# City University of Hong Kong
## Course Syllabus

### offered by Department of Biostatistics
### with effect from Semester A 2024/25

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**Part I     Course Overview**

**Course Title:**      **Survival Analysis**

**Course Code**:      **BIOS6904**

**Course Duration:**      **1 Semester**

**Credit Units**:      **3 CUs**

**Level**:      **P6**

**Medium of Instruction:**      **English**

**Medium of Assessment:**      **English**

**Prerequisites**:
*(Course Code and Title)*      **Nil**

**Precursors**:
*(Course Code and Title)*      **Nil**

**Equivalent Courses**:
*(Course Code and Title)*      **Nil**

**Exclusive Courses**:
*(Course Code and Title)*      **Nil**

**Part II    Course Details**

1.  **Abstract**
    This course aims to educate students about estimation procedures needed for time to event and other right-censored data.   It will begin with examples of such data and then describe types of censoring and truncation, distributions relevant for time to event data, and assumptions commonly made in conjunction with their analysis.   Students will then learn about estimation techniques for univariate survival curves and common summaries of them such as medians, other quantiles, and restricted means.   The course will then discuss models for multivariate situations with time to event outcomes including those with accelerated life and proportional hazards assumptions.   These will begin by making parametric restrictions which are then relaxed to the nonparametric cases.   Finally, frailty and other models for multivariate outcomes will be described.   The R statistical software package is used throughout the course to analyze survival data examples and enable students, on completing the course, to analyze and interpret real time to event data arising from observational studies, clinical trials, and other sources.

2.  **Course Intended Learning Outcomes (CILOs)**
    *(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)*

| No. | CILOs | Weighting (if applicable) | Discovery-enriched curriculum related learning outcomes (please tick where appropriate) | | |
|---|---|---|---|---|---|
| | | | *A1* | *A2* | *A3* |
| 1. | Explain the fundamental concepts and methods. | 20% | ✓ | ✓ | |
| 2. | Develop a solid understanding of the techniques. | 20% | ✓ | ✓ | |
| 3. | Conduct a thorough reading of the literature and know current state-of-the-art tools. | 30% | ✓ | ✓ | ✓ |
| 4. | Apply the techniques and methods to real data applications. | 30% | ✓ | ✓ | ✓ |
| | | 100% | | | |

*A1:    Attitude*
*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*
*A2:    Ability*
*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.*
A3:    *Accomplishments*
*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

### 3. Learning and Teaching Activities (LTAs)
*(LTAs designed to facilitate students' achievement of the CILOs.)*

| LTA | Brief Description | CILO No. | | | | Hours/week (if applicable) |
| --- | --- | --- | --- | --- | --- | --- |
| | | 1 | 2 | 3 | 4 | |
| Lectures | Learning through teaching is primarily based on lectures | ✓ | ✓ | ✓ | ✓ | 3 hours/week |
| Assignments | Learning through take-home assignments helps students understand the key concepts and acquire the techniques | ✓ | ✓ | ✓ | ✓ | After class |

### 4. Assessment Tasks/Activities (ATs)
*(ATs are designed to assess how well the students achieve the CILOs.)*

| Assessment Tasks/Activities | CILO No. | | | | Weighting | Remarks |
| --- | --- | --- | --- | --- | --- | --- |
| | 1 | 2 | 3 | 4 | | |
| Continuous Assessment: 60% | | | | | | |
| Assignments | ✓ | ✓ | ✓ | ✓ | 40% | Help to train students with basic knowledge, concepts, and analysis techniques |
| Midterm/quizzes | ✓ | ✓ | ✓ | ✓ | 20% | Test students' capabilities in applying the knowledge to solve relevant problems |
| Examination: 40% (duration: 3 hours) | ✓ | ✓ | ✓ | ✓ | 40% | Examination questions are designed to see how well students have achieved the learning objectives and acquired the requisite techniques for problem-solving |
| | | | | | 100% | |

## 5. Assessment Rubrics

*(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)*

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B, B-) | Fair (C+, C, C-) | Marginal (D) | Failure (F) |
|---|---|---|---|---|---|---|
| 1. Assignments | Problem solving skills | Consistently exhibits adept comprehension of time to event data analysis principles and their practical implementation | Sufficiently applies time to event data analysis concepts to moderately complex problems | Demonstrates a moderate understanding of time-to-event data analysis concepts and their practical application to intermediate-level problems. | Displays basic grasp of time to event data analysis concepts and their application to straightforward problems. | Shows limited comprehension of time to event data analysis concepts and lacks the ability to apply them to problem-solving |
| 2. Midterm/quizzes | Problem solving based on comprehensive understanding | Exhibits a thorough grasp of time to event data analysis concepts and effectively applies them to intricate problems | Displays sufficient understanding of time to event data analysis concepts and effectively applies them to moderately complex problems | Exhibits a moderate level of comprehension regarding time-to-event data analysis concepts and effectively applies them to intermediate-level problems. | Shows basic comprehension of time to event data analysis concepts and applies them to straightforward problems | Displays limited grasp of time to event data analysis concepts and lacks the ability to apply them to problem-solving |
| 3. Examination | Problem solving based on comprehensive understanding | Consistently exhibits a deep understanding of time to event data analysis concepts and effectively applies them to complex problems | Effectively applies time to event data analysis concepts to moderately complex problems, demonstrating sufficient understanding | Applies time-to-event data analysis concepts to intermediate-level problems with a moderate level of understanding. | Applies time to event data analysis concepts to simple problems with a basic understanding | Lacks understanding of time to event data analysis concepts and cannot apply them to problem-solving |

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B) | Marginal (B-, C+, C) | Failure (F) |
|---|---|---|---|---|---|
| 1. Assignments | Problem solving skills | Consistently exhibits adept comprehension of time to event data analysis principles and their practical implementation | Sufficiently applies time to event data analysis concepts to moderately complex problems | Displays basic grasp of time to event data analysis concepts and their application to straightforward problems. | Shows limited comprehension of time to event data analysis concepts and lacks the ability to apply them to problem-solving |
| 2. Midterm/quizzes | Problem solving based on comprehensive understanding | Exhibits a thorough grasp of time to event data analysis concepts and effectively applies them to intricate problems | Displays sufficient understanding of time to event data analysis concepts and effectively applies them to moderately complex problems | Shows basic comprehension of time to event data analysis concepts and applies them to straightforward problems | Displays limited grasp of time to event data analysis concepts and lacks the ability to apply them to problem-solving |
| 3. Examination | Problem solving based on comprehensive understanding | Consistently exhibits a deep understanding of time to event data analysis concepts and effectively applies them to complex problems | Effectively applies time to event data analysis concepts to moderately complex problems, demonstrating sufficient understanding | Applies time to event data analysis concepts to simple problems with a basic understanding | Lacks understanding of time to event data analysis concepts and cannot apply them to problem-solving |

**Part III   Other Information** (more details can be provided separately in the teaching plan)

1.   **Keyword Syllabus**
     *(An indication of the key topics of the course.)*

     Time to event analysis, survival models, failure time models, censoring, clinical trials

2.   **Reading List**
**2.1   Compulsory Readings**
     *(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

     Nil.

**2.2   Additional Readings**
     *(Additional references for students to learn to expand their knowledge about the subject.)*

| 1. | Survival Analysis: Techniques for Censored and Truncated Data, 2$^{nd}$ ed. (Springer) by Klein, J. and Moeschberger, M. |
|----|---|
| 2. | Modern Applied Statistics with S (Springer) by Venables, W.N. and Ripley, B., Ch. 13. |
| 3. | Modeling Survival Data: Extending the Cox Model (Springer) by Therneau, T.M. And Grambsch, P.M. |