Islamic Republic of Iran
Ministry of Health and Medical Education
Deputy for Education

Biostatistics
Doctor of Philosophy (Ph.D.)

Total Course Credits

Core: 16
Non-core (Elective): 6
Thesis: 20

Program Description

Biostatistics is one of the main branches of basic medical sciences with an emphasis on its applied aspects in the field of medical health and biological sciences.
A graduate of the Doctorate (Ph.D.) in Biostatistics, in addition to being familiar with the basic and theoretical principles of this branch of science, should be able to educate and train young and elite personnel to invent and develop new methods related to mastering advanced methods of statistical analysis, in addition to conducting research in this field, should be able to provide consulting services to other researchers and provide training if needed.

Admission Requirements

- Possession of a master's degree in biostatistics (Vital statistics or Medical statistics)

Expected Competencies at the End of the Program

General Competencies*

- The general competencies expected of graduates of this level are:
- Communication and interaction skills
- Education
- Research and writing scientific articles and reports
- Critical thinking and problem-solving skills
- Management skills: policy-making, planning, organizing, monitoring, supervision, control and evidence-based evaluation
- Familiarity with the concepts of social responsibility

Educational Strategies, Methods and Techniques*

- The following teaching methods and techniques will be used in this course: Lecture-based lectures
- Exploratory question and answer problem solving
- Working with specialized software and programming
- Interdepartmental conferences and seminars
- Discussion in small groups - Workshops - Journal club and book reading - Case presentation

- Use of simulation techniques and distance learning according to the possibilities
- Use of learning management systems (LMS) in blended learning

Student Assessment (Types and Methods)

As will be discussed in each lesson, learners will be assessed using a combination of the following methods:

- Written, Oral, Project Assessment, Computer-based Interactive Test, 360-degree test, Portfolio Assessment and Log Book Assessment

Assessment Frequency

- Intra-group tests are available to the teaching team. Typically, there will be two mid-term and end-of-term assessments in each lesson. Continuous assessment is also recommended in practical units.

Ethical Considerations

*Note: The related document(s) can be found at http://hcmep.behdasht.gov.ir/

Table of the Courses

Table 1. Compensatory Courses*

Code	Title	Theoretical		Practical		Internship		Total		Prerequisite or Concurrent Courses
		Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	
01	**Advanced Epidemiology**	2	34	-	-	-	-	2	34	-
02	**Data mining principles and methods**	2	34	-	-	-	-	2	34	-
03	**Categorical data analysis**	2	34	-	-	-	-	2	34	-
04	**Computational and Bayesian Statistics in the Life Sciences**	2	34	-	-	-	-	2	34	-
05	**Statistical simulation**	2	34	-	-	-	-	2	34	-
06	**Medical information systems****	0.5	9	0.5	17	-	-	1	26	-
07	**Principles and foundations of disaster risk management****	1	17	1	34	-	-	2	51	-

*The student is required to take all or some of the deficiency or compensatory courses (Table 1) as determined by the relevant educational department and approved by the University's Graduate Education Council.

**Taking these courses is mandatory for all students who have not previously taken them.

Table 2. Core Courses

Code	Title	Theoretical		Practical		Internship		Total		Prerequisite or Concurrent Courses
		Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	
08	**Classical and Bayesian statistical inference**	3	51	-	-	-	-	3	51	-
09	**Advanced Categorical data analysis**	3	51	-	-	-	-	3	51	03
10	**Advanced survival data analysis**	2	34	-	-	-	-	2	34	08
11	**Advanced longitudinal data analysis**	3	51	-	-	-	-	3	51	08, 09
12	**Data mining and statistical learning methods**	3	51	-	-	-	-	3	51	02
13	**Design and analysis of advanced clinical trials**	2	34	-	-	-	-	2	34	-
14	**Thesis**	20								

Table 3. Optional/Elective Courses*

Code	Title	Theoretical		Practical		Internship		Total		Prerequisite or Concurrent Courses
		Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	Credit	Teaching hours	
15	**Statistical methods in genetics**	2	34	-	-	-	-	2	34	08, 12
16	**Machine learning theory in biological and health cloud data**	2	34	-	-	-	-	2	34	12
17	**Advanced computational statistics and simulation**	2	34	-	-	-	-	2	34	04, 05
18	**Spatial data analysis**	2	34	-	-	-	-	2	34	08, 09
19	**Advanced epidemiological methods and models**	2	34	-	-	-	-	2	34	01
20	**Advanced linear models**	2	34	-	-	-	-	2	34	-
21	**Applied programming and familiarity with databases**	1	17	1	34	-	-	2	51	-

*The student must take 6 credits from the courses in the table above, appropriate to the topic of the thesis, after approval from the supervisor.

Titles of required training workshops for the course

Workshop name	Titles	Teaching hours
Introduction to new teaching methods**	Types of teaching methods, using new tools in teaching, virtual teaching, virtual learning platforms, using simulation in teaching, how to use artificial intelligence tools in teaching	20
How to write an original research paper?*	Types of articles Structure of original research articles Choosing a suitable title, writing an introduction, writing a methodology, writing findings, writing a discussion and conclusion, writing an abstract	12
How to publish an article?**	Choosing the right journal, preparing the article for submission, ethics in publishing, authorship and participation, plagiarism, conflict of interest, overlapping articles, how to correspond with the journal, and how to respond to the refereeing results.	6
Systematic Review*	Determining strategy, databases of articles and research reports, methods of searching and selecting articles, screening and categorizing articles, qualitative evaluation of articles and familiarity with their critical review tools, how to summarize and write results	16
Meta-analysis Workshop*	Determining the title for meta-analysis based on different studies (observational-interventional), extracting information from selected articles and preparing them for analysis, examining homogeneity and subgroup analysis, meta-analysis of mean indices, HR, OR, RR, publication bias and meta-regression analysis, sensitivity analysis	24
Introduction to Python Programming*	Introduction and general principles, loops and functions, data structures in Python, libraries	48
R and RStudio programming*	How to install, define variables, define vectors and matrices, important commands and functions, distributions and statistics, transformations and normalization, visualization, maximum likelihood estimation, regression models	48
Advanced SAS**	How to analyze, functions, libraries and macros	48
MATLAB**	Modeling, statistical analysis, fuzzy logic, image processing, neural network	
Database (SQL Server)**	How to install, familiarize yourself with the program environment, operators, conditional statements, columns and fields, data management Introduction to other databases (MS SQL, Oracel)	32
Methods of using artificial intelligence tools in analyzing large databases **	How to install tools, how to use dialogs, how to introduce data, how to maintain data security, high-dimensional data and hyperparameters, interactive commands	48
Design and development of dynamic prediction models**	Differences between classical statistical models and dynamic models, data structures, general principles of using existing tools	48

*These workshops are mandatory for all students who have not completed a master's degree or a Ph.D. degree at a center approved by the department.

**It is mandatory to complete all or some of these workshops if approved by the department and supervisor.