**Department of Epidemiology & Population Health**

**EPHD 319**

**Advanced quantitative methods in epidemiology**

**[1 credit]**

**Course Syllabus**

**Spring Semester, Academic Year 2023-2024**

**Class time and Venue:**

**Dates and times:** Wednesday 2:30 pm – 3:45 pm

**Venue:** Van Dyck building, room 101

**Course Instructors and Contact Details:**

**Name:** Khalil El-Asmar (PhD), Assistant Professor

**Email:** [ke05@aub.edu.lb](mailto:ke05@aub.edu.lb)

**Office Hours:** By appointment, Van Dyck building, room 215

**Course Description:**

This course will provide students with an overview of the theory and applications of advanced quantitative methods in epidemiology. The purpose of the course is to assist students in answering complex etiological research questions in epidemiology. The course includes two main modules:

- Cox models with time-varying coefficients

- Competing risk analysis

**Course learning Objectives**

**By the end of the course, students will be able to:**

1. Analyze Survival data with time varying coefficients
2. Analyze competing risks using separate cox models and Fine and Gray models
3. Describe the independence assumption needed in the analysis of competing risks.
4. Explain statistical outputs from competing risk analysis in simple and clear terms.
5. Write R and Stata codes to analyze correlated data and competing risks.

**Council on Education for Public Health (CEPH) Core/Concentration Competencies mapped to EPHD 319**

* Perform advanced statistical analysis on data from different epidemiological studies
* Identify and conduct the appropriate data analysis methods using a computerized software program
* Demonstrate ability to critically assess the results of their own or others’ epidemiological studies

**Essential Skills**

* **Essential Skill 1: Advanced data analysis**
* **Essential Skill 2: Advanced use of statistical programming languages.**

**Link to** [**PHEO Faculty Portal**](https://sites.aub.edu.lb/fhspheo/coursedevelop/)

**Course Learning Objectives mapped to CEPH competencies**

**Table 1. Mapping of course LO to CEPH competencies**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** |
| **Perform advanced statistical analysis on data from different epidemiological studies** | X | X | X |  |  |
| **Identify and conduct the appropriate data analysis methods using a computerized software program** |  |  |  | X | X |
| **Perform advanced statistical analysis on data from different epidemiological studies** |  |  | X | X |  |

**Assigned Text Book and Readings (if applicable)**

EPHD 319 has a **recommended** textbook:

Survival Analysis: A Self-Learning Text. Third Edition, Kleinbaum et al.

*Additional Suggested Instructions:*

The course will also use an assortment of educational resources including: publications, reports, white papers, videos and case studies. All course readings, except for book chapters, will be posted on Moodle according to the weekly topic and reading schedule. It is the responsibility of students to access the Moodle and download/ print the course readings as per the weekly schedule.

**Course requirements and Student evaluation:**

**Pre-requisite:** EPHD 313 – EPHD 320 or the instructor’s approval.

**Student Evaluation:**

**Table-2 Summary of students' assessments mapped to course learning objectives**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Learning Objectives | | | | | | |
|  | LO1 | LO2 | LO3 | LO4 | LO5 |  |  |
| Assignment 1 | X |  |  | X | X |  |  |
| Assignment 2 |  | X | X | X | X |  |  |
| Knowledge check 1 | X | X | X |  |  |  |  |

**Table -3 Description of Assessment methods, Due Dates and Corresponding Learning Objectives**

| **Assessment method** | **Date (tentative)** | **Grade percentage** |
| --- | --- | --- |
| ***Assignment 1*** | *13 March 2024* | *30%* |
| In this assignment, students will begin by analyzing survival data from a prospective cohort study. They will formulate a hypothesis, run cox PH models with time varying coefficients, and evaluate the assumptions of the chosen model. Finally, students will interpret and draw conclusions from their results. | | |
| ***Assignment 2*** | *3 April 2024* | *30%* |
| In this assignment, students will begin by analyzing competing risks from a clinical study. They will formulate a hypothesis, run the appropriate analysis, test the independence assumption, and evaluate it. Finally, students will interpret and draw conclusions from their results. | | |
| ***Knowledge check*** | *24 April 2024* | *40%* |
| The exam will test theoretical and conceptual knowledge for models that analyze survival data with time varying coefficients and competing risks. Students will interpret statistical outputs and draw the appropriate conclusions. | | |

**Policies and other General Notes:**

**Attendance**:

"Students who miss more than one-fifth of the sessions of any course in the first ten weeks of the semester (five weeks in the case of the summer term) are dropped from the course if the faculty member has stated in the syllabus that attendance will be taken."

**Moodle Surveys:**

This course uses Moodle as the Learning Management system. Your AUBnet account will allow you access to the course content and activities, by logging into: http://moodle.aub.edu.lb

**Academic integrity:**

Education is demanding and you need to properly manage your time. Do not hesitate to use the resources around you but do not cut corners. Cheating and plagiarism will not be tolerated. Review the Student Code of Conduct and familiarize yourself with definitions and penalties. Cheating might earn you a failing mark on the assignment, at the very least. You might fail the course in which you cheated, be warned, suspended or expelled from University and a permanent mention of the disciplinary action might be made in your student records. If you’re in doubt about what constitutes plagiarism, ask your instructor because it is *your* responsibility to know. Remember that the American University of Beirut has a strict anti-cheating and anti-plagiarism policy. Do not become a lesson to others.For further information, kindly visit AUB’s Policies and Procedures or

<http://pnp.aub.edu.lb/general/conductcode.>

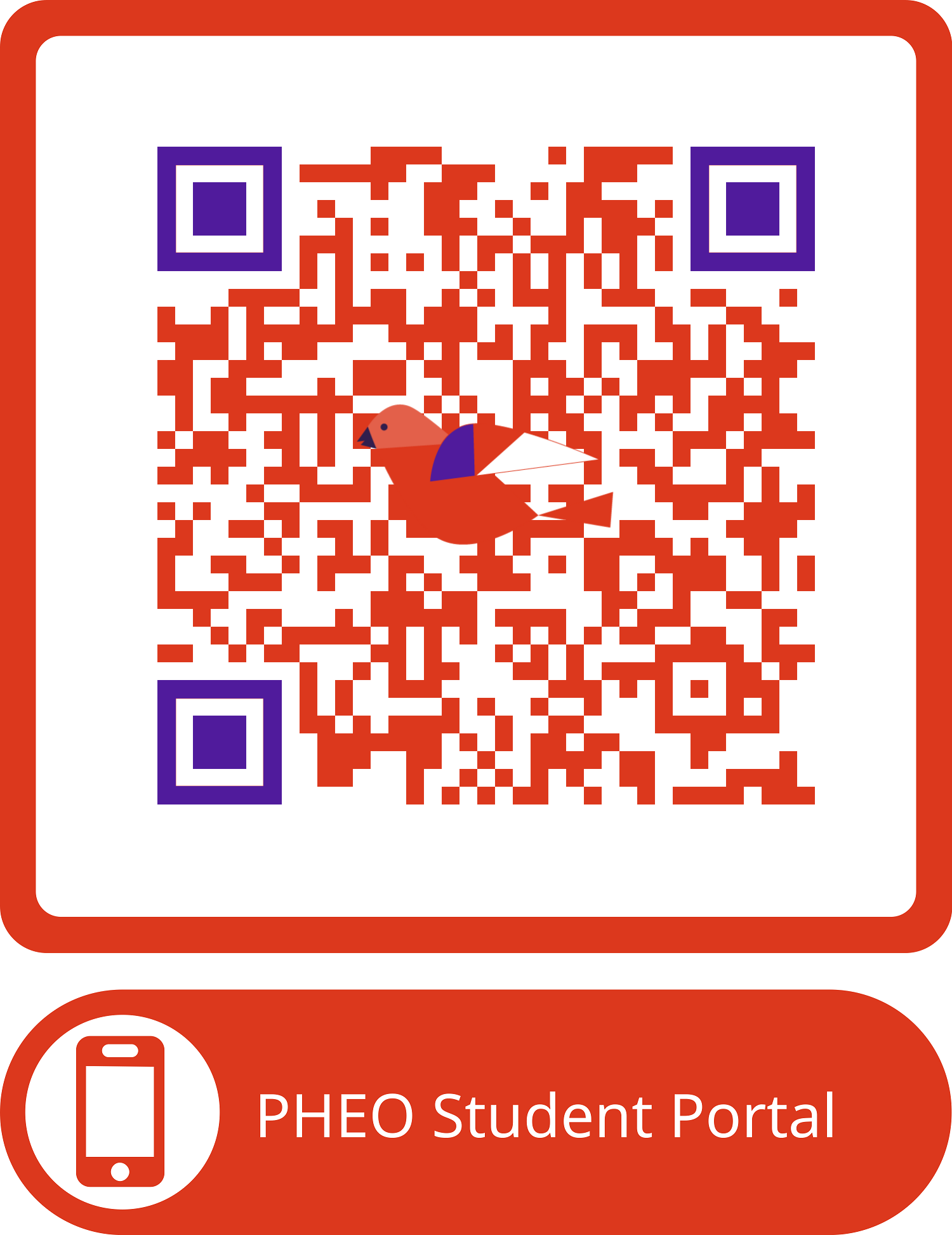
**Students with Disabilities:**

If you have a disability, for which you may request accommodation in AUB classes, consult the website for more information and make arrangements with the Coordinator (http://www.aub.edu.lb/sao/Pages/Students\_20with\_20Special\_20Needs.aspx). Also, please see the instructor of this course privately in regard to possible support services that can be provided to you.

**Non-Discrimination- Title IX- AUB:**

AUB is committed to facilitating a campus free of all forms of discrimination including sex/gender-based harassment prohibited by Title IX. The University’s non-discrimination policy applies to, and protects, all students, faculty, and staff. If you think you have experienced discrimination or harassment, including sexual misconduct, we encourage you to tell someone promptly. If you speak to a faculty or staff member about an issue such as harassment, sexual violence, or discrimination, the information will be kept as private as possible, however, faculty and designated staff are required to bring it to the attention of the University’s Title IX Coordinator. Faculty can refer you to fully confidential resources, and you can find information and contacts at [www.aub.edu.lb/titleix](https://www.aub.edu.lb/titleix). To report an incident, contact the University's Title IX Coordinator Trudi Hodges at 01-350000 ext. 2514, or [titleix@aub.edu.lb](mailto:titleix@aub.edu.lb). An anonymous report may be submitted online via EthicsPoint at [www.aub.ethicspoint.com](https://www.aub.ethicspoint.com/).

**Accessible Education Office (AEO):**

The Accessible Education Office (AEO) coordinates academic accommodations and services for all eligible AUB students with disabilities (such as ADHD, learning difficulties, mental health conditions, chronic or temporary medical conditions, and others). If you have a disability for which you wish to request accommodations at the department, faculty or university level, please contact AEO as soon as possible. Once you register with our office, we will assist you in receiving appropriate accommodations and will liaise with your instructors and any related entity to best support your needs. AEO is located in West Hall room 314, and can be reached by phone at 1-350000 ext. 3246 or by email: [accessibility@aub.edu.lb](mailto:accessibility@aub.edu.lb). Information about our services can be found at: <https://www.aub.edu.lb/SAO/Pages/Accessible-Education.aspx>

**Writing:**

Written communication is essential for communication, health education and behavioral science. You are expected to proofread and spell-check any written documents before submission. Points will be deducted from the grades for low quality writings. You are encouraged to contact AUB’s Writing Center, located in Ada Dodge Hall, 2nd floor or West Hall, 3rd floor. Appointments can be booked online: <https://aub.mywconline.com/>, over the phone (Ext. 4077) or by walking in.

**Public Health Education Office:**

Please refer to the Public Health Education Office Student Portal

**The use of AI:**

In the context of graduate epidemiology courses, the integration of Artificial Intelligence (AI) tools such as ChatGPT presents both opportunities and ethical challenges. While these tools can assist in data analysis, literature review, and idea generation, it is imperative to establish clear guidelines for their ethical use. Students can use AI as a supplementary resource to enhance their understanding and analytical skills, but not as a replacement for their original work. Assignments and projects should reflect the student's own critical thinking, understanding, and problem-solving abilities. It's important to foster an academic environment where AI is used responsibly, with students citing any AI assistance as they would any other source.

**Detailed course outline:**

Schedule of Lectures, Practical Sessions, Readings and Assessments

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| --- | --- | --- | --- |
|  | **Detailed course schedule** | **Course learning objective** | **CEPH or distinct competency** |
| 17 Jan, 2024 | Course intro | LO1, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 24 Jan, 2024 | Introduction to survival analysis | LO1, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 31 Jan, 2024 | Article discussion + Application session | LO1, LO5 | **Identify and conduct the appropriate data analysis methods using a computerized software program** |
| 7 Feb, 2024 | Cox Model | LO1, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 14 Feb, 2024 | Cox Model | LO1, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 21 Feb, 2024 | Application session | LO1, LO4, LO5 | **Identify and conduct the appropriate data analysis methods using a computerized software program** |
| 28 Feb, 2024 | Cox Model with Time varying coefficient | LO1, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 6 March, 2024 | No Class | LO1, LO4, LO5 |  |
| 13 March, 2024 | Application session + Assignment 1 (Take home) | LO2,LO3, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 20 March 2024 | Article Discussion | LO1, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 27 March, 2024 | Competing risk analysis | LO2,LO3, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 3 April 2024 | Assignment 2 (Take Home) | LO1, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 10 April 2024 | Application session | LO2,LO3, LO4, LO5 | **Identify and conduct the appropriate data analysis methods using a computerized software program** |
| 17 April 2024 | Article Discussion | LO2,LO3, LO4, LO5 | **Perform advanced statistical analysis on data from different epidemiological studies** |
| 24 April 2024 | Final Exam | LO1, LO2, LO3, LO4, LO5, LO6, LO7 | **Perform advanced statistical analysis on data from different epidemiological studies** |

**Appendix I. Reinforced – Introduced CEPH competencies**

Introduced competencies: the competency is introduced at a basic level. Instruction and learning activities focus on basic knowledge, skills and entry-level complexity. The competency is **not assessed**

Reinforced competency: The competency is reinforced with feedback; students demonstrate the outcome at an increasing level of proficiency (above the introductory stage). Instruction and learning activities concentrate on enhancing and strengthening existing knowledge and skills, as well as expanding complexity. The competency is **not assessed**

| **Core Competencies** | **Introduced** | **Reinforced** |
| --- | --- | --- |
| CC1. Apply epidemiological methods to the breadth of settings and situations in public health practice |  | x |
| CC2. Select quantitative and qualitative data collection methods appropriate for a given public health context |  | x |
| CC3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate | x |  |
| CC4. Interpret results of data analysis for public health research, policy or practice |  | x |
| CC5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings |  |  |
| CC6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels |  |  |
| CC7. Assess population needs, assets and capacities that affect communities’ health |  |  |
| CC8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs |  |  |
| CC9. Design a population-based policy, program, project or intervention |  |  |
| CC10. Explain basic principles and tools of budget and resource management |  |  |
| CC11. Select methods to evaluate public health program |  |  |
| CC12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence |  |  |
| CC13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes |  |  |
| CC14. Advocate for political, social or economic policies and programs that will improve health in diverse populations |  |  |
| CC15. Evaluate policies for their impact on public health and health equity |  |  |
| CC16. Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making |  |  |
| CC17. Apply negotiation and mediation skills to address organizational or community challenges |  |  |
| CC18. Select communication strategies for different audiences and sector |  |  |
| CC19. Communicate audience-appropriate public health content, both in writing and through oral presentation |  |  |
| CC20. Describe the importance of cultural competence in communicating public health content |  |  |
| CC21. Integrate perspectives from other sectors and/or professions to promote and advance population health |  |  |
| CC22. Apply systems thinking tools to a public health issue |  |  |

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| **HPCH competencies** | **Introduced** | **Reinforced** |
| HPCHCC1. Demonstrate a critical understanding of multidisciplinary theories/frameworks utilized in health promotion research and practice |  |  |
| HPCHCC2. Employ theoretical knowledge and methodological skills in health promotion program planning, implementation, monitoring, and evaluation |  |  |
| HPCHCC3. Conduct rigorous quantitative and qualitative research for health promotion |  |  |
| HPCHCC4. Use participatory approaches in community health programs and research |  |  |
| HPCHCC5. Promote social justice and equity in health promotion research, practice, and policy |  |  |

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| --- | --- | --- |
| **HMPD competencies** | **Introduced** | **Reinforced** |
| HMPCC1: Assess how the structure, organization, delivery, and financing of health care systems affect system performance in terms of efficiency, quality, equity, and effectiveness |  |  |
| HMPCC2: Apply systems thinking approaches to improve healthcare organizations’ performance and responsiveness |  |  |
| HMPCC3: Apply quality tools and concepts to evaluate and improve performance in health care organizations |  |  |
| HMPCC4: Apply the principles of planning, budgeting, management and evaluation in healthcare related programs and projects |  |  |
| HMPCC5: Analyze relevant financial data for efficient management of healthcare programs and organizations |  |  |
| HMPCC6: Utilize health information systems and data analytics to support evidence-based decision making at the organizational and system levels |  |  |
| HMPCC7: Apply public policy principles, frameworks and tools to understand health problems and priorities |  |  |
| HMPCC8: Evaluate policy options to address health challenges including economic, legal and political implications |  |  |
| HMPCC9: Utilize knowledge translation strategies and tools to communicate effectively and influence health policy and system decision making |  |  |

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| --- | --- | --- |
| **EPHD competencies** | **Introduced** | **Reinforced** |
| EBCC1: Discuss the extent, distribution and determinants of common and emerging communicable and non-communicable diseases, and mental health disorders of local, regional and global importance |  | **x** |
| EBCC2: Discuss prevention and control strategies/programs for common and emerging communicable and non-communicable diseases and mental health disorders |  | **x** |
| EBCC3: Design epidemiological studies to investigate public health research questions |  |  |
| EBCC4: Demonstrate ability to write software codes in order to manage and analyze health data through the use of multiple statistical software |  | **x** |
| EBCC5: Apply inferential statistics and advanced statistical approaches such as regression modelling to analyze complex health related data |  | **x** |
| EBCC6: Interpret and communicate statistical findings in oral and written format |  | **x** |
| EBCC7: Review, synthesize and communicate published epidemiological findings in oral and written format |  | **x** |
| EBCC8: Appraise the quality of epidemiological evidence by evaluating studies for bias and other sources of systematic errors |  | **x** |
| EBCC9: Analyze Health related data using advanced statistical techniques and software packages |  | **x** |