

THOMAS ADEWUMI UNIVERSITY OKO		
COURSE OUTLINE		
Faculty	COMPUTING AND APPLIED SCIENCES	
Department	BIOLOGICAL SCIENCES	
Course title	PETROLEUM MICROBIOLOGY	
Year of study	4	
Course code	MCB 410	
Credit hours	2	
Contact hours	30	
Mode of delivery	CLASSROOM LECTURES	
Mode of assessment		WEIGHT%
Continuous assessment		30%
Final examination		70%
Total		100%
Course lecturers and Instructors	MR. BAMIDELE OLADAPO -LECTURER	
Course description	<p>Petroleum Microbiology is a specialized field of microbiology that focuses on the study of microorganisms and their interactions within petroleum reservoirs, production facilities, and related environments. It explores the roles of bacteria, archaea, and other microorganisms in various aspects of the petroleum industry, including oil exploration, production, refining, transportation, and environmental impact.</p>	
Course objectives	<p>This course will make it possible to understand</p> <ol style="list-style-type: none"> 1. The origin of fossil fuel and the role of microorganisms in their formation 2. The fundamentals of petroleum microbiology, its relevance in the oil and gas industry, and its impact on reservoir ecosystems. 3. The diverse range of microorganisms present in hydrocarbon-rich environments, including bacteria, archaea, and fungi. 4. The roles of microorganisms in processes such as biodegradation, production of secondary metabolites, and modification of reservoir properties. 5. Some negative effect of microbial activities such as reservoir souring caused by microbial sulfate reduction, as well as the microbial-induced corrosion of oil infrastructure. 	

	<ol style="list-style-type: none"> 6. The potential of microorganisms to remediate oil spills and polluted sites, and study effective bioremediation techniques. 7. Enhanced Oil Recovery (EOR) and Microbial Methods: microbial-enhanced oil recovery techniques and their applications, including the injection of microbes for improved oil extraction. 8. The influence of microorganisms on refining processes, such as the formation of fouling and corrosion in downstream facilities.
Learning outcomes	<p>By the end of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the origin of fossil fuel and the role of microorganisms in their formation 2. Understand the fundamentals of petroleum microbiology, its relevance in the oil and gas industry, and its impact on reservoir ecosystems. 3. Describe the diverse range of microorganisms present in hydrocarbon-rich environments, including bacteria, archaea, and fungi. 4. Explain the roles of microorganisms in processes such as biodegradation, production of secondary metabolites, and modification of reservoir properties. 5. Explain the negative effect of microbial activities such as reservoir souring caused by microbial sulfate reduction, as well as the microbial-induced corrosion of oil infrastructure. 6. Understand the potential of microorganisms to remediate oil spills and polluted sites, and study effective bioremediation techniques. 7. Explain enhanced Oil Recovery (EOR) and Microbial Methods: microbial-enhanced oil recovery techniques and their applications, including the injection of microbes for improved oil extraction. 8. Understand the influence of microorganisms on refining processes, such as the formation of fouling and corrosion in downstream facilities.
Teaching and learning	The class will meet for two hours a week.
Detailed course content	Biogenesis of fossil fuels with emphasis on the role of microorganisms. Petroleum prospecting and secondary recovery. Microbial corrosion of pipes and equipment. Methanogenesis and Methanotrophy. Effects of microbial activities in aquatic and terrestrial ecosystems. Biodeterioration and Biotransformation of hydrocarbons.

Course content sequencing	
Weeks	
Week 1	Biogenesis of fossil fuels with emphasis on the role of micro-organisms.
Week 2 – 3	Petroleum prospecting and secondary recovery.
Week 4	Continuous Assessment 1
Week 5 – 6	Methanogenesis and Methanotrophy.
Week 7	Effects of microbial activities in aquatic and terrestrial ecosystems.
Week 8 – 9	Biodeterioration and Biotransformation of hydrocarbons.
Week 10	Continuous Assessment 2
Week 11	Revision
Week 12	Revision
Recommended reading material	
<ol style="list-style-type: none"> 1. Joanne Willey and Kathleen Sandman and Dorothy Wood (2020). Prescott's Microbiology. McGraw-Hill Higher Education 2. Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley W. Matthew Sattley and David A. Stahl (2019). Brock Biology of Microorganisms. Pearson Educational Limited 3. Bernard Ollivier and Michel Magot (2005). Petroleum Microbiology. American Society Microbiology 	

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Preamble:

Specific course objectives/learning outcomes.

The course will enable the understanding of the following:

1. Explain the origin of fossil fuel and the role of microorganisms in their formation
2. Understand the fundamentals of petroleum microbiology, its relevance in the oil and gas industry, and its impact on reservoir ecosystems.

3. Describe the diverse range of microorganisms present in hydrocarbon-rich environments, including bacteria, archaea, and fungi.
4. Explain the roles of microorganisms in processes such as biodegradation, production of secondary metabolites, and modification of reservoir properties.
5. Explain the negative effect of microbial activities such as reservoir souring caused by microbial sulfate reduction, as well as the microbial-induced corrosion of oil infrastructure.
6. Understand the potential of microorganisms to remediate oil spills and polluted sites, and study effective bioremediation techniques.
7. Explain enhanced Oil Recovery (EOR) and Microbial Methods: microbial-enhanced oil recovery techniques and their applications, including the injection of microbes for improved oil extraction.
8. Understand the influence of microorganisms on refining processes, such as the formation of fouling and corrosion in downstream facilities.

Learning activities/Course delivery methods

1. Lectures: detailed content of course are taught in class

Course content: Biogenesis of fossil fuels with emphasis on the role of micro-organisms. Petroleum prospecting and secondary recovery. Microbial corrosion of pipes and equipment. Methanogenesis and Methanotrophy. Effects of microbial activities in aquatic and terrestrial ecosystems. Biodeterioration and Biotransformation of hydrocarbons.