBA
- number of ECVET credits allocated: 4
- name of trainer(s): TBA
- learning outcomes of the course module:

After completing this module, the student will be able to:

- retrieve information and data regarding specific genes and proteins which could be chosen as candidate genes for a disease, e.g. functional information and sequence variant information
- perform analyses and comparisons to identify essential and non-essential parts in a gene or a protein, e.g. multiple sequence alignments using publicly available, web-based tools
- understand how applying such skills can lead to quick and cost-effective diagnoses of diseases and disorders with a genetic component
- mode of delivery (full-time, part-time, e-learning, synchronous/asynchronous sessions etc): TBA
- prerequisites and co-requisites: school biology knowledge of DNA and protein
- recommended optional programme components: none
- training content:
  - Biological databases, with main focus on DNA and protein sequences and on human genome data
  - Comparison and alignment of sequences, similarity-based searches in databases
  - Genome browsers
  - Micro-RNAs and their targets



- Metabolic pathway data as a resource for evaluating relevance of disease candidate genes
- Sources of gene expression data
- Case studies
- recommended or required reading: TBA
- planned learning activities and teaching methods: VOOC materials and TBA
- assessment methods and criteria: TBA (by guidelines of another BioS document)
- language of instruction: TBA

### **2.2.2 Module 2: Computational Statistics for clinical doctors**

- type of course module (compulsory, optional): compulsory
- level of course module: EQF Level 5
- semester/trimester when the course module unit is delivered: TBA
- number of ECVET credits allocated: 4
- name of trainer(s): TBA
- learning outcomes of the course module:
  - Understanding of how to choose appropriate statistical tests and how to assess statistical significance
  - Understanding of how to visualize data and carry out statistical testing
  - Understanding of R, a powerful programming language for statistical computing and graphics
  - Understanding selected kinds of analyses of biomedical data that a professional can carry out easily using e.g. the BioConductor package of R for the analysis of sequencing data from a patient
- mode of delivery (full-time, part-time, e-learning, synchronous/asynchronous sessions etc): TBA
- prerequisites and co-requisites: none
- recommended optional programme components: none
- training content:
  - Basic statistical techniques, including: descriptive statistics, elements of probability, hypothesis testing, nonparametric methods, correlation analysis, and linear regression

- How to choose appropriate statistical tests and how to assess statistical significance
- Biological data analysis with R: Demonstrations of how data can be visualized and tested within the R language environment, e.g. how variants can be identified from sequencing data
- Case study
- recommended or required reading: TBA
- planned learning activities and teaching methods: VOOC materials and TBA
- assessment methods and criteria: TBA (by guidelines of another BioS document)
- language of instruction: TBA

### **2.2.3 Module 3: Commercial personalized genomics services in patient care**

- type of course module (compulsory, optional): compulsory
- level of course module: EQF Level 5
- semester/trimester when the course module unit is delivered: TBA
- number of ECVET credits allocated: 4
- name of trainer(s): TBA
- learning outcomes of the course module:

After completing this module, the student should be able to:

- Explain single nucleotide polymorphisms (SNPs) and different types of SNPs
- Describe some example roles of SNP's in disease development
- Describe the basic principles of variant effect prediction for genetic variants in protein-coding genes and in micro-RNA genes
- Use reports in patient care from commercial personal genomics services
- Interpret SNP-related increased and decreased risks in selected diseases
- Interpret commercial reports and translate them to actions in appropriate health care segments
- mode of delivery (full-time, part-time, e-learning, synchronous/asynchronous sessions etc): TBA
- prerequisites and co-requisites: Modules 1 and 2 of this programme are required before taking this module
- recommended optional programme components: none

- training content:
  - SNPs and their role in health and disease
  - Disease risk related statistics and their interpretation
  - Overview of reports from the following services: 23andMe, deCODE, Gene by Gene
  - Translating example reports to non-disease phenotypes with selected example traits, e.g. bitter taste perception
  - Translating example reports to disease risks with selected example diseases, e.g. asthma
  - Translating example reports to drug response traits with relevant examples, e.g. Warfarin sensitivity
  - Case study
- recommended or required reading: TBA
- planned learning activities and teaching methods: VOOC materials and TBA
- assessment methods and criteria: TBA (by guidelines of another BioS document)
- language of instruction: TBA

#### **2.2.4 Module 4: Quality Improvement in Healthcare**

- type of course module (compulsory, optional): compulsory
- level of course module: EQF Level 5
- semester/trimester when the course module unit is delivered: TBA
- number of ECVET credits allocated: 2
- name of trainer(s): TBA
- learning outcomes of the course module:

After completing this module, the Learner:

- Communicates disease and risk information to patients in understandable and compassionate ways
- Helps patients make informed decisions of treatment or non-treatment of discovered diseases
- Identifies and addresses the differences in patients' values, preferences and expressed needs
- Aims at a coaching culture that supports consistent exceptional care and service

- mode of delivery (full-time, part-time, e-learning, synchronous/asynchronous sessions etc): TBA
- prerequisites and co-requisites: none
- recommended optional programme components: none
- training content:
  - Concepts related to disease risk assesment
  - Communication and Management in Healthcare
  - Risk Management in Healthcare
  - Decision making in Healthcare
- recommended or required reading: TBA
- planned learning activities and teaching methods: VOOC materials and TBA
- assessment methods and criteria: TBA (by guidelines of another BioS document)
- language of instruction: TBA