



UNIVERSITI TEKNOLOGI MARA

BMS653: BIOREMEDIATION TECHNOLOGY

Course Name (English)	BIOREMEDIATION TECHNOLOGY APPROVED
Course Code	BMS653
MQF Credit	3
Course Description	Bioremediation biotechnology utilizes microorganisms and biological systems for effective treatment of contaminated waters and wastewaters, clean up of industrial waste streams, and remediation of soils contaminated with hazardous and toxic chemicals. New, emerging technologies employs the use of biotechniques for the detoxification of hazardous chemicals, environmental biomonitoring, and microbial genetic engineering for bioremediation of air, water, and soil
Transferable Skills	Searching and extracting information from the internet on available technology for bioremediation of environmental problems. Designing and conducting bioremediation experiments.
Teaching Methodologies	Lectures, Lab Work, Case Study
CLO	CLO1 Illustrate the principles and mechanisms of the major microbial bioremediation reactions CLO2 Demonstrate social communication skills in a group task on bioremediation process. CLO3 Perform laboratory experiments in bioremediation.
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction to bioremediation 1.1) 1.1 Applicationsof and factors influencing bioremediation	
2. Microbial systems 2.1) 2.1 Types of microorganisms	
3. Microbial transformation reactions 3.1) 3.1 Aerobic biotransformations and Anaerobic biotransformations	
4. Microbial detoxification of specialty chemicals 4.1) 4.1 Insecticides, Herbicides, Fungicides, Petroleum hydrocarbons, 4.2) Polychlorinated biphenyls and halogenated aromatics, Industrial solvents and wastes and Xenobiotics	
5. Bioremediation of heavy metals 5.1) 5.1 Microbial transformation, Bioleaching, Biosorption, Bioaccumulation	
6. Bioremediation systems and processes 6.1) 6.1 In situ bioremediation and Ex-situ bioremediation 6.2) 6.2 Phytoremediation	
7. Microbial cleaning of gases 7.1) 7.1 Biofiltration and Bioscrubbing, Bioindicators, and Biomonitoring	
8. Emerging Bioremediation Technologies 8.1) 8.1 Carbon Dioxide Sequestering	

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	ASSIGNMENT	20%	CLO2
	Practical	mini project	10%	CLO3
	Test	test	20%	CLO1

Reading List	Recommended Text	Reference Book Resources
	<ul style="list-style-type: none"> • Ram Chandra 2015, <i>Advances in Biodegradation and Bioremediation of Industrial Waste</i>, CRC Press [ISBN: 1498700543] • Domenic Grasso 2017, <i>Hazardous Waste Site Remediation</i>, Routledge [ISBN: 9781351441438] • Maria S. Fuentes, Verónica L. Colin, Juliana M. Saez 2018, <i>Strategies for Bioremediation of Organic and Inorganic Pollutants</i>, CRC Press [ISBN: 9781351857376] 	<ul style="list-style-type: none"> • Surajit Das 2014, <i>Microbial Biodegradation and Bioremediation</i>, 1 Ed., Elsevier [ISBN: 9780128004821] • Michael R. Templeton , Prof. David Butler, 2013, <i>Introduction to Wastewater Treatment</i>, 1 Ed., Bookboon [ISBN: 9788776818432] • Rathoure, Ashok K. 2015, <i>Toxicity and Waste Management Using Bioremediation</i>, 1 Ed., IGI Global [ISBN: 9781466697355] • I. V Murali Krishna, Valli Manickam 2017, <i>Environmental Management</i>, 1 Ed., Butterworth-Heinemann [ISBN: 9780128119891] • Surajit Das, HIRAK Ranjan Dash 2017, <i>Handbook of Metal-microbe Interactions and Bioremediation</i>, 1 Ed., CRC Press [ISBN: 9781498762427] • Mogens Henze, Poul Harremoës, Erik Arvin, Jes LaCour Jansen 2013, <i>Wastewater Treatment</i>, Springer Science & Business Media [ISBN: 9783662226056] • Ebrahim Mohammadi Goltapeh, Younes Rezaee Danesh, Ajit Varma 2013, <i>Fungi as Bioremediators</i>, Springer [ISBN: 9783642338106] • Alireza Bahadori 2013, <i>Pollution Control in Oil, Gas and Chemical Plants</i>, Springer [ISBN: 9783319012339] • Jian-Jiang Zhong 2014, <i>Future Trends in Biotechnology</i>, Springer [ISBN: 9783642365089]
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	