

TIGP Bioinformatics Program
Advanced Statistical Methods in Bioinformatics (S2)
Spring 2026 Syllabus

For the latest syllabus, please visit the BP website: <https://idv.sinica.edu.tw/tigpbio/>

Place: Room 308, Institute of Statistical Science, Academia Sinica Time: Thursday 9:00-12:00 Chair: Dr. Grace S. Shieh (gshieh@stat.sinica.edu.tw) / Start from 2026/4/1—Dr. Shin-Sheng Yuan (syuan@stat.sinica.edu.tw) Outline: Introduction to useful and advanced statistical methods in computational biology. The topics include: Analysis of next generation sequencing (NGS) Data (e.g., RNA-Seq and ChIP-Seq), maximum likelihood estimation, the EM algorithm, Bayesian inference, Monte Carlo methods, Resampling (Bootstrap & permutation test), Human Genetics, clustering and classification, dimension-reduction and missing data. Prerequisite course: Fundamental Statistical Methods in Bioinformatics (S1) Textbook: N/A TA: N/A (Please refer to the lectures respectively shall you have any questions for each class)□ Grades: Midterm exam 50%. Final exam 50%.

【For Non-BP student】

For Non-BP student to register/sit-in any BP course, it is required to gain course chair's permission:

(1) Basic Enrollment Information form: <https://forms.gle/oK7vJzrx9EvybbT9>

(2) TIGP-BP Course Registration Consent Form:

https://idv.sinica.edu.tw/tigpbio/index/TIGP%20Bioinformatics_Class%20Registration%20Consent%20Form.docx

※ Deadline: **the 4th week** of each semester.

※ Signature of the course chair should be collected before submission. Incomplete form will not be accepted.

※Course grade will NOT be given (even class enrollment is completed at school) if fail to follow the above procedures.

Week	Date	Topics/Brief Description	Sub-topics/Detail Descriptions	Lecturers	Evaluation Method	Email
1	2026/2/25 (Wed) 9:00-12:00	Analysis of NGS data I	Analysis of DNA sequencing data	Dr. Shih-Kai Chu	Take-home exam with a specified deadline.	uhenivag@gm.ntpu.edu.tw
2	2026/3/4 (Wed) 9:00-12:00	Analysis of NGS data II	Analysis of RNA sequencing data	Dr. Shih-Kai Chu		
3	2026/3/12	Maximum likelihood estimates and the EM algorithm I	Maximum likelihood estimates	Dr. Yen-Tsung Huang	Take-home exam with a specified deadline.	ythuang@stat.sinica.edu.tw
4	2026/3/19	Maximum likelihood estimates and the EM algorithm II	The EM algorithm	Dr. Yen-Tsung Huang		
5	2026/3/26	Bayesian Statistics	prior dist., conjugate families & applications to genetics	Dr. Grace S. Shieh	In-class exam on midterm exam date	gshieh@stat.sinica.edu.tw
6	2026/4/2	Resampling methods	Bootstrap for hypothesis testing , confidence interval, and Permutation method	Dr. Grace S. Shieh	Take-home exam with a specified deadline.	
7	2026/4/9	Monte Carlo Markov Chains	Monte Carlo Markov Chains	Dr. Shin-Sheng Yuan	Take-home exam with a specified deadline.	syuan@stat.sinica.edu.tw
8	2026/4/16	Midterm Exam	--	--	--	--
9	2026/4/23	Prediction of Drug Response	Feature selection, logistic ridge, KNN, ML and transfer learning	Dr. Grace S. Shieh	No exam.	gshieh@stat.sinica.edu.tw
10	2026/4/30	Cluster Analysis	K-Means, Hierarchical Clustering, Heatmap, Cluster Validation	Dr. Han-Ming Wu	Take-home exam with a specified deadline.	wuhm@g.nccu.edu.tw
11	2026/5/7	Classification and Its Assessment	ROC Curve, Decision Tree, Ensemble Methods	Dr. Han-Ming Wu		
12	2026/5/14	Statistics in Human Genetics/Genomics I	Concept of Statistical Genetics, International Genomic Projects, Linkage Analysis, Genetic Association Analysis	Dr. Hsin-Chou Yang	Take-home exam with a specified deadline.	hsinchou@stat.sinica.edu.tw
13	2026/5/21	Statistics in Human Genetics/Genomics II	Genome-Wide Association Study, Gene-Gene Interaction, Rare Variant Analysis, Polygenic Risk Score	Dr. Hsin-Chou Yang		
14	2026/5/28	Advanced regression and dimension reduction I	Sliced Inverse Regression and PHD	Dr. Shin-Sheng Yuan	Take-home exam with a specified deadline.	syuan@stat.sinica.edu.tw
15	2026/6/4	Advanced regression and dimension reduction II	Liquid Association and related developments	Dr. Kang-Chung Yang	Take-home exam with a specified deadline.	kcyang@stat.sinica.edu.tw
16	2026/6/11	Final Exam	--	--	--	--