جامعة أم القرى

كلية العلوم التطبيقية

الدكتوراه في الأحياء الدقيقة

4. Learning and Teaching

4/1 Learning Outcomes and Graduate Specifications

4/1/1 Main tracks or specializations covered by the program:

(1)- Environmental Microbiology
(2)- Food Microbiology
(3)- Water and Wastewater Microbiology
(4)- Medical Microbiology
(5)- Industrial Microbiology
(6)- Agricultural Microbiology
(7)- Soil Microbiology
(8)- Microbial Toxicology
(9)- Petroleum Microbiology and Bioremediation
(10)- Microbial Biotechnology
(11)- Infection, Immunity and Public Health Microbiology

4/1/2 Curriculum Study Plan Table

Year	Course Code	Course Title	Required or Elective	* Pre-Requisite Courses	Credit Hours	College or Department
1st Year (Semester 1) 2 Compulsory courses (8 credit hours) Semester total = 8 credit hours 1st Year (Semester 2) 1 Subject-Specific Elective Course (4 credit hours) Semester total = 4 credit hours	4014711-4	Advanced Microbial Physiology	R	N/A	4	
	4014712-4	Advanced Molecular Microbiology	R	N/A	4	
	4014770-4	Emerging Topics in Food Microbiology	E	N/A	4	
	4014771-4	Emerging Topics in Water Microbiology	E	N/A	4	
	4014772-4	Emerging Topics in Environmental Microbiology	E	N/A	4	
	4014773-4	Emerging Topics in Petroleum Microbiology and Bioremediation	E	N/A	4	
	4014774-4	Emerging Topics in Microbial Biotechnology	E	N/A	4	
	4014775-4	Emerging Topics in Medical Microbiology	E	N/A	4	
	4014776-4	Emerging Topics in Microbial Toxicology	E	N/A	4	
	4014777-4	Emerging Topics in Industrial Microbiology	E	N/A	4	
	4014778-4	Emerging Topics in Soil Microbiology	E	N/A	4	
	4014779-4	Emerging Topics in Antimicrobial Agents and Chemotherapy	E	N/A	4	
	4014780-	Emerging Topics in	E	N/A	4	

	4	Immunology and Infection Control				
	4014781-4	Emerging Topics in Agricultural Microbiology	E	N/A	4	
2nd and 3rd Years (first and second semesters)	4014799-10 / Research Project leading to PhD thesis					

Include additional levels or courses if needed

4/1/4. Course Specification: A. Course Identification and General Information

Institution:	**Umm Al-Qura University**
College/Department:	**Faculty of Applied Science / Department of Biology**

1. Course title and code: Advanced Microbial Physiology (4014711-4)

2. Credit hours: **4 C.H.**

3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
PhD Microbiology

4. Name of faculty member responsible for the course
Dr. Abdulrahman S. Assaeedi (asassaeedi@uqu.edu.sa)

5. Level/year at which this course is offered

6. Pre-requisites for this course (if any)

7. Co-requisites for this course (if any)

8. Location if not on main campus

9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course?
This course aims to provide a strong fundamental advanced understanding to microbial metabolism to the student. Major aspects include: microbial growth, nutrition and metabolism, important metabolic pathways related to synthesis, degradation and regulation of metabolism.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:
The course on advanced microbial physiology covers a wide range of topics from growth, biochemistry of catabolic and anabolic pathways, aerobic to anaerobic

metabolism various common and special metabolic pathways in bacteria and eukaryotic microorganisms Role of glyoxylate cycle in acetic acid oxidation, special pathways for primary attack on organic compounds by microorganisms, Regulation of metabolic pathways. Environmental influence on metabolism, growth and survival.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Microbial Physiology and metabolism: Structure, functions and assembly of various cellular components of procaryotes, Archea and fungi.	**1**	**4**
Membrane transport – Nutrient uptake and Protein secretion Solute transport: primary and secondary transport, kinetics, ABC transporters, drug and aminoacid transport system	**1**	**4**
Microbial growth, cell cycle and central metabolic pathways; Glycolysis, PPP, ED pathway	**2**	**8**
Tricarboxylic acid cycle (TCA) – Electron transport and Oxidative phosphorylation, Gloxylate pathway	**2**	**8**
Biosynthesis of macromolecules: Aminoacids, lipid and nucletides	**3**	**12**
Anaerobic fermentation	**1**	**4**
Anaerobic respiration	**1**	**4**
Chemolithotrophy	**1**	**4**
Photosynthesis in bacteria; plant photosynthesis.	**1**	**4**
Regulation of metabolic pathways	**2**	**8**
Energy, environment and microbial survival	**1**	**4**

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the mechanisms of physiology and metabolism in microbial cells**
- **Understanding the mechanisms of metabolic pathways and energy release**

- **Identify and differentiate factors and requirements associated with each metabolic pathway**
- **Present information clearly in the form of verbal reports**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**
- **Work effectively as an individual or part of a team**
- **Use conventional and electronic resources to collect, select and organize complex scientific information**
- **Be able to assimilate and synthesis data from multiple sources**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management**
- **Critically evaluate their personal performance both as an individual and within a team**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Spector M. et al. (2002) Microbial Physiology 4th edition. Wiley-Liss (ISBN: 047-394-839)

(2)- Kim B. H. and Gadd G. H. (2008) Bacterial Physiology and Metabolism. Cambridge University Press. (ISBN: 052-171-2300) **(3)- White D. (2011) The Physiology and Biochemistry of Prokaryotes 3rd edition. Oxford University Press. (ISBN: 019-539-304X).** **(4) Doelle, H.W. (2005) Bacterial Metabolism. Academic Press (ISBN: 1483254607)**
2. List Essential References Materials (Journals, Reports, etc.) **High Impact Journals:** **(1)- Advances in Microbial Physiology (Academic Press)** **(2)- Nature Reviews in Microbiology (Nature)** **(3)- Advances in Applied Microbiology (Academic Press)** **(4)- Applied Microbiology and Biotechnology (Springer)** **(5)- Enzyme and Microbial Technology (Elsevier)** **(6)- Applied Biochemistry and Microbiology (Springer)** **(7)- Journal of Applied Microbiology (Wiley-Blackwell)** **(8)- Current Microbiology (Springer)** **(9)- Current Opinion in Microbiology (Elsevier)** **(10)- Annual Reviews in Microbiology (Annual Reviews Inc)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual**

student/staff meeting
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students**
3 Processes for Improvement of Teaching **(1)- Workshops for teaching methods** **(2)- Continuous training for teaching staff members** **(3)- Preparing the course as PPT.** **(4)- Using scientific movies.** **(5)- Coupling the theoretical part with laboratory part** **(6)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Advance Molecular Microbiology (4014712-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Gamal E. H. Osman (geosman@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100%**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **This course is designed specially to introduce a comprehensive understanding with advanced concept of molecular biology and microbial genetics to the students. It also aims to give experimental knowledge to understand characterization of genetic materials and genetic exchange mechanism in bacteria and viruses.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course is designed to cover fundamental advanced understanding on central dogma of molecular biology in bacteria and microbial genetics. The major topics covered mechanism of DNA replication, Protein synthesis, Bacterial genome, Genetic exchange, Viral genetic material and transcription mechanism. Eukaryotic cell cycle: cell cycle**

regulation and checkpoints, Cell signaling, signal transduction and Apoptosis (programmed cell death), DNA repair-mechanisms that safeguard DNA in prokaryotic and eukaryotic systems. Basic concepts of proteomics. Molecular genetics of Cyanobacteria and Mycoplasma (Mollicutes). Genetic regulation of lytic and lysogenic pathways. Oncogenes and proto-oncogenes.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Molecular Microbiology: Structure and function of nucleic acids; DNA replication in mechanisms in prokaryotes, and eukaryotic microorganisms. Basics of eukaryotic DNA replication, Transcription, Post – transcriptional modification of RNA. Eukaryotic cell cycle: cell cycle regulation and checkpoints.	**4**	**16**
Protein synthesis, Post translation modification of proteins. RNA editing; mRNA stability, Cell signaling, signal transduction and Apoptosis (programmed cell death), DNA repair-mechanisms that safeguard DNA in prokaryotic and eukaryotic systems. Basic concepts of proteomics. Molecular genetics of Cyanobacteria and Mycoplasma (Mollicutes).	**4**	**16**
Bacterial genome, Genetic exchange in bacteria, Gene transfer in bacteria – conjugation, transformation and transduction, gene mapping and sequencing of DNA. Mobile DNA, Plasmids and episomes, Determination of plasmid replication, maintenance, stability and copy number, plasmid incompatibility. (Inc P, N, W, Q,), MOB-Typing. Bacterial variation and population genetics (Dynamics). Mutation-Types of mutations, Molecular basis of mutation, Site-directed mutagenesis.	**4**	**16**
Viral genetic material and transcription mechanism. Replication of single and double stranded nucleic acids of bacterial viruses. Phages of bacteria (Lytic & Lysogenic phages): Mechanism of infection, One-step growth curves of bacteriophages, Genetic regulation of lytic and lysogenic pathways. Oncogenes and protooncogenes.	**4**	**16**

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week.	

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the concept of central dogma of molecular biology.**
- **Understanding the mechanisms DNA replication and various processes involved in its repair.**
- **Explain the biochemistry of protein synthesis and mechanism of regulation at various steps.**
- **Describe the mechanism of gene exchange in bacteria.**
- **Discuss various factors influencing gene transfer and role of transferable plasmids and transposons.**
- **Understand the bacterial variation and mutation.**
- **Explain various mechanism of transcription in viruses.**
- **Identify and differentiate symptoms associated with major microbial infections**
- **Present information clearly in the form of verbal reports**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**
- **Work effectively as an individual or part of a team**
- **Use conventional and electronic resources to collect, select and organize complex scientific information**
- **Be able to assimilate and synthesis data from multiple sources**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**

6. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) **Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.** **Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.**

E Learning Resources

1. List Required Textbooks **(1) Pesring D. H., Tenvor F. C., Hayden R. T., Ieven G., Miller M. B., Nolte F. S. (2016) Molecular Microbiology: Diagnostic Principles and Practice 3rd edition. ASM Press. (ISBN: 1555819087).** **(2)- Snyder L., Peters J. E., Henkin T. M., Champness W. (2013) Molecular Genetics of Bacteria 4th edition. ASM Press. (ISBN: 1555816274).** **(3)- Reddy C. A., Beveridge T. J., Breznak J. A., Marzulf G. (2007) Methods for General and Molecular Microbiology 3rd editions. ASM Press. (ISBN: 0125480350).**
2. List Essential References Materials (Journals, Reports, etc.) **High Impact Journals:** **(1)- Nature Methods (Nature)** **(2)- Molecular Cell (Cell Press)** **(3)- Nature Structural and Molecular Biology (Nature)** **(4)- Microbiology and Molecular Biology Reviews (ASM)** **(5)- Molecular Microbiology (Wiley-Blackwell)** **(6)- DNA Research (Oxford University Press)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.)

(1)- Class rooms are equipped with data show. **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part.** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Food Microbiology (4014770-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Khaled Elbanna (kabanna@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The course aimed to provide in depth understanding and exposure to the current trends and emerging problem in food microbiology and to make student familiar with the critical gap and emerging issues relevant to human health.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the recent trends and emerging topics in food microbiology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.** **Not all topics listed below to be covered, however the topics to be chosen are based on**

the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Rapid and automated methods for detection of pathogens in food		
Food regulatory issues: USDA, FDA, CDC		
Food surveillance		
What happen when food outbreak occur?		
The biochemical foundation of food fermentation		
Fermentation using Yeast species		
Fermentations using bacterial species		
Food-related parasites and their infections		
Food sanitation and related practices		
Food safety objectives		
Good manufacturing practices		
Determination of toxicants in food		
Toxicity texting in food samples		
Natural toxins in animal foodstuffs		
Natural toxins in plant foodstuffs		
Toxic food contaminant from industrial wastes		
Pesticides residues in foodstuffs		
Food additives		
Transmission of diseases via foods: What is foodborne diseases; Bases for determining that the disease is foodborne; Detection and reporting foodborne diseases; Relative incidents and impact of various foodborne diseases; Pathogens transmission via food versus other routs		
Disease process in foodborne illness: Classification of disease process in foodborne illness; Structure and function of the digestive system; Food infections (types of agents involved; pathogenesis; defense mechanisms); Food intoxications (types of agents involved; site of action; symptoms; characteristics of toxins; defense mechanisms)		
Preservation, sanitation and microbiological specifications for foods: Microbial ecology of foods; Food preservations; Sanitation in the food industry; Microbiological criteria for foods		
Food intoxications: Naturally occurring toxicants in foods; Staphylococaal food poisoning; Botulism; Bacillus cereus food poisoning; Clostridium perfringes food posioning Mycotoxins		

Food infections: Salmonella; Shigella; Escherichia coli; Campylobacter jejuni; Yersinia enterocolitica; Vibrio; Listeria monocytogenes; Infrequent microbial infections (Brucella; Mycobacterium bovis; Pseudomonas aeruginosa; Clostridium difficile;		
Viral and parasitic foodborne diseases		
Introduction and scope of food quality and human health **Food protection ; Physical and chemical methods**		
Food sanitation, control and inspection.		
Detection of microorganisms in food: indicator organism, Food poisoning and food infections, Food borne diseases their causative agents and control measures.		
Quality control: Microbiological quality standards of food.		
Food quality and assurance: Quality control parameters of various foods with special reference to microbiological quality:		
Indicator of food microbial quality and safety: **Indicator of product quality: Presence of microorganism Metabolic products** **Indicator of food safety: Presence of specific microorganism** **Predictive microbiology and microbial modeling.**		
Importance of microbiological quality in pre harvest and during food processing and packaging.		
Quality assurance through Good manufacturing practices (GMP), Hazard Analysis Critical Control Point (HACCP), and FSO system.		
Significance of Government regulatory practices and policies. FDA, EPA, HACCP, ISI, and food laws.		
Microbial growth and survival in food: Food ecosystem; Physiological state of bacteria; Factors that influence microbial growth in food		
Spores and their significance: Spores in food industry; Spores biology; The cycle of sporulation and germination		
Detection and enumeration of microbes in food		
Indicator microorganisms and microbiological criteria		
Spoilage organisms: Meat; Poultry; Sea food; Milk and Dairy products; Fresh produce and grains		
Control of microorganisms in food: Chemical antimicrobials; Naturally occurring antimicrobial; Physical methods of control (heat and cold methods); Non-thermal methods of control (Ozone;		

Biological based preservation and probiotic bacteria: Controlled acidification; Bacteriocin; Probiotic bacteria		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the types of food microbial contaminants and their role.**
- **Understanding the mechanisms food spoilage and factors affecting microbial survival in foods.**
- **An introduction to the various approaches to preserve foods.**
- **Detect and enumerate microorganism in food s using cultural and molecular methods.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner.**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Be able to assimilate and synthesize data from multiple sources.**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills.**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management.**
- **Critically evaluate their personal performance both as an individual and within a team.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
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3	**Short written exam**		**10%**

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5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Doyle M. P., Buchanan R. L. (2012) Food Microbiology: Fundamentals and Frontiers 4th edition. ASM Press. (ISBN: 1555816266)

(2)- Adams M. R., Moss M. O., McClure P. (2015) Food Microbiology 4th edition. Royal Society of Chemistry. (ISBN: 1849739609).

(3)- Montville T. J., Mathews K. R., Kniel K. E. (2012) Food Microbiology an Introduction. ASM Press. (ISBN: 1555816363)

(4)- Soon J. M. and Manning L. (2016) Foodborne Diseases: Case Studies of Outbreaks in Agri-Food Industries. CRC Press. (ISBN: 148-220-827X).

(5)- Dodd C. E. R. (2016) Foodborne Diseases 3rd edition. Academic Press. (ISBN: 012-385-007X).

(6)- WHO (2009) Foodborne Diseases Outbreaks: Guidelines for Investigation and Control. WHO. (ISBN: 924-154-7227).

(7)- Morris J. G., Potter M. (2013) Foodborne Infections and Intoxications 4th edition. Academic Press. (ISBN: 0124160417).

(8)- Landau E. (2010) Food Poisoning and Foodborne Diseases. Twenty-First Century Books. (ISBN: 0822572907).

2. List Essential References Materials (Journals, Reports, etc.)

(1)- Food Microbiology (Elsevier)
(2)- International Journal of Food Microbiology (Elsevier)
(3)- Food Control (Elsevier)

(4)- Journal of Food and Drug Analysis (Elsevier) **(5)- Applied and Environmental Microbiology (ASM)** **(6)- Journal of Applied Microbiology (Wiley-Blackwell)** **(7)- Letters in Applied Microbiology (Wiley-Blackwell)** **(8)- Environmental Microbiology (Wiley-Blackwell)** **(9)- Microbial Ecology (Springer)** **(10)- Frontiers in Microbiology (Frontiers Media S. A.)** **(11)- Foodborne Pathogens and Disease (Mary Ann Liebert Inc)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Water Microbiology (4014771-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Hussein H. Abulreesh (hhabulreesh@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The course aimed to provide in depth understanding and exposure to the current trends and emerging problem in water microbiology and to make student familiar with the critical gap and emerging issues relevant to human health.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the recent trends and emerging topics in water microbiology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.** **Not all topics listed below to be covered, however the topics to be chosen are based on**

the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Recreational water quality: assessing the public health risks		
Cyanobacterial toxins: Waterborne hazards to health		
Water quality and hygiene in drinks vending machines		
Ground water microbiology		
Effects of global warming and climate changes on microbial water borne diseases		
Public health aspects of Heterotrophic Bacteria in drinking water (HPC)		
Relationships between common water bacteria and pathogens in drinking water		
Detection and enumeration of waterborne bacteria pathogens in water samples		
Survival of bacterial pathogens in water		
E. coli: the best biological drinking water indicator for public health protection		
The fate of E. coli through water treatment and in distribution		
Survival of bacterial fecal indicators in water		
Aeromonads and their significance as potential pathogens in water		
Fecal streptococci as indicators of fecal contamination in water		
Development and structure of drinking water biofilms and techniques for their study		
Methods for determination of filamentous fungi in treated and untreated waters		
Sensitivity of biofilms to antimicrobial agents		
The effect of climate change on waterborne diseases		
Environmental aspects of waterborne infectious bacterial agents		
Environmental aspects of waterborne infectious viral agents		

Environmental aspects of waterborne infectious parasitic agents		
Drinking water microbiology: World-wide concern over drinking water safety; Health effects of water consumption and water quality; Microbiological quality of source water; Drinking water quality at the consumer's tap; Drinking water standards for the developing world		
Microbial contamination in drinking water: Transmission routs of pathogens and parasites; Classical and emerging waterborne pathogens; Fecal indicator organisms; Detection, enumeration and identification of environmental microorganisms of public health significance.		
Biofilm microbiology: Biofilm development in water distribution systems; Growth of pathogens and other microorganisms in water distribution system; Advantages and disadvantages of biofilm in drinking water and water distribution system; Biofilm control and prevention		
Esthetic and other concerns associated with drinking water: Taste and odor problems in drinking water; Algae and cyanobacteria; Fungi; Actinomycetes; Iron, manganese and sulfur bacteria; Nitrifying bacteria		
Bottled water Microbiology: Source and categories of bottled water; Bottled water microorganisms; Regulations concerning bottled water		
Microbial risk assessment for drinking water: Health based targets for drinking water; Quantitative microbial risk assessment		
Waterborne Bacterial agents: all bacterial waterborne agents will be discussed as follows: Basic microbiology; Metabolism and physiology; Clinical features; Survival in the environment; Enhanced growth in biofilms; Methods of detection; Antimicrobial control; Risk assessment		
Waterborne Protozoan agents: all protozoan agents will be discussed as follows: Basic microbiology; Life cycle and taxonomy; Clinical feature; Survival in the environment; Methods of detection; Treatment; Risk assessment		
Waterborne Viral agents: all viral waterborne agents will be discussed as follows: Basic microbiology; Pathogenesis and clinical features; Transmission and epidemiology; Distribution in the environment; Risk assessment		
Overview of processes involved in drinking water treatment plants		
Process microbiology and fate of pathogens and parasites in drinking water treatment plans		

Waste residuals from drinking water treatment plans		
Drinking water disinfection: Chlorine; Chlorine dioxide; Ozone; Ultraviolet light; Use of photochemicals in water disinfection; Physical removal/inactivation of pathogens in treatment plants		
Water purification system (overview)		
Water sources; Intake and Screening		
Coagulation and Floculation: Process purpose; Coagulant chemicals (types and aids); Process operation: coagulation; Process operation: floculation		
Sedimentation: Process purpose; Process equipments; Process operation		
Filtration: Process purpose; Process equipments (Slow sand filtration systems; Rapid sand filtration systems; Other common filtration systems)		
Disinfection: Cholera outbreak in London 1854; Process purpose: Disinfection; Chlorination (chemistry, equipment, by-products); UV radiation; Ozonation; Membrane process (reverse osmosis, electrodialysis)		
Distribution: Process purpose and method; Distribution systems; Process equipment		
Microbiology of wastewater treatment: Activated sludge process; Bulking and foaming in activated sludge; Fixed films process; Biofilm formation and its role in fixed films process; Sludge microbiology		
Microbiology of wastewater treatment: Waste stabilization ponds; anaerobic digestion of wastewater and biosoilds; Microbiology of phosphorus removal in activated sludge; Nitrogen cycle and its application in wastewater treatment; Low cost treatment systems		
Behavior of pathogens in wastewater treatment process: Viruses in feces; Bacterial pathogen removal from wastewater treatment plant; fate and behavior of parasites in wastewater treatment systems		
Problems in wastewater treatment processes: Odor generation; Recalcitrant organic compounds and xenobiotics; Heavy metals in wastewater treatment process		
Microbiology and public health aspects of wastewater and biosolids: Public health aspects of wastewater and biosolids disposal on land; Public health aspects of contamination of recreational water with wastewater; Wastewater reuse		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**46**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the diversity of microbes in water, fresh water and marine environment.**
- **Describe the importance drinking water microbiology and various issues associated with its safety and quality.**
- **An introduction the role of microbial biofilm in drinking water and other aquatic system.**
- **Identify and differentiate various microbes from drinking water and marine system.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner.**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Be able to assimilate and synthesize data from multiple sources.**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills.**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management.**
- **Critically evaluate their personal performance both as an individual and within a team.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**

4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Bitton G. (2014) Microbiology of Drinking water Production and Distribution. Wiley-Blackwell (ISBN: 111-874-392X).

(2)- Mara D. and Horan N. (2003) Handbook of Water and Wastewater Microbiology. Academic Press. (ISBN: 0-12-470100-0)

(3)- Fewtrell L. and Bartram J. (2001) Water Quality: Guidelines, Standards and Health: Assessment of Risk and Risk Management for Water-Related Infectious Diseases. IWA Publishing (ISBN: 1-900-222-280).

(4)- Bartram J. et al. (2003) Heterotrophic Plate Counts and Drinking Water Supply. IWA Publishing. (ISBN: 1-483390-25-6).

(5)- Bartram J. and Rees G. (2000) Monitoring Bathing Water. E & F Spon. (ISBN: 0-419-24380-9).

(6)- Golding A. M. B. et al. (1994) Water and Public Health. Smith Gordon & Co. (ISBN: 185-463-0180).

(7)- Percival S. L., et al. (2013) Microbiology of Waterborne Diseases: Microbiological Aspects and Risk 2nd edition. Academic Press (ISBN: 012-415-8463).

(8)- Cloete T. E. et al. (2004) Microbial Waterborne Pathogens. IWA Publishing (ISBN: 1-84339-055-8).

(9)- Hunter P. R. (1997) Waterborne Disease: Epidemiology and Ecology. John Wiley and Sons. (ISBN: 0-471-96646-0).

(10)- Bridle H. (2013) Waterborne Pathogens: Detection Methods and Applications. Academic Press. (ISBN: 044-459-5430).

(11)- Parks P. J. (2013) Waterborne Illnesses. Lucent Books (ISBN: 1420509357).

(12)- Drinan J. E. and Spellman F. (2012) Water and Wastewater Treatment for Non-engineering Professionals 2nd edition. CRC Press. (ISBN: 143-985-4009).

(13)- Bitton G. (2011) Wastewater Microbiology 4th edition. Wiley-Blackwell. (ISBN: 074-063-0337).

(14)- Glymph T. (2005) Wastewater Microbiology: A Handbook for Operators. American Water Works Association. (ISBN: 158-321-3430).

2. List Essential References Materials (Journals, Reports, etc.)

(1)- Journal of Water and Health (IWA)
(2)- Water Research (Elsevier)
(3)- Water Science and Technology (IWA)
(4)- Applied and Environmental Microbiology (ASM)
(5)- Journal of Applied Microbiology (Wiley-Blackwell)
(6)- Letters in Applied Microbiology (Wiley-Blackwell)
(7)- Environmental Microbiology (Wiley-Blackwell)
(8)- Microbial Ecology (Springer)
(9)- Frontiers in Microbiology (Open Access)
(10)- Desalination (Elseiver0
(11)- Water Resources Management (Kluwer Academic Publishing)
(12)- Ground Water (National Ground Water Association, UK)
(13)- Nordic Hydrology (IWA)
(14)- Science of the Total Environment (Elsevier)
(15)- Journal of Environmental Quality (American Society of Agronmoy)
(16)- Waste Management (Pergamon Press

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

(1)- Class room is already provided with data show
(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.

2. Computing resources (AV, data show, Smart Board, software, etc.)

(1)- Class rooms are equipped with data show.
(2)- A computer lab is required and connected to the network for students to gather their

data and study materials
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Environmental Microbiology (4014772-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Hussein H. Abulreesh (hhabulreesh@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The main purpose of the course is to familiarize the student with the current emerging area in environmental microbiology. And the mechanism of microbial interaction with pro and eukaryotes and with abiotic surfaces and their impact on microbial, and environmental health.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course is developed for the students to provide new understanding on the role of microbes in new domain of environment and their complex interaction.** **The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented**

below, but will also cover future relevant issues. **Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Nitrous oxide and earth's atmosphere		
Biogenesis of halomethanes and other organohalogens		
Composting		
Adverse effects of microbe-metals interactions		
Benefits of microbe-metals interactions		
Methods for studying microbe-metals interactions		
Ecological niches and their genetic basis		
Microbe-microbe interactions		
Microbe-eukaryote interactions		
Noculturable microorganisms in the environment		
The role of gentic exchange in the biodegradation of xenobiotic chemicals		
Migratory birds and human pathogens		
Climate change and airborne, waterborne and foodborne pathogens		
Microorganisms in the environment: Indigenous viral populations in the environment; nature of viruses; taxonomic diversity of viruses. Bacterial lifestyle; taxonomic diversity of bacteria. Fungal lifestyle; taxonomic diversity of fungi. Algal lifestyle; taxonomic diversity of algae. Protozoa lifestyle; ecology of disease-causing protozoa		
Terrestrial environments: Microorganisms in surface soil and subsurface environments; Role of microorganisms in soil formation; Role of microorganisms in nutrient cycling; role of microorganism in pollution abatement via bioremediation and role of microorganisms in municipal waste disposal		
Aquatic environments: Planktonic environments; benthic habitats; microbial mats; biofilm; freshwater environment; brackish water; marine water		
Air and extreme environments: The atmosphere; important airborne pathogens; microbial survival in air. Environmental determination that governs extreme environments (air-water interface; high temperature; high solute; low pH; high pressure; no nutrients)		
Environmental sample collection and processing: sample collection; microscopic techniques; culture methods; physical methods; immunological methods; molecular methods		

Biogeochemical cycling: Carbon cycle; Nitrogen cycle; Sulfur cycle		
Microbial biodeterioration: Microbially influence corrosion (metal / concrete corrosion); Acid mine drainage and metal recovery; Biomethylation of metals		
Microbial biodegradation: Relationship between contamination structure and biodegradation; environmental factors affecting biodegradation; biodegradation of organic pollutants; bioremedation		
Microbe-metals interactions: Metals defined; sources of metals; metals toxicity; mechanisms of microbial metal resistance		
Environmentally transmitted pathogens: Bacteria (Salmonella, E. coli, Shigella, Campylobacter, Vibrio, Helicobacter, Yersinia, Legionella; opportunistic bacterial pathogens). Parasites (protozoa, nematodes, cestodes, termatodes). Viruses (enteric viruses, respiratory viruses). Harmful algal blooms		
Types of waste and their environmental significance		
Methods of recycling of agricultural and organic wastes (solid and liquid waste)		
Landfilling and composting		
Treatment of sewage and industrial wastewater		
Biogas plants for recycling of waste.		
Microbial strategies for bioremediation of organic pollutants in soil and water.		
Microbially assisted phytoremediation of metal pollution.		
Use of biofertilisers and biopesticides to reduced inorganic fertilisers and chemical pesticides.		
Biofuel from algae and Enzyme technology in bioremediation		
Role of genetically modified microorganism in bioremediation.		
Important airborne pathogens: Viral; Bacterial and Fungal airborne pathogens		
Important airborne toxins:		
Aeromicrobiological pathways: Launching; Transport and Deposition		
Microbial survival in the air: Relative humidity; Temperature; Radiation; Oxygen; OAF and Ions		

Extramural aeromicrobiology: Agriculture; Waste disposal; Germ warfare		
Intramural aeromicrobiology: Buildings; Flights; Public health and Hospitals and laboratories		
Bioaerosol control: Ventilation; Filtration; Biocidal control and Isolation		
Biosafety in the laboratory: Biological safety cabinets; Biosafety laboratories and Biological agents classification		
Sampling and analysis of airborne microorganisms		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the role of microbes in specific environmental processes.**
- **Understanding the mechanisms microbe- microbe and microbe–metal interaction.**
- **Explain the methods of metal removal through biosorption process.**
- **An introduction to non culturable microorganism in environment and their significance.**
- **Identify and differentiate relevance of climate change and pathogen prevalence.**
- **Can recognize the importance of gene transfer in the environment among bacteria.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner.**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Be able to assimilate and synthesize data from multiple sources.**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills.**
- **Demonstrate effective communication skills in the form of student led group**

presentations.

- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management.**
- **Critically evaluate their personal performance both as an individual and within a team.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week).

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Maier R. M. et al. (2014) Environmental Microbiology 3rd edition. Academic Press. (ISBN: 012-394-6263).

(2)- Madsen E. L. (2015) Environmental Microbiology: From Genomes to Biogeochemistry 2nd edition. Blackwell Publishing (ISBN: 111-843-9635).

(3)- McArthur J. J. (2006) Microbial Ecology: An evolutionary Approach. Academic Press. (ISBN: 012-369-4914).

(4)- Collwell R. R. and Grimes D. J. (2000) Nonculturable Microorganisms in the Environment. ASM Press. (1-55581-196-5).

(5)- Hurst C. J. et al. (2007) Manual of Environmental Microbiology 3rd edition. ASM Press. (ISBN: 155-581-3798). **(6)- Evans G. G., Furlong J. (2010) Environmental Biotechnology: Theory and Application 2nd edition. John Wiley & Sons. (ISBN: 0740684178).** **(7)- Madsen E. L. (2015) Environmental Biotechnology: From Genomes to Biogeochemistry 2nd edition. Wiley-Blackwell. (ISBN: 1118439635).** **(8)- Vallero D. (2015) Environmental Biotechnology: A Biosystem Approach 2nd edition. Academic Press. (ISBN: 0124077765).** **(9)- Thakur I. S. (2011) Environmental Biotechnology: Basic Concepts and Applications 2nd edition. I. K. International Publishing House. (ISBN: 9380578474).** **(10)- Sukla L. B., Pradhan N., Panda S., Mishra B. K. (2016) Environmental Microbial Biotechnology. Springer. (ISBN: 3319363123).**
2. List Essential References Materials (Journals, Reports, etc.) **High Impact Journals:** **(1)- Environmental Microbiology (Wiley-Blackwell)** **(2)- Environmental Microbiology Reports (Wiley-Blackwell)** **(3)- Applied and Environmental Microbiology (ASM)** **(4)- Microbial Ecology (Springer)** **(5)- FEMS Microbiology Ecology (Wiley-Blackwell)** **(6)- Frontiers in Microbiology (Frontiers Media S. A.)** **(7)- Horticulture, Environment and Biotechnology (Springer)** **(8)- Environmental Biotechnology (Ministry of Science and Higher Education, Poland)** **(9)- Biotechnology Advances (Elsevier)** **(10)- Journal of Microbiology and Biotechnology (Springer)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.**

(2)- A computer lab is required and connected to the network for students to gather their data and study materials
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) .

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Petroleum Microbiology and Bioremediation (4014772-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Hussein H. Abulreesh (hhabulreesh@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply) a. traditional classroom ✓ What percentage? **100 %** b. blended (traditional and online) ☐ What percentage? ☐ c. e-learning ☐ What percentage? ☐ d. correspondence ☐ What percentage? ☐ f. other ☐ What percentage? ☐

B Objectives

1. What is the main purpose for this course? **The main purpose of this course is to provide in depth knowledge and development in the emerging area of petroleum microbiology and its future prospects.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course is design for students to provide a comprehensive idea in new emerging areas of petroleum microbiology.** **The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.**

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Microbial control of hydrogen sulfide production in oil reservoirs		
Microbially enhanced oil recovery		
Biotechnological upgrading of petroleum		
Biodiversity, function and biocatalytic applications of Alkane oxygenases		
Biodegradation of hydrocarbons under unoxic conditions		
Biodegradation of fuel ethers		
The microbiology of marine oil spill bioremediation		
Metabolic indicators of anaerobic hydrocarbon biodegradation in petroleum-laden environments		
Microbiology of oil fields: Oil reservoirs and oil production		
Microbiology of oil fields: Indigenous microbial communities in oil fields		
Microbiology of oil fields: Sulfate-reducing bacteria and Archaea		
Microbiology of oil fields: Hyperthermophilic and methanogenic Archaea in oil fields		
Microbiology of oil fields: The fermentative, iron-reducing and nitrate-reducing microorganisms		
Pernicious effects of bacterial activity: Biodegradation of petroleum in subsurface geological reservoirs; Reservoir souring (mechanisms and prevention); Microbial corrosion in the oil industry		
Pernicious effects of bacterial activity: Biodegradation of petroleum in subsurface geological reservoirs		
Pernicious effects of bacterial activity: Reservoir souring (mechanisms and prevention)		
Pernicious effects of bacterial activity: Microbial corrosion in the oil industry		
Methods for determining biodegradability in the environments		
Biodegradation of hydrocarbons		
Biodegradation of nitroaromatic compounds		
Biodegradation of halogenated solvents		
Biodegradation of agricultural chemicals		
Use of fungi in biodegradation		
Anaerobic biodegradation		
Bioremediation of contaminated ground water		
Bioagumentation		

Bioremediation of contaminated soils and aquifires		
Bioremediation of marine oil spills		
Bioremediation of heavy metals and radionuclides		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. [ ]

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the diversity of petroleum microbiology and function and activity of various microbes.**
- **Understanding the mechanisms of petroleum enhanced recovery and role of microbes.**
- **An introduction to the concept of biotechnological intervention in bio fouling in petroleum industry.**
- **Identify and differentiate specific role played by bacteria in biodegradation of petroleum.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner.**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Be able to assimilate and synthesize data from multiple sources.**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills.**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management.**
- **Critically evaluate their personal performance both as an individual and within a team.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment

1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)
Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks
(1) Bernard Ollivier and Michel Magot (2005) Petroleum Microbiology. ASM Press. (ISBN: 155-581-3275).

(2)- Trevor Jones**,** Jean-Paul Vandecasteele **(2013) Petroleum Microbiology. OPHRYS edition. (ISBN: 2710811359).**

(3)- Chandra R. (2015) Advances in Biodegradation and Bioremediation of Industrial Waste. CRC Press. (ISBN: 1498700543).

(4)- Atlas R. M. and Philp J. (2005) Bioremediation: Applied Microbial Solutions for Real-World Environmental Cleanup. ASM Press. (ISBN: 1-55581-239-2).

(4)- Hurst C. J. et al. (2014) Manual of Environmental Microbiology 3rd edition. ASM Press. (ISBN: 155-581-3798).

(5)- Pepper I. L. et al. (2014) Environmental Microbiology 3rd edition. Academic Press. (ISBN: 012-394-6263).

2. List Essential References Materials (Journals, Reports, etc.)
High Impact Journals:
(1)- International Biodeterioration and Biodegradation (Elsevier)
(2)- Biodegradation (Springer)
(3)- Bioremediation Journal (Taylor & Francis)
(4)- Applied and Environmental Microbiology (ASM)
(5)- Environmental Microbiology (Wiley-Blackwell)

(6)- Environmental Microbiology Reports (Wiley-Blackwell) **(7)- Microbial Ecology (Springer)** **(8)- FEMS Microbiology Ecology (Wiley-Blackwell)** **(9)- Frontiers in Microbiology (Open Access)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students**.
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning

for improvement.
A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Microbial Biotechnology (4014774-4)
2. Credit hours **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Gamal E. H. Osman (geosman@uqu.edu.sa)** **Prof. Khaled Elbanna (kabana@uqu.edu.sa)** **Dr. Mohamed Monjed (mkmonjed@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **This course aims to provide background and recent development in advances in microbial biotechnology with special emphasis on molecular, industrial, agricultural and environmental biotechnology.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the recent trends and emerging topics in microbial biotechnology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented**

below, but will also cover future relevant issues. **Emerging topics in microbial biotechnology will cover all sub-categories in the subject of microbial biotechnology (i.e. environmental biotechnology, food biotechnology, fungal biotechnology). However, the choice of sub-category subjects is based on the nature of the work in the research plan** **Not all topics listed below to be covered; however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor.**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Suggested topics in general microbial biotechnology		
Principles of Microbial Biotechnology: Screening for Microbial Products, Bioprocess Technology, Enzymology.		
Manipulation of Genes, Regulatory Issues on Application of Natural and Genetic Engineered Microbes in Environmental Biotechnology		
High-throughput screening for novel metabolites and strain improvement,		
Concept and development in Metabolic engineering		
Use of recombinant DNA technology. In vitro mutagenesis and directed evolution of enzymes		
Biotransformation of steroids and non steroid transformation, **Reactors for immobilized enzymes and cells.**		
Production technology for microbial fertilizers.		
Biopesticides:. Biofules from microorganisms.		
Genetically engineered Baculovirus,		
***Bacillus thuringensis* and fungal based biopesticides**		
Microbes and Livestock.		
Development of transgenic plants and agrobacterium based gene delivery.		
Suggested topics in Food and dairy biotechnology		

Food technology and application of microbes and microbial products		
Production and preservation fermented foods; Soy sauce Saurkraut, Sausages		
Production and application of Bakers' Yeast		
Application of microbial enzymes in food industry.		
Role of microorganisms in beverages – tea and coffee and cocoa fermentations.		
Vinegar Fermentation. Single cell protein, Genetically modified foods :prospects and constraints		
Cleaning and sanitizing in milk production and processing Fermented milks and cream, Cheese products		
Starter Cultures and their use, metabolism of starter cultures		
Probiotics and Prebiotics		
Control of Microorganisms in Dairy Processing: Dairy Product Safe		
Wastes Utilization and disposal of dairy by-product – whey		
Biosensors in food industry		
Suggested topics in environmental biotechnology		
Environmental biotechnology and application in environment restoration and protection.		
Types of waste and their environmental significance		
Methods of recycling of agricultural and organic wastes (solid and liquid waste)		
Landfilling and composting		

Treatment of sewage and industrial wastewater		
Biogas plants for recycling of waste.		
Microbial strategies for bioremediation of organic pollutants in soil and water.		
Microbially assisted phytoremediation of metal pollution.		
Use of biofertilisers and biopesticides to reduced inorganic fertilisers and chemical pesticides.		
Biofuel from algae and Enzyme technology in bioremediation		
Role of genetically modified microorganism in bioremediation.		
Suggested topics in fungal biotechnology		
Introduction: Fungal primary and secondary metabolites		
Fungi as source of biotechnologically important chemicals therapeutic and industrial products: Antibiotic, enzymes and specific primary or secondary metabolites		
Fungal biomass as food, feed and source of single cell protein.		
Genetic improvement of important fungi by protoplast fusion, interspecific hybridization and RDT. **Genetic improvement of yeast for the production of baker's yeast and yeast derived products and organic feed stock.**		
Production of fungal lipid, gelatin, ergot, enzymes such as cellulases and lignases.		
Fungal bioinoculants for crop productivity and bioremediation.		
Production of edible fungi (Mushrroms)		
Production of fermented foods, and high-value products like mycoprotein.		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the importance of microbial biotechnology**
- **Understanding the process of enhanced metabolite production through gene technology.**
- **An introduction to the new domain of high throughput screening strategies.**
- **Identify and differentiate various techniques for gene manipulation.**
- **Explain the role of enzyme engineering and RDT in biotransformation.**
- **Able to mass produced pesticides and biofertilizers in the laboratory.**
-
- **Understand the role of various microorganisms in food and dairy industry.**
- **Explain the general process in food fermentation and its preservation.**
- **Demonstrate and distinguished various types of fermented product from milk.**
- **Understand and explain the concept of transgenic food its prospects and limitation.**
- **Develop skills related to food industry processes.**
- **Get an idea to recycle or reutilize various food industrial wastes.**
- **Learn various factors influencing starter culture growth and product quality**
- **Get exposure of health benefit of pro and prebiotics**

Understand the application environmental biotechnology.
(2)- Explain the major environmental deteriorating agents and their resources.
(3)- Understanding the mechanisms toxicity problem associated with these wastes.
(4)- An introduction to the strategies to recycle and reuse effectively the organic waste.
(5)- Identify various problems associated with waste disposal and treatment.

- **Understand the use of biotechnological tools for obtaining fungal based products.**
- **Understanding genetic improvement of fungi for biotechnological applications.**
- **Explain the methods of bioinoculant production for food, environment and agricultural application.**
- **Learn the basics of molecular methods for genetic improvement of strain for desired products.**
- **Present information clearly in the form of verbal reports**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**

- **Work effectively as an individual or part of a team.**

Use conventional and electronic resources to collect, select and organize complex scientific information

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

Main references in general microbial biotechnology

(1)- Lee Y. K. (2013) Microbial Biotechnology 3rd edition. World Scientific Publishing Company. (ISBN: 981436682X).

(2)- Harzvevili F. D., Chen H. (2014) Microbial Biotechnology: Progress and Trends. CRC Press. (ISBN: 1482245205).

(3)- Bhukya B., Tangutur A. D. (2016) Microbial Biotechnology: Technological Challenges and Development Trends. Apple Academic Press. (ISBN: 1771883324).

Main reference food and dairy biotechnology

(1)- Joshi V. K., Snigh R. S. (2012) Food Biotechnology. I. K. International Publishing House. (ISBN: 9381141495).

(2)- Bahatia S. C. (2017) Food Biotechnology. WPI Publishing. (ISBN: 9385059181).

(3)- Lee B. H. (2015) Fundamentals of Food Biotechnology 2nd edition. Wiley-Blackwell. (ISBN: 1118384954).

Main references in environmental biotechnology

(1)- Evans G. G., Furlong J. (2010) Environmental Biotechnology: Theory and Application 2nd edition. John Wiley & Sons. (ISBN: 0740684178).

(2)- Madsen E. L. (2015) Environmental Biotechnology: From Genomes to Biogeochemistry 2nd edition. Wiley-Blackwell. (ISBN: 1118439635).

(3)- Vallero D. (2015) Environmental Biotechnology: A Biosystem Approach 2nd edition. Academic Press. (ISBN: 0124077765).

(4)- Thakur I. S. (2011) Environmental Biotechnology: Basic Concepts and Applications 2nd edition. I. K. International Publishing House. (ISBN: 9380578474).

Main references in fungal biotechnology

(1)- T. Satyanarayana, Gotthard Kunze (2009) Yeast Biotechnology: Diversity and Applications. Springer. (ISBN 9781402082917).

(2)- Gupta V. K., Ayyachamy M. (2012) Biotechnology of Fungal Genes. CRC Press. (ISBN: 1578087872).

(3)- Polizeli M. L. T. M., Rai M. (2013) Fungal Enzymes. CRC Press. (ISBN: 1466594543).

(4)- Arora D. K. (2003) Fungal Biotechnology in Agricultural, Food and Environmental Applications. CRC Press. (ISBN: 0824747704).

(5)- Petre M. (2015) Mushroom Biotechnology: Developments and Applications. Academic Press. (ISBN: 0128027940).

(6)- Soliman S. A. et al. (2015) Fungal Biotechnology in Agricultural Food. Koros Press Limited. (ISBN: 178163792X).

(7)- Berry D. R., Russell I., Stewart G. C. (2013) Yeast Biotechnology. Springer. (ISBN: 940107903X)

2. List of Essential Reference Materials (Journals)

High Impact Journals:

Main Journals in general microbial biotechnology

(1)- Nature Biotechnology (Nature)
(2)- Metabolic Engineering (Academic Press)
(3)- Critical Reviews in Microbiology (Taylor & Francis)
(4)- Applied and Environmental Microbiology (ASM)
(5)- Critical Reviews in Biotechnology (Taylor & Francis)
(6)- Microbial Cell Factories (BioMed Central)

(7)- Microbial Biotechnology (Wiley-Blackwell) **(8)- Applied Microbiology and Biotechnology (Springer)** **(9)- Journal of Nanobiotechnology (BioMed Central)** **Main journals in food and dairy biotechnology** **(1)- Trends in Food Science & Technology (Elsevier)** **(2)- Journal of Food Science (Wiley-Blackwell)** **(3)- Food Science and Technology International (SAGE)** **(4)- Innovative Food Science and Emerging Technologies (Elsevier)** **(5)- International Journal of Dairy Technology (Wiley-Blackwell)** **(6)- International Dairy Journal (Elsevier)** **(7)- Dairy Science and Technology (Springer)** **(8)- Australian Journal of Dairy Technology (Dairy Industry Society of Australia)** **Main Journals in environmental biotechnology** **(1)- Horticulture, Environment and Biotechnology (Springer)** **(2)- Environmental Biotechnology (Ministry of Science and Higher Education, Poland)** **(3)- Biotechnology Advances (Elsevier)** **(4)- Journal of Microbiology and Biotechnology (Springer)** **(5)- Applied and Environmental Microbiology (ASM)** **(6)- Environmental Science and Technology (ACS)** **Main journals in fungal biotechnology** **(1)- Fungal Biology and Biotechnology (Springer)** **(2)- Fungal Biology (Elsevier)** **(3)- Fungal Biology Reviews (Elsevier)** **(4)- FEMS Yeast Research** **(5)- Fungal Genetics and Biology (Elsevier)** **(6)- Journal of Mycology (Hindawi)** **(7)- Yeast (Wiley-Blackwell)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.**

(2)- A computer lab is required and connected to the network for students to gather their data and study materials
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Medical Microbiology (4014775-4)
2. Credit hours **4 credit hours**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Sameer R. Organji (srorganji@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The course aimed to provide in depth understanding and exposure to the current trends and emerging problem in medical microbiology and to make student familiar with the critical gap and emerging issues relevant to human health.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the recent trends and emerging topics in medical microbiology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.**

Emerging topics in medical microbiology will cover all sub-categories in the subject of medical microbiology (i.e. infection control; infectious diseases; microbial pathogenesis; infectious agents; diagnostic microbiology). However, the choice of sub-category subjects is based on the nature of the work in the research plan

Not all topics listed below to be covered; however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Suggested emerging topics in medical microbiology:		
Emerging new viral diseases; example: Dengue and Neuroteratogenic Viruses and Lessons for Zika Virus Models		
Infectious diseases in immunocompromised paitents; role of opportunistic pathogens		
Probiotics and health benefits; characteristics and mechanism of action of probiotics.		
Biofilms in health and disease; Oral Biofilm Architecture at the Microbial Scale. Techniques, sensors, and approaches for imaging biofilms.		
Emergence and spread of MDR bacteria and Nosocomial infection		
Cell to cell communication (Quorum sensing) in pathogenic microbes; Qs as anti-infective drug targets.		
Microbial genomics; Rapid method of Pathogen detection.		
Gut Microbiome and gene expression; Current understanding and future prospects.		
Suggested topics in Microbial Pathogenesis		
General principles of pathogenecity		
Attachment and entry of microorganisms into the body		
Early stages of infection after pathogens entry		

Encounter of microbes with phagocytic cells		
The spread of microbes through the body		
The immune response to infection		
Microbial strategies in relation to immune response		
Mechanisms of cell and tissue damage		
Recovery from infection		
Failure to eliminate microbes		
Host and microbial Factors influencing susceptibility		
Vaccines and how they work		
Molecular microbial pathogenecity		
Suggested topics in infection and immunity		
Introduction to infection and immunity **Process of host microbe interaction; The process of infection**		
Types of immunity; species and strains; individual differences		
First and second line of defense mechanism;		
Role of surface defenses, Tissue defenses; Opsonization; Inflammatory reactions		
hormone balance; Tissue metabolites with bacterial properties		
Interferon, and complement.		

The Immune Response: Humoral, cellular, actively acquired, passively acquired. Cellular Interaction in the induction of antibody formation		
cellular interactions in the induction of immune T cells - Lymphoid cell interactions,		
in vivo – immune memory -		
Defects in Immunoglobulin synthesis and cell mediated immunity		
Immunosuppression. Prophylaxis, Vaccines.		
Suggested topics in infection control		
hospital acquired (Nosocomial) infection		
Hospital environment and infection and control strategy		
Common hospital pathogens their transmission routes and public health: Bacteria		
Common hospital pathogens their transmission routes and public health: Fungi		
Common hospital pathogens their transmission routes and public health: Viruses		
Common hospital pathogens their transmission routes and public health: Protozoa and parasites		
Route of transmission: Direct, air borne, Indirect(medical instruments, fomites, inanimate objects, vector and vehicle.		
Airborne Nosocomial Microorganisms infection control program: Surveillance, reporting, isolation procedures, education and management		
Control measures and reducing the risk of infection		
Method of Cleaning, Disinfection, and sterilization, decontamination methods. Disinfectants and antiseptics disinfection of the Inanimate environment.		

Importance of hand hygiene and hand washing procedures and hospital waste disposal and management.		
Topics in microbial infectious agents		
Basic concepts of bacterial, viral and fungal mechanisms of pathogenesis. **The role of bacteria, viruses and fungi in disease**		
Bacterial pathogens: **Staphylococcus and related Gram-positive cocci** **Streptococcus and Enterococcus** **Bacillus** **Listeria and related organisms** **Mycobacterium and related acid-fast bacteria** **Niesseria, Haemophilus and related genera** **Enterobacteriacea** **Vibrio and related genera** **Pseudomonas and related genera** **Campylobacter and Helicobacter** **Clostridium** **Non-spore forming anaerobic bacterial pathogens** **Treponema, Borrelia and Leptospira** **Mycoplasma, Rickettsia and Chlamydia**		
Viral pathogens:		
Fungal and Parasitic pathogens		
Suggested topics in medical mycology		

Classification of fungal diseases		
Superficial mycoses: Dermatophytes; characteristics, pathogenicity, diagnoses , epidemiology and treatment		
Candidoses; Candida spp in disease development		
Deep mycoses: Subcutaneous and Systemic mycoses Role of various species of yeast and their diseases		
Opportunistic systemic mycoses: Causative agents like Aspergillus, Penicillium, Mucor and other fungi.		
Detection , identification and cultural characteristics of pathogenic fungi		
Approaches to diagnosis of fungal infection; cultural, serological and molecular techniques		
Model organism for fungal virulence and host –pathogen interaction:Candida albicans, Aspergillus fumigatus and Cryptococcus.		
Antifungal chemotherapy: Antifungal drugs and their mode of action.		
Development of drug resistance in pathogenic fungi.		
Suggested topics in diagnostic microbiology		
Safety and specimen management		
Isolation procedures for bacterial pathogens from clinical samples		
Growth dependent identification methods		
Testing cultures for antimicrobial drug sensitivity		
Immunodiagnostics: Agglutination, Immunoblot procedures,		
Immunoelectron microscopy, Fluorescent antibody techniques		

Radioimmunoassay and ELIZA		
PCR and nucleic acid probes in clinical diagnostics		
Development of New Technology in diagnostic : PCR combined with electrospray ionization-mass spectrometry (PCR/ESI-MS) and matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS).		
Quality assurance in clinical laboratory **Infection control**		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:
(1)- Understand the critical emerging problems in the medical microbiology.
(2)- Enhance their knowledge on the specific area.
(3)- Explain the methods to overcome such emerging problems.
(4)- Enhance learning skills through group discussion and experimentation on specific area of interest
(5)- Present information clearly in the form of verbal reports
(6)- Communicate complex ideas and arguments in a clear, concise and effective manner.
(7)- Work effectively as an individual or part of a team.
(8)- Use conventional and electronic resources to collect, select and organize complex scientific information.
(9)- Demonstrate effective communication skills in the form of student led group presentations.

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

Main references in medical microbiology

(1)- R. C. Mahajan, Amu Therwath (2001) Multi-Drug Resistance in Emerging and Re-Emerging Diseases, CRC Press, 0849309832, 9780849309830.

(2)- Sunit K. Singh (2016) Human Emerging and Re-emerging Infections, Volume 1. John Wiley & Sons. (ISBN: 1118644719).

(3)- Sunil K. Lal (2007) Emerging Viral Diseases of Southeast Asia *Volume 4 of Issues in infectious diseases*. Karger Medical and Scientific Publishers. (ISBN: 3805581750)

(4)- Julian R Marchesi (2014) The Human Microbiota and Microbiome, CABI. (ISBN: 1780640498).

(5)-Kendra P. Rumbaugh (2007) Quorum Sensing: Methods and Protocols Volume 692 of Methods in Molecular Biology. Humana Press. (ISBN: 1607619709).

(6)- Gavin Lear, Gillian D. Lewis (2012) Microbial Biofilms: Current Research and Applications. Horizon Scientific Press. (ISBN: 1904455964).

(7)- Murray P. R., Rosenthal K. S., Pfaller M. A. (2015) Medical Microbiology 8th Edition. Elsevier. (ISBN: 0323299563).

(8)- Carroll K. C., Butel J., Morse S. (2015) Jawets Melnick & Adelbergs Medical Microbiology 27th edition. McGraw-Hill Education. (ISBN: 0071824987).

(9)- Goering R., Dockrell H., Zuckerman M. et al. (2012) Mims' Medical Microbiology 5th edition. Saunders. (ISBN: 0723436010).

(10)- Ryan K., Ray G., Ahmad N. et al. (2014) Sherris Medical Microbiology 6th edition. McGraw-Hill Education. (ISBN: 0071818219).

Main references in microbial pathogenesis

(1)- Nash et al. (2015) Mim's Pathogensis of Infectious Diseases 6th edition. Academic Press (ISBN: 012-397-1888).

(2)- Engelberg N. C. et al. (2012) Schaechter's Mechanisms of Microbial Disease 5th edition. LWW (ISBN: 078-178-7440).

(3)- Wilson B. et al. (2010) Bacterial Pathogenesis: A Molecular Approach. ASM Press, Washington D.C. (ISBN: 063-203-775X).

Main reference in infection and immunity

(1)- Playfair J., Bancroft G. (2013) Infection and Immunity 4th edition. Oxofrd University Press. (ISBN: 0199609500).

(2)- Delves P. J., Martin S. J., Burton D. R., Roitt I. M. (2017) Roitt's Essential Immunology 13th Edition. Wiley-Blackwell. (ISBN: 978-1-118-41577-1).

(3)- Abbas A. K., Lichtman A. H. H., Pillai S. (2014) Cellular and Molecular Immunology 8th edition. Saunders. (0323222757).

Main references in infection control

(1)-Weston D., Burgess A., Roberts S. (2016) Infection Prevention and Control at a Glance. Wiley-Blackwell. (ISBN: 1118973550).

(2)- Zelman M., Zelman C.M. (2013) Infection Control and Safety. Pearson Education. (ISBN: 0133045668).

(3)- Weston D. (2013) Fundamental of Infection Prevention and Control: Theory and Practice. Wiley-Blackwell. (ISBN: 1118306651).

(4)- Mayhall C. G. (2011) Hospital Epidemiology and Infection Control 4th edition. LWW

publishing. (ISBN: 160831300X)

Main reference medical microbiology

(1)- Reiss E., Shadomy H.J., Lyon G. M. (2012) Fundamental Medical Mycology. Wiley-Blackwell. (ISBN: 978-0-470-17791-4).

(2)- Ng K. P., Soo Hoo T. S., Na S. L. (2014) A Guide the Study the Basic of Medical Mycology. Partirdge-Singapore. (ISBN: 1482824124).

(3)- Larone D. H. (2011) Medically Important Fungi: A Guide to Identification 5th edition. ASM Press. (ISBN: 1555816606)

Main references in diagnostic microbiology

(1)- Tille P. (2013) Bailey & Scott's Diagnostic Microbiology 13th edition. Mosby. (ISBN: 0323083307).

(2)- Mahon C. R., Lehman D. C., Manuelis G. (2014) Text Book of Diagnostic Microbiology 5th edition. Saudners. (ISBN: 0323089895).

(3)- Procop G. W., Koneman E. W. (2016) Koneman's Color Atals and Textbook of Diagnostic Microbiology 7th edition. LWW. (ISBN: 1451116594).

(4)- Delost M. D. (2014) Introduction to Diagnostic Microbiology for the Laboratory Sciences. Jones & Bartlett Learning. (ISBN: 1284032310).

(5)- Jorgensen J. H., Pfaller M. A. (2015) Manual of Clinical Microbiology 11th edition (2 volumes set). ASM Press. (ISBN: 1555817378).

2. List Essential References Materials (Journals, Reports, etc.)

High Impact Journals:

Main journals in Medical Microbiology

(1)- Clinical Microbiology Reviews (ASM)
(2)- Microbiome (BioMed Central)
(3)- Clinical Infectious Diseases (Oxford University Press)
(4)- Emerging Infectious Diseases (US NCID)
(5)- Frontiers in cellular and Infection Microbiology (Frontiers Media S. A.)
(6)- Clinical Microbiology and Infection (Wiley-Blackwell)
(7)- Current Opinion in Infectious Diseases (LWW)
(8)- Journal of Clinical Microbiology (ASM)
(9)- Journal of Infection (Saunders)
(10)- International Journal of Medical Microbiology (Elsevier)
(11)- Pathogens and Disease (Wiley-Blackwell)
(12)- Journal of Medical Microbiology (SGM)

Main journals in infection and immunity and infection control

(1)- Journal of Hospital Infection (Elsevier)
(2)- American Journal of Infection Control (Elsevier)

(3)- Journal of Infection Prevention (SAGE) **(4)- Infection and Immunity (ASM)** **(5)- Epidemiology and Infection (Cambridge Journals)** **(6)- Journal of Infectious Diseases (Oxford Academics)** **(7)- Infection (Springer)** **(8)- Journal of Infection (Elsevier)** **(9)- Journal of Infection in Developing Countries (JIDC)** **(10)- Journal of Hospital Infection (Elsevier)** **(11)- American Journal of Infection Control (Elsevier)** **(12)- Journal of Infection Prevention (SAGE)** **Main journals of medical mycology** **(1)- Medical Mycology (Taylor & Francis)** **(2)- Medical Mycology Case Reports (Elsevier)** **(3)- Medical Mycology (Wiley-Blackwell)** **(4)- Medical Mycology (J-Stage)** **(5)- Fungal Biology (Elsevier)** **(6)- Fungal Biology Reviews (Elsevier)** **(7)- Mycoses (Wiley-Blackwell)** **(8)- FEMS Yeast Research** **(9)- Fungal Genetics and Biology (Elsevier)** **(10)- Mycopathologia (Springer)** **(11)- Journal of Mycology (Hindawi)** **Main journals on general and medical Virology** **(1)- Journal of Virological Methods (Elsevier)** **(2)- Archives of Virology (Springer)** **(3)- Journal of Virology (ASM)** **(4)- Virology Journal (BioMed Central)** **(5)- Journal of Clinical Virology (Elsevier)** **(6)- Journal of General Virology (SGM)** **(7)- Annual Review in Virology (Annual Review Inc.)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.)

(1)- Class rooms are equipped with data show. **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Microbial Toxicology (4014776-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Hussein H. Abulreesh (hhabulreesh@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The major objective of this course is to familiarize the students with latest development in the microbial toxins in the domain of mechanism of action, methods of detection and adverse effects on host cell.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course is designed to for students to cover new emerging topics in microbial toxicology.** **The course is not limited to the topics listed below; these topics are only a suggestion of what the course might include any emerging topics will be covered as they happen.**

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Mycotoxins		
Cyanobacterial toxins and human health		
Bacterial genotoxins		
Theraputic use of clostridia neurotoxins		
Clostridia toxins in the pathogenesis of gas gangrene		
Engineering of botulinum neurotoxin as novel therapeutic tool		
Engineering of bacterial toxins for research and medicine		
Exploiting endolytic pathways to prevent bacterial toxin infection		
Inhibitors of pore-forming toxins		
Bacterial protein toxins as biological warfare		
Marine biotoxins		
Analytical methods for detection of bacteria toxins		
Analytical methods for detection of mycotoxins		
The role of streptococcal toxins in diseases		
Kits for the detection of bacterial food poisoning toxins: Problems; Pitfalls and Benefits		
The toxins of Clostridium difficile		
Algal harmful blooms and algal toxins		
Bacterial protein toxins: Diphtheria toxin; Pseudomonas aeruginosa toxins; Bordetella toxins		
Bacterial protein toxins: Vibrio cholerae and Escherichia coli heat-liable enterotoxins; Vibrio parahaemolyticus virulence determinants		
Bacterial protein toxins: Typhoid toxin; Shiga toxins		
Bacterial protein toxins: Clostridial neurotoxins; Bacillus anthracis toxins		
Bacterial protein toxins: Staphylococcus toxins; Clostridium perfringens toxins		
Bacterial protein toxins: Bacillus cereus toxins; Bacillus thuringiensis toxins; Streptococcal toxins		
Bacterial protein toxins: Escherichia coli heat-stable enterotoxins		

Bacterial protein toxins: Bacterial superantigens and superantigens-like toxins; Aerolysins and related Aeromonas toxins		
Bacterial protein toxins: Helicobacter and Campylobacter toxins; Pastuerlla toxin		
Bacterial cell wall associated toxins: Structure; properties and mode of action		
Bacterial cell wall associated toxins: The role of cell wall associated bacterial toxins in the pathogenecity of Gram-negative bacteria: Salmonella; Shigella; Brucella; Yersinia;		
Cyanobacterial toxins: types, structure and mood of actions		
Mycotoxins: types, structure and mood of actions		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the diversity of microbial toxins and their role.**
- **Understanding the mechanisms of action and impact on host cell damage.**
- **An introduction to the symptoms associated toxicity of toxins in the host.**
- **Identify and differentiate types of toxin producer.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner.**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Be able to assimilate and synthesize data from multiple sources.**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills.**
- **Demonstrate effective communication skills in the form of student led group**

presentations.

- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management.**
- **Critically evaluate their personal performance both as an individual and within a team.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Alouf J. E. et al. (2015) The comprehensive source book of Bacterial Protein Toxins 4th edition. Elsevier (ISBN: 012-800-1887).

(2)- Lax A. J. (2005) Toxins: The Cunning of Bacterial Poisons. Oxford University Press. (ISBN: 019-860-5587).

(3)- Proft T. (2013) Bacterial Toxins: Genetics; Cellular Biology and Practical Applications. Caister Academic Press. (ISBN: 190-823-0287).

(4)- Guar R. et al. (2011) Microbial Toxins: Structure and Their Types. LAP LAMBERT

Academic Publishing. (ISBN: 384-432-5944).
2. List Essential References Materials (Journals, Reports, etc.) **High Impact Journals:** **(1)- Toxicon (Elsevier)** **(2)- Toxin Reviews (Taylor & Francis)** **(3)- Natural Toxins (Wiley-Blackwell)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
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3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics of Industrial Microbiology (4014777-4)
2. Credit hours **4 credit hours**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Abdulrahman S. Assaeedi (asassaeedi@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

2. What is the main purpose for this course? **The course aimed to provide current trends and emerging problem in industrial microbiology. The students will be familiarized with the critical gap and emerging issues for future work and to get advanced understanding on the subject.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the on the recent trends and emerging topics in industrial microbiology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.**

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Taping unexplored and non culturalble microorganism in industry. **Conventional and Newer Methods of Drug Discovery.** **Computer aided drug design, Combinatorial chemistry,**		
Genomic and proteomics based approaches for drug discovery.		
Microbial polysaccharides production .		
Development efficient of starter culture for food industry.		
Improved Methods of immobilizing enzymes and cells Practical Application of Immobilized Biological Catalyst Systems. **Manipulation of Microorganisms for Higher Yield of Enzymes**		
Treatment of the Sludge: Anaerobic Breakdown of Sludge **Waste Water Disposal in the Pharmaceutical Industry**		
Applications of PCR in industrial microbiology and biotechnology,		
Metagenomic, and Bioinformatics application		
Approaches to obtain new microbial metabolites. **Screening of new metabolites: Test system and strains used for screening.**		
Strain Improvement Techniques: Mutation, Recombination Regulation and Gene technology.		
General concept of microbial fermentation		
Unit operation in product recovery: isolation and purification of microbial metabolites		
Processes of fermentation: Steps involved		
Methods of fermentation: Batch, Fed Batch and Continuous fermentation		
Growth kinetics of microorganisms during fermentation.		
Types of fermentors		
Concept and importance of gas exchange and mass transfer **Scale-up in microbial fermentation.**		
Basic concept of cell and enzyme immobilization. **Reactors used for immobilized enzymes.**		
Microbial production of ethanol, citric acid and acetic acid: microbiology, fermentation and product recovery		

Microbial enzymes (Amylases, Glucose isomers, Proteases, Penicillin acylases) : producing organisms, fermentation and product recovery		
Fermentation of antibiotics :e.g. Penicillin and semisynthetic penicillin		
Industrial production of amino acids (Glutamic acid) and Vitamins (Riboflavin & Vit B-12)		
Production of yeast and yeast derived products		
Single Cell Protein : Production and application		
Role of microbes and microbial enzymes in the fermentation of tea, coffee and cocoa and production of silage.		
Biotransformation of metabolites by microbes		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the use of biotechnological tools for obtaining fungal based products.**
- **Understanding genetic improvement of fungi for biotechnological applications.**
- **Explain the methods of bioinoculant production for food, environment and agricultural application.**
- **Learn the basics of molecular methods for genetic improvement of strain for desired products.**
- **Present information clearly in the form of verbal reports.**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information.**
- **Demonstrate effective communication skills in the form of student led group presentations.**

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- T. Satyanarayana, Gotthard Kunze (2009) Yeast Biotechnology: Diversity and Applications. SPRINGER. (ISBN 9781402082917).

(2)- Dilip K. arora, et al (2004) Handbook of Fungal Biotechnology 2nd edition, MARCEL Dekker Inc. New York. (ISBN: 0824740181).

(3)- Dilip K. Arora (2003) Fungal Biotechnology in Agricultural, Food, and Environmental Applications. CRC Press. (ISBN 9780824747701) .

(4)- Kevin Kavanagh (2011) Fungi: Biology and Applications, 2nd Edition. Wiley-Blackwell. (ISBN: 9780470977095).

2. List Essential References Materials (Journals, Reports, etc.)

High Impact Journals:

(1)- Journal of Industrial Microbiology and Biotechnology (Springer) **(2)- Advances in Microbial Physiology (Elsevier)** **(3)- PLoS One Microbial Physiology (PLoS)** **(4)- Frontiers in Microbiology (Frontiers Media S. A.)** **(5)- Journal of Applied Microbiology (Wiley-Blackwell)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Soil Microbiology (4014778-4)
2. Credit hours **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Khaled Elbanna (kabana@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The course aimed to provide current trends and emerging problem in soil microbiology. The students will be familiarized with the critical gap and emerging issues for future work and to get advanced understanding on the subject.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the on the recent trends and emerging topics in soil microbiology. The content of the course will be flexible to be changed to cover any emerging topics that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues.**

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Studying Soil microbial community structure and functions: Conventional approach and molecular approach		
Rhizosphere ecology and Chemistry and significance of Root exudates, Plant root - microbe interaction.		
Microbial biofilm on plant and soil		
Soil Enzymes as indicator of soil health– principles and applications		
Microbial mediated plant stress management.		
Plant Endophytic microorganism and their significance		
Plant growth promoting bacteria and fungi		
Microbial interactions mechanisms		
Mycorrhizae and their significance. Methods of mass propogation.		
Concept and significance of soil metagenome analysis.		
Soil as substrate for growth of microorganisms.		
Role of humus and clay in ion exchange and nutrient availability.		
Soil microbial diversity; functional characterization (Bacteria, actinomycetes ,fungi, algae, protozoans and viruses.		
Culture dependent and independent methods of studying soil microbial diversity.		
Soil enzymes as indicators of soil health.		
Aerobic decomposition of native and added organic matter		
Degradation of organic matter;cellulose, hemicellulose and lignin.		
Carbon cycle and global warming and climate change.		
Microbiology and biochemistry of ammonification, nitrification and denitrifcation, and Nitrogen fixation:		
Nitrogenase protection mechanism in diazotrophs		

Mechanism of nodulation and nitrogen fixation, role of various genes in these processes.		
Diversity of diazotrophs, associative and symbiotic nitrogen fixers.		
Microbial transformation of Phosphorus; mechanism of phosphate solubilization.		
Microbial transformation of sulphur- and sulphur compounds. Sulphur oxidizing and reducing microorganisms (*Thiobacillus* and *Desulfovibrio*).		
Microbial transformation of Iron, Manganese, Zinc, Copper and		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

(1)- Familiarize the new development in soil microbiology.
(2)- Understanding molecular basis of soil microbial community structure and function.
(3)- Explain the role of microbial biofilm under natural conditions.
(4)- Learn the basics of molecular methods for genetic improvement of strain for desired products.
(5)- Exploration of microbial interaction with plant roots and significance of root exudates.
(6)- Understand cooperation and negative interaction with in microbial population in soil.
(7)- Present information clearly in the form of verbal reports
(8)- Communicate complex ideas and arguments in a clear, concise and effective manner
(9)- Work effectively as an individual or part of a team.

(10)- Use conventional and electronic resources to collect, select and organize complex scientific information **(11)- Demonstrate effective communication skills in the form of student led group presentations.**

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) **Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.** **Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.**

E Learning Resources

List Required Textbooks **(1)- Paul E. A. (2014) Soil Microbiology, Ecology and Biochemistry 4th edition. Academic Press. (ISBN: 0124159559).** **(2)- Tate R. L. (2012) Soil Microbiology 2nd edition. John Wiley & Sons. (ISBN: 812653978X).** **(3)- Vallabhaneni S. (2012) Soil Microbiology: A Laboratory Manual, Protocols and Techniques. Lab Lambert Academic Publishing. (ISBN: 3659195782).**
2. List Essential References Materials (Journals, Reports, etc.)

High Impact Journals: **(1)- Microbial Ecology (Springer)** **(2)- Microbes and Environments (Japanese Society of Microbial Ecology)** **(3)- Applied and Environmental Microbiology (ASM)** **(4)- Soil Biology and Biochemistry (Pergamon Press)** **(5)- Molecular Plant Pathology (Wiley-Blackwell)** **(6)- Advances in Agronomy (Academic Press)** **(7)- Applied Soil Biology (Elsevier)** **(8)- FEMS Microbiology Ecology (Wiley-Blackwell)** **(9)- Environmental Microbiology 9Wiley-Blackwell)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Antimicrobial Agents and Chemotherapy (4014779-4)
2. Credit hours **4 credit hours**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Khaled Elbanna (kabana@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

3. What is the main purpose for this course? **The course aimed to provide current trends and emerging problem in antimicrobial agents and chemotherapy. The students will be familiarized with the critical gap and emerging issues for future work and to get advanced understanding on the subject.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course includes the on the recent trends and emerging topics in antimicrobial agents and chemotherapy.** **The content of the course will be flexible to be changed to cover any emerging topics**

that arise in the future. Thus, the course is not limited to the list of topics presented below, but will also cover future relevant issues. **Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Emerging topics in antimicrobial agents and chemotherapy		
Antibacterial and antifungal drug development : Current status		
New drug candidates in pipe line drug		
Problematic groups of MDR bacteria		
Molecular mechanism of drug resistance		
Horizontal transfer of drug resistance and role		
Genomics, proteomics based drug discovery approach		
Drug delivery for reducing toxicity and increasing efficacy		
Nanomedicine and drug delivery		
New approaches to enhance antibiotic activity		
New strategies to combat drug resistant problem; Antipathogenic, phage therapy, resistance reversal, combinational approach and use of antibiofilm agents		
Genomics and proteomics based drug target identification in drug discovery		
Nanoparticle and its impact on microbial pathogens		
Resistance to antifungal drugs in yeast and filamentous fungi		
Common physical, chemical agents and their mode of antimicrobial actions and their uses.		
Antibiotic and chemotherapeutic agents. Classification and mode of action against bacteria, fungi, viruses. **Uncovering the molecular basis of antimicrobial action.**		
Methods of assays for antimicrobial sensitivity test and its significance		

Mode of action of antimicrobial drugs **Antibiotics that inhibit peptidoglycan biosynthesis.** **Drugs that interfere with the biosynthesis of the cell wall of mycobacteria.** **Fungal cell wall as a target for antimicrobial drugs. Ionophoric antibiotics.** **Antifungal agents that interfere with the function and biosynthesis of membrane sterols.** **Inhibitors of nucleic acid biosynthesis.** **Inhibitors of protein biosynthesis.** **Nitroheterocyclic antimicrobial agents.**		
Need for new antimicrobial development and current progress.		
Mechanism of antimicrobial resistance and distribution of resistance genes in bacteria and fungi. Detection of resistance genes by molecular techniques.		
Antiviral and antiprotozoal agents: Chemistry and mode of action.		
Safety, side effects and toxicity of common antibiotics and roles of improved drug delivery in enhancing efficacy and reducing toxicity.		
Approaches to develop new antimicrobial agents and combinational strategy.		
Concept of antipathogenic drug principle as antimicrobial agents; use of antiresistance, antibiofilm , antiquorum sensing, and antivirulence agents.		
Nanoparticle as antimicrobial agents and use of Nanotechnology in drug delivery.		
Microbial drug resistance: A historical perspective		
Ecology of antibiotic resistance genes		
Multidrug efflux pumps: Structure; Mechanisms and Inhibition		
Mechanisms of Aminoglycoside antibiotic resistance		

Resistance to Beta-Lactam antibiotics: Structure; Mechanisms and Evolution		
Target modification as a mechanism of antimicrobial resistance		
Antibiotic permeability		
Genetic methods for detecting bacterial resistance genes		
Antimicrobial resistance in the Enterococcus		
Methicillin resistance in Staphylococcus aureus		
Mechanisms of drug resistance in Mycobacterium tuberculosis		
Antibiotic resistance in Enterobacteria		
Resistance as a worldwide problem		
Public health response to antimicrobial resistance in healthcare settings		
Antimicrobial drug discovery in the 21 century		
Secondary metabolism microorganism; Antibiotic production		
Definition, types and need of new antibiotics		
Microorganisms producing antibiotics		
Function and ecological relevance of antibiotics		
Antibiotics as chemotherapeutic agent.		
Common Antibiotic producing microbes		
Actinomycetes; diversity of antibiotics produced by actinomycetes. Biosynthesis and regulation.		
Bacillus as antibiotic produces; chemical nature and mode of action		
Fungi producing antibiotics. e.g. Penicillium sp, types , biosynthesis and mode of action		
Screening for new antibiotic discovery: Role of strain selection and design of test system		
Methods for Isolation and characterization of antibiotic producing microorganism and product characterization.		
Toxicity of antibiotics		

New antimicrobials from marine microorganisms.		
Combinatorial biosynthesis for new antibiotic discovery. Antibiotic in pipe line		
Non -medical Application of antibiotics.		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the problem of antimicrobial drugs.**
- **Explain the constraints in developing novel class of antimicrobials.**
- **Understand mechanism of drug resistance.**
- **Explain the role of HGT in spread of drug resistance gene.**
- **Understanding strategy used for combating drug resistance problem.**
- **Learn the basics of molecular methods for determination of antibiotic resistance in bacteria and fungi.**
- **Present information clearly in the form of verbal reports**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**
- **Work effectively as an individual or part of a team.**
- **Use conventional and electronic resources to collect, select and organize complex scientific information**
- **Demonstrate effective communication skills in the form of student led group presentations.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment

1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Coste A. T., Vandeputte P. (2015) Antifungals: From Genomics to Resistance and the Development of Novel Agents. Caister Academic Press (ISBN: 9781910190012).

(2)- Borysowski J., Międzybrodzki R., Górski A. (2014) Phage Therapy: Current Research and Applications. Caister Academic Press (ISBN: 9781908230409).

(3)- Sánchez S., Demain A. L. (2015) Antibiotics: Current Innovations and Future Trends. Caister Academic Press. (ISBN: 9781908230546).

(4)- Dougherty E., Thomas J., Pucci, Michael J. (2012) Antibiotic Discovery and Development. Springer. (ISBN 9781461414001).

(5)- Mayers D.L., Sobel J.D., Ouellette M., Kaye K.S., Marchaim D. (2017) Antimicrobial Drug Resistance Mechanisms of Drug Resistance, Volume1. Springer. (ISBN: 9783319467160)

(6)- Mayers D.L., Sobel J.D., Ouellette M., Kaye K.S., Marchaim D. (2017) Antimicrobial Drug Resistance: Clinical and Epidemiological Aspects, Volume 2. Springer. (ISBN 9783319472645).

(7)- Kumar A., Mansour H. M., Friedman A., Blough E. R. (2013) Nanomedicine in Drug

Delivery, CRC Press. (ISBN: 9781466506169).

(8)- Laidi R. F. (2014) Actinomycetes and Antibiotic Production: Isolation, Screening and Characterization of Novel Antibiotic Producing Streptomycetes Strains from Soil Origin. Scholars' Press. (ISBN: 3639715829).

(9)- Lechevalier H. A., Waksman S. A. (2011) Guide to the Classification and Identification of the Actinomycetes and their Antibiotics. Nabu Press. (ISBN: 1175994081).

(10)- De Vries R. P., Gelber I. B., Anderson M. R. (2016) Aspergillus and Penicillium in the Post-Genomic Era. Caister Academic Press. (ISBN: 191019039X)

(11)- Uddin M., Manchur M. A., Mahmud N. (2013) Search for Novel Antimicrobial Meatbolite Producing Microorganisms. LAB Lambert Academic Publishing. (ISBN: 3659328693).

(12)- Srividya A. R., Vishnuvarthan V. J. (2013) Newer Antibiotics Produced by Soil Isolates from Indian Soil. LAB Lambert Academic Publishing. (ISBN: 3848480603)

(13)- Madhuri R. J., Kumari K. (2014) The Role of Marine Bacteria in Antibiotic Production. LAB Lambert Academic Publishing (ISBN: 3659476315).

(14)- SergioSanchez and A.L. Demain (2015) Antibiotics: Current Innovation and future Trends, Caister Academic Press (ISBN: 97811908230546).

(15)- Douglas Mayers (2009) Antimicrobial Drug Resistance: Mechanisms of Drug Resistance, Volume 1. Springer Science & Business Media. (ISBN: 1597451800).

(16)- Bryan L. (2012) Antimicrobial Drug Resistance. Elsevier. (ISBN: 0323144950).

(17)- Davey P., Wilcox W. H., Irving W., Thwaites G. (2015) Antimicrobial Chemotherapy 7th edition. Oxford University Press. (ISBN: 0199689776).

(18)- Gigure S., Prescott J. F., Dowling P. M. (2013) Antimicrobial Therapy in Veterinary Medicine 5th edition. Wiley-Blackwell. (ISBN: 0470963026).

(19)- Kon K., Rai M. (2016) Antibiotic Resistance: Mechanisms and New Antimicrobial Approaches. Academic Press. (ISBN: 0128036427).

(20)- Silver L. L., Busch K. (2016) Antibiotic and Antibiotic Resistance. Cold Spring Harbor Laboratory Press. (ISBN: 1621821196).

4. List Essential References Materials (Journals, Reports, etc.)

High Impact Journals:

(1)- International Journal of Antimicrobial Agents (Elsevier)
(2)- Journal of Global Antimicrobial Resistance (Elsevier)
(3)- Antimicrobial Agents and Chemotherapy (ASM)
(4)- Journal of Antimicrobial Chemotherapy (Oxford Journals)
(5)- Microbial Drug Resistance (Mary Ann Liberet Inc)

(6)- Frontiers in Microbiology (Frontiers Media S. A.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking**

feedback from students and in the light of new development in the subject.

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Immunology (4014780-4)
2. Credit hours **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Dr. Hesham A. Malak (hamalak@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **Emerging Topics in Immunology course aims to provide an in-depth understanding to various domains of immunology to the student to enhance the knowledge and skill in immunology.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description **The course is designed to cover various important aspects of Immunology and Vaccination.** **The course is not limited to the topics listed below; these topics are only a suggestion of what the course might include any emerging topics will be covered as they happen.**

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Immune responses- T and B cells. Antigens and its properties. Humoral and cell mediated immune responses,		
Antibody : Structure and functions of of immunoglobulin's,		
Antigenic determinants of immunoglobulin- Isotypic, allotypic and Idiotypic determinants		
Theories of antibody formation- Selection and Clonal selection theory.		
Antigen-Antibody interactions- Antibody affinity, Antibody avidity, Precipitin reaction in fluids and gel, Agglutination reaction		
Serological methods: RIA, ELISA, Immunofluorescence.		
Hybridomas and Monoclonal Antibodies-Formation. Principal of monoclonal antibodies production, Application of monoclonal antibodies		
In vitro synthesis of immunoglobulins, complement and other proteins		
Cytokines: Types and general properties of cytokines and chemokines. Source and effect of Tumor necrosis factors and Interferon. Super antigens and septic shock syndrome.		
T-Cell Receptor: T cell accessory membrane molecules (CD and adhesion molecules).		
Regulation of Immune Response: Negative regulation-Immunological tolerance, T cell mediated suppression of immune response. Tumor Immunology: Effector mechanisms, Immuno- surveillance theory.		
Approaches in cancer immunotherapy: Immunomodulation (definition and concept. Concept of Clinical Immunology and experimental immunology.		
Etiological agents of communicable diseases requiring new or improved human vaccines		
Mechanisms of pathogenesis		
Innate and acquired immune responses		
Immune response to infectious and parasitic diseases		
Identification and analysis of vaccine antigens		

Developing new vaccines		
New and improved live attenuated vaccines		
EBV Vaccine development: a laboratory-based case study		
HBV Vaccines: from the laboratory to license – a case study		
Concepts of molecular vaccines		
Public health and regulatory issues		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week. ☐

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the mechanisms and components of the immune system.**
- **Understand the immune defense mechanism.**
- **Able to differentiate between the different types of immune cells.**
- **Understand the regulatory roles of the immune system.**
- **Define the immunotherapy and understand its concepts and applications.**
  Understand the importance of vaccine and vaccination to human health.
- **Understanding the types of vaccine and their efficacy and limitation.**
- **Explain how immune system-respond to a new vaccine.**
- **Understand new concept of molecular vaccine.**
- **Elaborate the public health and regulatory issue associated with vaccine.**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**

2	**Short essay**		**20%**
3	**Short written exam**		**10%**
4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Delves P. J., Martin S. J., Burton D. R., Roitt I. M. (2017) Roitt's Essential Immunology 13th Edition. Wiley-Blackwell. (ISBN: 978-1-118-41577-1).

(2)- Abbas A. K., Lichtman A. H. H., Pillai S. (2014) Cellular and Molecular Immunology 8th edition. Saunders. (0323222757).

(3)- Stevens C. D., Miller L. E. (2016) Clinical Immunology and Serology: A Laboratory Perspective 4th edition. F. A. Davis Company. (ISBN: 0803644663).

(4)- Turgeon M. L. (2013) Immunology and Serology in Laboratory Medicine 5th edition. Mosby. (ISBN: 0323085180).

(5)- Barry R. Bloom, Paul-Henri Lambert (2016) The Vaccine Book. Academic Press. (ISBN: 012805400X).

(6)- Stanley A. et al (2012) Vaccines. Elsevier Health Science. (ISBN: 1455700908).

(7)- Matthias Giese (2013) Molecular Vaccines: From Prophylaxis to Therapy, Volume 1. Springer. (ISBN: 3709114195).

2. List Essential References Materials (Journals, Reports, etc.) **High Impact Journals:** **(1)- Nature Immunology (Nature)** **(2)- Nature Reviews Immunology (Nature)** **(3)- Journal of Immunology (American Association of Immunologists)** **(4)- Journal of Immunological Methods (Elsevier)** **(5)- Journal of Clinical Immunology (Springer)** **(6)- European Journal of Immunology (Wiley-Blackwell)** **(7)- Infection and Immunity (ASM)** **(8)- Clinical and Vaccine Immunology (ASM)** **(9)- Human Vaccines and Immunotheraputics (Landes Biosciecne).** **(10)- Vaccines (MDPI).** **(11)- Genetic Vaccines and Therapy (BioMed Central)** **(12)- Annual Reviews in Immunology (Annual Reviews Inc)** **(13)- Frontiers in Immunology (Frontiers Media S. A.)**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **(1)- Class room is already provided with data show** **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**

3 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____

A. Course Identification and General Information

1. Course title and code: Emerging Topics in Agricultural Microbiology (4014782-4)
2. Credit hours: **4 C. H.**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **PhD Microbiology**
4. Name of faculty member responsible for the course **Prof. Khaled Elbanna (kabana@uqu.edu.sa)**
5. Level/year at which this course is offered
6. Pre-requisites for this course (if any)
7. Co-requisites for this course (if any)
8. Location if not on main campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	**100 %**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

B Objectives

1. What is the main purpose for this course? **The major objective of the course is to introduce the strong understanding on various aspects of Agricultural Microbiology below and above the ground and its impact on plant heath and crop productivity.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **The course is designed to cover various important aspects of agricultural microbiology with main emphasis on plant–microbe interaction and its application in sustainable agriculture.** **The course is not limited to the topics listed below; these topics are only a suggestion of**

what the course might include any emerging topics will be covered as they happen.

Not all topics listed below to be covered, however the topics to be chosen are based on the nature of the work in the research plan, guided by the supervisor

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Agricultural Microbiology: The soil-plant-microorganism system		
The rhizosphere environment		
Organic compound released by plants		
Plant-growth promoting bacteria		
Beneficial root-microbial intercations: Biological dinitrogen fixation; Free living dinitrogen fixation; associative dinitrogen fixation		
The legume-rhizobia symbiosis		
Mycorrhizal association		
Pathogenic microbes in agriculture: Fungal pathogens; Bacterial pathogens; viral pathogens		
Soil supressivness of plant pathogens		
Biological pesticides for control of seed and soil-borne plant pathogens		
Microbial pesticides; (*Bacillus thuriengenesis*): Production technology for bio control agents.		
Microbial pesticides; (Baculovirus) Production technology for bio control agents		
Pseudomonas flourecencse as biocontrol agent.		
Trichoderma as biocontrol agent		
Advantages and limitation of biocontrol agents		
Bacterial diseases of plants: causative agents, symptoms, pathogenicity		
Phytoplasma as plant pathogens		
Fungal diseases: Causative agents, symptoms, pathogenicity		
Virulence factors and role of various toxins in plant diseases		
Defense mechanism in plants and role of plant secondary metabolites		
Plant diseases caused by viruses: General characteristics and symptoms		
Detection and characterization of plant pathogenic bacteria.		
Detection and characterization of plant pathogenic fungi.		
Role of environmental factors in plant diseases		
Plant diseases: control measures and strategies		

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**64**					**64**
Credit	**4**					**4**

3. Additional private study/learning hours expected for students per week.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On completion of this course students will have or be able to:

- **Understand the mechanisms plant-microbe interaction.**
- **Explain the role of various factors and plat root exudates in promoting plant-microbe interaction.**
- **Demonstrate the mechanisms of plant growth promotion by rhizobacteria and mycorrhizal fungi.**
- **An introduction to application of PGPR, and biocontrol agents in crop productivity.**
- **Present information clearly in the form of verbal reports**
- **Communicate complex ideas and arguments in a clear, concise and effective manner**
- **Work effectively as an individual or part of a team**
- **Use conventional and electronic resources to collect, select and organize complex scientific information**
- **Be able to assimilate and synthesis data from multiple sources**
- **Demonstrate capacity for self-learning and independent thinking and to utilize problem solving skills**
- **Demonstrate effective communication skills in the form of student led group presentations.**
- **Demonstrate skills in working collegiately and effectively with others as a member of a team.**
- **Set priorities and link these with effective time management**
- **Critically evaluate their personal performance both as an individual and within a team**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Paper presentation (seminar)**		**30%**
2	**Short essay**		**20%**
3	**Short written exam**		**10%**

4	**Long literature review**		**40%**
5	**TOTAL**		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week).

Academic teaching staff will be available to meet individual students for consultation and academic advice at their private offices at the times advised.

Office hours: 10 hrs per week; each semester. Time will varies each semester based on academic schedule for each teaching staff.

E Learning Resources

1. List Required Textbooks

(1)- Maier R. M. et al. (2014) Environmental Microbiology 3rd edition. Academic Press. (ISBN: 012-394-6263).

(2)- van Elsas J. D. et al. (2006) Modern Soil Microbiology 2nd edition. CRC Press. (ISBN: 082-472-7495).

(3)- Paul E. A. (2014) Soil Microbiology, Ecology and Biochemistry 4th edition. Academic Press. (ISBN: 0124159559).

(4)- Tate R. L. (2012) Soil Microbiology 2nd edition. John Wiley & Sons. (ISBN: 812653978X).

(5)- Vallabhaneni S. (2012) Soil Microbiology: A Laboratory Manual, Protocols and Techniques. Lab Lambert Academic Publishing. (ISBN: 3659195782).

(6)- Agrios G. (2005) Plant Pathology 5th Edition. Academic Press. (ISBN: 9780120445653)

(7)- Schumann G. L., D'Arcy C. J. (2010) Essential Plant Pathology 2nd edition. American Phytopathological Society Press. (ISBN: 978-0-89054-381-8)

(8)- Singh R. S. (2009) Plant Diseases. Oxford and IBH Publishing Co. New Delhi. (ISBN: 8120417461).

(9)- Singh R. S. (2010) Introduction to Principles of Plant Pathology 4th Edition. Oxford and IBH Publishing Co. New Delhi. (ISBN 10: 8120415515).

(10)- Heimpel G. E., Mills N. J. (2017) Biological Control: Ecology and Applications 8th

edition. Cambridge University Press. (ISBN: 0521845149).

(11)- Helyer N., Cattlin N. D., Brown K. C. (2014) Biological Control in Plant Protection: A Colour Handbook 2nd Edition. CRC Press. (ISBN 9781840761177).

(12)- van Driesche R., Simberloff D., Blossy B. et al. (2016) Integrating Biological Control into Conservation Practice. Wiley-Blackwell. (ISBN: 1118392590).

(13)- Green V. (2017) Biocontrol Agents: Types, Applications and Research Insights. Nova Science Pub Inc. (ISBN: 1536105538).

(14)- Copping L. G. (2011) Manual of Biocontrol Agents: A World Compendium 4th edition. CABI. (ISBN: 1901396177).

2. List Essential References Materials (Journals, Reports, etc.)

High Impact Journals:
(1)- Symbiosis (Springer)
(2)- Journal of Agricultural Science and Technology (National Center for Scientific Research)
(3)- Journal of Agricultural of Safety and Health (American Society of Agricultural Engineers)
(4)- Frontiers in Microbiology (Open Access)
(5)- Applied and Environmental Microbiology (ASM)
(6)- Environmental Microbiology (Wiley-Blackwell)
(7)- Microbial Ecology (Springer)
(8)- Plant Diseases (American Phytopathological Society)
(9)- Journal of Plan Disease and Protection 9Springer0
(10)- Plant Pathology (Wiley-Blackwell)
(11)- Molecular Plant Pathology (Wiley-Blackwell)
(12)- Biological Control (Elsevier)
(13)- Biocontrol (Springer)
(14)- Journal of Biological Control (Society of Biocontrol Advancment)
(15)- Biocontrol Science and Technology (Taylor & Francis)
(16)- Biocontrol (J-Stage)
(17)- Egyptian Journal of Biological Pest Control (Egyptian Society of Biological Control of Pests)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

(1)- Class room is already provided with data show **(2)- The area of class room is suitable concerning the number of enrolled students (could accommodate up to 100 students) and air conditioned.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **(1)- Class rooms are equipped with data show.** **(2)- A computer lab is required and connected to the network for students to gather their data and study materials**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) .

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **(1)- Questionnaires / students opinion survey** **(2)- Open discussion in the class room at the end of the lectures or during individual student/staff meeting**
4 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(1)- Revision of student answer papers / assignments by another staff member.** **(2)- Analysis the grades of students.**
5 Processes for Improvement of Teaching **(1)- Preparing the course as PPT.** **(2)- Using scientific movies.** **(3)- Coupling the theoretical part with laboratory part** **(4)- Periodical revision of course content.**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **After the agreement of Department and Faculty administrations; it might include:** **(1)- Random check of students exam papers / assignments by external examiner** **(2)- Random check of students exam papers / assignments by internal examiner**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **A departmental review committee will look after the arrangement periodically after taking feedback from students and in the light of new development in the subject.**

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Course Instructor _____

Program Coordinator:_____

Signature: _____ Date Received: _____