



UNIVERSITI TEKNOLOGI MARA

BMS661: PROTEOMICS

Course Name (English)	PROTEOMICS APPROVED
Course Code	BMS661
MQF Credit	3
Course Description	This course introduces the student to the field of proteomics, its wide usage and the technical aspects of proteomics analysis. We begin with a recap of the inter-relationship between DNA and proteins and the use of bioinformatics in proteomics. This is followed by the fundamentals of protein separation, identification and quantification using various methods. Emphasis will be given on modified proteins which have been the major target of proteomic studies and the specific techniques that are involved. Students will also be exposed to the various available techniques for determining interacting proteins and lastly the application of proteomics in multiple fields will be discussed.
Transferable Skills	Mining for proteomics data from online databases Performing two dimensional electrophoresis and Western Blotting
Teaching Methodologies	Lectures, Practical Classes
CLO	CLO1 Illustrate the principles and mechanisms for protein separation, identification and advance protein characterisation techniques. CLO2 Elaborate with relevant examples how developments in proteomics have help advance understanding of cellular biology and disease. CLO3 Perform laboratory experiments in protein separation and analysis and report the results. CLO4 Demonstrate autonomous learning ability to retrieve biological information from protein databases and public repositories for analysis.
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction 1.1) 1.1 Relationship between genome, transcriptome and proteome 1.2) 1.2 Rationale and scope of proteomics 1.3) 1.3 Challenges in proteomics	
2. Bioinformatics in proteomics 2.1) 2.1 Data mining from protein databases 2.2) 2.2 Useful information for experimental design 2.3) 2.3 Principle of protein sequence comparison 2.4) 2.4 Functional annotation 2.5) 2.5 Big data in proteomics 2.6) 2.6 Functional annotation	
3. Protein separation techniques 3.1) 3.1 2D gel electrophoresis 3.2) Basic protocol and methodology 3.3) Staining methods for total protein and modified proteins 3.4) Improvements for better separation and simpler analysis 3.5) Two differential gel electrophoresis 3.6) 3.7) 3.2 Mass Spectrometry 3.8) Principle of mass spectrometry 3.9) Basic components of mass spectrometry 3.10) Variable modification in mass spectrometry for optimum 3.11) separation	

4. Protein identification

- 4.1) 4.1 Chemical degradation
- 4.2) 4.2 Antibodies
- 4.3) Principle and protocol of Western Blotting
- 4.4) 4.3 Tandem Mass Spectrometry
- 4.5) Principle of accurate protein identification

5. Protein Quantification

- 5.1) 5.1 Gel-based densitometry
- 5.2) 5.2 Mass spectrometry labels in in vivo and in vitro

6. Interaction proteomics

- 6.1) 6.1 Array-based
- 6.2) 6.2 Library-based (yeast two hybrid)
- 6.3) 6.3 Assay-based (immunoprecipitation, FRET, pull down)

7. Application of proteomics

- 7.1) 7.1 Medical
- 7.2) • Proteins underlying diseases
- 7.3) • Proteins as biomarkers
- 7.4) 7.2 Pharmaceutical, drug discovery
- 7.5) 7.3 Microbial proteomics
- 7.6) 7.4 Proteomics in biotechnology
- 7.7) 7.5 Proteomics in environment and others

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Bioinformatics and protein database mining assignment.	20%	CLO4
	Test	Test	10%	CLO1
	Written Report	One practical report as summary for the experiments that have been demonstrated.	20%	CLO3

Reading List	Recommended Text	Reference Book Resources
	<ul style="list-style-type: none"> • Josip Lovric 2011, <i>Introducing Proteomics from concepts to sample preparation, mass spectrometry and data analysis</i>, 1 Ed., 5, Wiley-Blackwell United Kingdom [ISBN: 978-047003524] • Nawin Mishra 2010, <i>Introduction to proteomics: Principles and Applications</i>, 7, Wiley United States [ISBN: 978-047175402] • Mirzaei, H., and Carrasco, M. 2016, <i>Modern Proteomics-Sample Preparation, Analysis and Practical Applications</i>, 24, Springer United States [ISBN: 978-331941446] 	<ul style="list-style-type: none"> • Barh, D., Zambare, V., Azevedo, V. 2017, <i>OMICS: Applications in Biomedical, Agricultural and Environmental Sciences</i>, 26, CRC Press United States [ISBN: 978-146656281] • Shah, H.N., Gharbia S.E 2017, <i>MALDI-TOF and Tandem MS for Clinical Microbiology</i>, 1 Ed., 23, Wiley Press United States [ISBN: 978-111896025] • Lytras, M.D., and Papadopoulou, P. 2017, <i>Applying Big Data Analytics in Bioinformatics ad Medicine (Advances in Bioinformatics and Biomedical Engineering)</i>, 1 Ed., 16, IGI Global United States [ISBN: 978-152252607] • Ahmed N 2016, <i>Microbial Genomics and Proteomics</i>, Intelliz Press United States [ISBN: 978-168251015]

Article/Paper List	This Course does not have any article/paper resources
Other References	This Course does not have any other resources