Course Code	HP4012
Course Title	Applied Multivariate Methods for Psychological Research
Pre-requisites	HP3101 Applied Statistical Methods for Psychological Research, or HP3804 Psychological Testing
No of AUs	4 AUs

Course Aims

Multivariate methods are a set of tools for analyzing multiple variables (obtained from multiple time points, multiple measures and/or multiple samples) in an integrated and powerful manner. It can enrich our understanding of the interrelatedness between and within sets of variables and provide greater assurance that we come to some conclusions with more validity than if we were to analyze these variables in isolation. The focus of this course is the analysis, interpretation, and reporting multivariate statistical analyses frequently used in psychological studies. It prepares students with advanced quantitative skills for conducting independent research.

Intended Learning Outcomes (ILO)

By the end of this course, you should be able to:

(1) *describe* and *explain* the relevant concepts and assumptions of the multivariate statistical techniques discussed in the course;
(2) *decide* appropriate multivariate statistical methods for data analysis involving multiple outcome variables;
(3) *conduct* multivariate analysis using software package such as SPSS and Mplus;
(4) *draw* valid conclusions from the results of multivariate analysis.

Course Content

This course is designed to help students effectively apply, interpret, and evaluate different multivariate statistical techniques. Conceptual understanding, including appropriate circumstances for use of each technique, the development of practical "how-to" skills, and an understanding of the trade-offs made in technique choice will be emphasized. Students will gain hands-on experience through several project assignments throughout the semester. These assignments will require students to learn how to draw statistical and substantive conclusions from the results of their analyses. Students will prepare written summaries of results using APA or accepted writing guidelines that are common formats for journals in psychology. Topics covered in this course include factor analysis, structural equation modeling, MANOVA, logistic regression and cluster analysis, etc.

Assessment (includes both continuous and summative assessment)

Component	ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual
1. Assignments	1, 2, 3, 4	Competence Communication Creativity	40%	Individual
2. Class Participation	1, 2, 3, 4	Competence Communication	5%	Individual

		Character Creativity		
3. Group project presentation	1, 2, 3, 4	Competence Communication Character Creativity	20%	Team/Individual
4. Group Project Report	1, 2, 3, 4	Competence Communication Character Creativity	35%	Team/Individual
Total			100%	

Formative feedback

Feedback is central to this course. Students will receive feedbacks from the course instructor about their quizzes, and assignments. For group project, students can arrange consultation with instructors to discuss their ideas. Feedback will be provided to them on the data analysis plan so to ensure students on the right track.

Learning and Teaching approach

Approach	**How does this approach support you in achieving the learning outcomes?**
Lecture	Interactive lectures on each topic to introduce students to the relevant concepts, knowledge areas, and practical concerns. [ILO 1,2,3,4]
Group project and project Presentation	Team based learning – allows students to apply theoretical and practical knowledge to develop a psychological test with sounded psychometric properties (good reliability and validity). [ILO 1,2,3,4]

Reading and References

Recommended References

[DTS] Dugard, P., Todman, J. & Staines, H. (2010). Approaching multivariate analysis: A practical introduction (2nd ed.).Routledge

[HBBAT] Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, R. L. (2018). Multivariate Data Analysis (8th ed.). Prentice Hall.

[PS] Pituch, K.A., & Stevens, J.P. (2016). Applied Multivariate Statistics for the Social Sciences: Analyses with SAS and IBM's SPSS (6th ed.), Routledge.

Course Policies and Student Responsibilities

Students are expected to complete all assigned class readings and activities, attend classes punctually and complete all scheduled assignments by due dates. Students are expected to take responsibility to follow up with course notes, assignments, and course related announcements for classes they have missed. Participation is expected in all discussions and activities. All missed assignments will have a zero grade. As

Psychology students, the guidelines of the American Psychological Association on referencing and citation are expected to be followed (see APA Publication Manual, 7th Edition).

Academic Integrity

Originality of work and appropriate acknowledgement of reference source are extremely important in the academic context. See here for the details:

https://ntulearn.ntu.edu.sg/bbcswebdav/courses/AI0001-Master/m/index.htm

As a psychology student, you are expected to follow the guidelines of the American Psychological Association on referencing and citation (see APA Publication Manual, 7th Edition).

As a student of NTU, you are expected to uphold the Honor Code against plagiarism and collusion. Plagiarism and collusion are defined as the following in the Honor Code:

> Plagiarism: "To use or pass off as one's own, the writings or ideas of another, without acknowledging or crediting the source from which the ideas are taken."
>
> Collusion: "Submitting an assignment, project or report completed by another person and passing it off as one's own; Preparing an assignment, project or report for a fellow student who submits the work as his or her own."

Committing plagiarism and/or collusion in this course warrants serious penalty, see here for more details: http://www.sss.ntu.edu.sg/Programmes/Undergraduate/CurrentStudents/Pages/Plagiarism.aspx

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Overview of multivariate data analysis and multivariate data exploration	1,2,3,4	HBBAT Ch. 2
2	Exploratory Factor analysis: Theory	1,2,3,4	HBBAT Ch. 3 PS(Ch 9),
3	Exploratory Factor analysis: SPSS Hand-on	1,2,3,4	DTS Ch 8 (p.177-193)
4	Structural Equation Modeling: Basics	1,2,3,4	HBBAT Ch. 9
5	Structural Equation Modeling: Path Analysis & Confirmatory Factor Analysis	1,2,3,4	HBBAT Ch. 10, 11
6	Structural Equation Modeling: Mplus-on	3,4	http://www.statmodel.com/ugexcerpts.shtml
7	Structural equation approach to longitudinal data analysis	1,2,3,4	HBBAT Ch. 12
8	Multivariate analysis of variance 1: Between subjects design	1,2,3,4	HBBAT Ch. 6
9	Multivariate analysis of variance 2:	1,2,3,4	HBBAT Ch. 6

	Within subjects and split plot design		
10	Logistic regression	1,2,3,4	HBBAT Ch. 8
11	Cluster analysis	1,2,3,4	HBBAT Ch. 4
12	Project Presentation	1,2,3,4	Nil
13	Summary	1,2,3,4	Nil