Chm 431: Principle of Surface Chemistry

Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Principle of Surface Chemistry**			
Course Code (according to the bylaw)	**Chm 431**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**-**	**-**	**2**
Course Type	**Compulsory Course** اجباري			
Academic level at which the course is taught	**Four level** الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Marwa Sameeh**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview (Brief summary of scientific content)

This course aims to understand the concepts of surface phenomena, colloid systems, and catalysis. Explore surface tension, its relationship with temperature, and measurements for various interfaces (solid/liquid, solid/gas, liquid/liquid). Learn about the colloid state, its classifications, and the behavior of colloid systems. Study catalysis, including types, components, preparation methods, and its role in different reactions.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems.	A1	Investigate the relation between surface and solid crystal structure on the catalyst behavior and the surface properties of different materials and the colloid state of matter.
		A2	Define the concepts of surface, colloid and catalysis.
		A3	Investigate the different applications of thin films of liquid on solid materials.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B1	Analyze the given chemical data to identify the activity of catalyst.
		B2	Explain the different theories of catalysis, different types of colloid systems.
4.3	Analyze, synthesis, assess and interpret quantitatively and qualitatively science relevant data.	D1	Use computer, internet & communications
4.9	Differentiate between the different states of matter, elements and chemical compounds based on the recognition and quantification of properties.	D2	Management, working in group & life-long learning

4. Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	**Training (Practical)**	**Self-learning (Tasks/ Assignments)**	**Other (to be determined**
1	○ Introduction to surface chemistry, catalysis, colloid state.	**2**	**2**	-	-	-
2	2.1. Surface tension and its relation with curvature and effect of temperature on it.	**2**	**2**	-	-	-
3	3.1. Measurements of surface tension and surface activity	**2**	**2**	-	-	-
4	a. Surface excess and how be measured, solid/liquid interface, spreading coefficient, Liquid/liquid interface and application of thin films	**2**	**2**	-	-	-
5	5.1. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (1).	**2**	**2**	-	-	-
6	6.1. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (2).	**2**	**2**	-	-	-
7	8.1. Introduction to Colloid state, types of colloid systems, preparation of them and purification.	**2**	**2**	-	-	-

8	**Mid-term**					
9	9.1. The properties of colloid solutions (electrical, optical and kinetic properties, protection of colloid systems).	**2**	**2**	-	-	-
10	10.1. Introduction to catalysis.	**2**	**2**	-	-	-
11	11.1. The components of catalyst part (1).	**2**	**2**	-	-	-
12	12.1. The components of catalyst part (2).	**2**	**2**	-	-	-
13	13.1. Materials used as catalyst (metals, semiconductor, insulators).	**2**	**2**	-	-	-
14	14.1. Preparation of catalyst, function of catalyst.	**2**	**2**	-	-	-
15	15.1. Revision	**2**	**2**	-	-	-

5.Teaching and Learning Methods

1- **Lecture and presentations**
2- **Practical section**
3- **Open discussions & Seminars**
4- **Self-learning Tasks**
5- **Problem Solving**

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	**20**	**20%**
2	Mid-Term Exam	Seventh week	**10**	**10%**
3	Final Written Exam	seventeenth week	**60**	**60%**
4	Final Oral Exam	Sixteenth week	**10**	**10%**
Total			**100**	**100%**

*** The methods mentioned are examples, the organization may add and/or delete**

7. Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	1. Richard M. Pashley and Marilyn E. Karaman`` Applied Colloid and Surface Chemistry 2. Introduction to Surface Chemistry and Catalysis" by Gabor A. Somorjai and Yimin Li, 2nd Edition, Wiley, 2019.
	Other References	https://pmc.ncbi.nlm.nih.gov/articles/PMC5513586/ https://link.springer.com/journal/10634
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank https://www.ekb.eg/web/guest/home https://www.sciencedirect.com/topics/materials-science/electron-microscopy
	Learning Platforms (Links must be added)	https://benhasci.ekb.eg/ https://ebook1.bu.edu.eg/
	Other (to be mentioned)	chemwiki.ucdavis.edu/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry www.chem1.com/acad/webtext/elchem/ chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/electro.php
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board
	Electronic Programs	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Course Coordinator	Program Coordinator
Dr. Marwa Sameeh	**Dr. Mohamed Atef**

1. Basic Information

Course Title (according to the bylaw)	**Principle of Heterocyclic Chemistry and Applications**			
Course Code (according to the bylaw)	**Chm 465**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**-**	**3**
Course Type	**Compulsory Course** اجباري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**B.Sc. Microbiology and Chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Prof. Dr. Mohamed Sayed Behalo**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025/12/9 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview

This course focuses on the fundamentals of heterocyclic chemistry, emphasizing the synthesis, reactivity, and practical applications of heterocyclic compounds. It examines the relevance of various heterocyclic derivatives in relation to standard industrial and pharmaceutical products. The course also includes structural elucidation of heterocyclic compounds using modern spectral analysis techniques.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	**A1**	Outline principles of organic synthesis in the prediction of reaction pathway and the nature of the synthesized heterocycles.
		A2	Describe an organic compound from any functional group or class, and explain the characteristic behavior (functionality) of each type of compound
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics.	**A3**	Utilize and define different characters for identification of different heterocyclic derivatives
		A4	Define the relative stability of different heterocyclic products.
		A5	Determine the structure of heterocyclic compounds and the reactivity associated with functional groups.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	**C1**	Design different methods for the synthesis of heterocycles
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	**C2**	Formulate mechanisms for reaction pathways
		C3	Hypothesize the relation between structures and the biological activity of heterocyclic compounds.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**D1**	Create relation between structures and toxicity of organic compounds.

4.Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignments)	Other (to be determined
1	1.1. Nomenclature of heterocyclic compounds	5	2	-	-	-
	1.2. Introduction about preparation of pharmaceuticals		-	3		
2	2.1. Synthesis, reactions and applications of three and four membered heterocycles	5	2	-	-	-
	2.2. Review about recrystallization process of heterocycles		-	3		
3	3.1. Synthesis, reactions and applications of five membered heterocycles (one heteroatom) part (1) -	5	2	-	-	-
	3.2. Recrystallization of benzoic acid by using aqueous media		-	3		
4	4.1. Synthesis, reactions and applications of five membered heterocycles (one heteroatom) part (2)	5	2	-	-	-
	4.2. Recrystallization of phthalic acid by mixed solvent		-	3		
5	5.1.Synthesis, reactions and applications of five membered heterocycles (more than one heteroatom) part (1)	5	2	-	-	-
	5.2.Preparation of aspirin		-	3		
6	6.1.Synthesis, reactions and applications of five membered heterocycles (more than one heteroatom) part (2)	5	2	-	-	-

	6.2.Preparation of b-naphthyl acetate.		-	3		
7	8.1. Synthesis, reactions and applications of six membered heterocycles (one heteroatom)	5	2	-		
	8.2. Preparation of phthalimide		-	3		
8	**Mid-term**					
9	9.1 Synthesis, reactions and applications of fused five membered heterocycles	5	2	-	-	-
	9.2. Preparation of phthalyl glycine		-	3		
10	10.1. Synthesis, reactions and applications of six membered heterocycles (more than one heteroatom) (1) part	5	2	-	-	-
	10.2 Preparation of N-benzylidine aniline		-	3		
11	11.1 Synthesis, reactions and applications of six membered heterocycles (more than one (2) heteroatom) part	5	2	-	-	-
	11.2. Preparation of chalcone		-	3		
12	12.1 Nomenclature of fused (1) heterocycle's part -	5	2	-	-	-
	12.2. Part 1: preparation of N-hydroxy phthalimide		-	3		
13	13.1 Advanced applications of ionic liquid according to their chemical properties.	5	2	-	-	-
	13.2. Part 2: preparation of N-hydroxy phthalimide		-	3		
14	14.1. Revision	5	2	-	-	-
	14.2. Revision		-	3		
15	15.1.Revision	5	2	-	-	-
	15.2. Revision		-	3		

5.Teaching and Learning Methods

1 **Lecture and presentations**
2 **Practical section**
3 **Open discussions & Seminars**
4 **Self-learning Tasks**
5 **Problem Solving**

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	fourteenth week	**15**	**%15**
2	Mid-Term Exam	Seventh week	**5**	**%5**
3	Final Written Exam	eighth week	**50**	**%50**
4	Final Practical Exam	Sixteenth week	**25**	**%25**
5	Final Oral Exam	Sixteenth week	**5**	**%5**
Total			100	100%

1 Methods of students' assessment

2 Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Lecture notes prepared by the course instructor(s) approved from Chemistry Department. 1- Patai, S., Rappoport, Z., & Stirling, C. H. The Chemistry of Heterocyclic Compounds (Volume 1: General Considerations and Methodologies). Wiley, 2023. Fawcett, J. W., & Binns, A. Heterocyclic Chemistry: -2 .Principles and Applications (2nd ed.). Elsevier, 2023
	Other References	Rajan, S. S. Heterocyclic Chemistry in Drug Discovery (1st ed.). Springer, 2023.
	Electronic Sources (Links must be added)	* Journal of Heterocyclic chemistry * Heteroatom Chemistry * Journal of American Chemical Society (JACS)
	Learning Platforms (Links must be added)	
	Other (to be mentioned)	
Supportive facilities & equipment for teaching	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board
	Electronic Programs	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments

and learning *	**Virtual Labs**	Praxilabs
	Other (to be mentioned)	

Course Coordinator **Prof. Dr. Mohamed Sayed Behalo**	**Program Coordinator** **Dr/ Mohamed Atef**

Mic 481: Plant pathology Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**Plant pathology**			
Course Code (according to the bylaw)	**Mic 481**			
Department/s participating in delivery of the course	**Botany and microbiology department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	**3**	**-**	**2**
Course Type	اجباري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**B.SC. in microbiology and chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Dr\ hassan emara**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview (Brief summary of scientific content)

By Finishing this course the graduate will be able to diagnose the general characteristics of disease symptoms: What are the cause of plant diseases (Biotic factors), What are the cause of plant

diseases(Abiotic factors),What types of plant diseases, How can we prevent or manage plant diseases.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Describe Early diagnosis of plant diseases.
		A2	Describe what are Biotic and Abiotic factors that cause of plant diseases.
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	B1	Compare between different Abiotic factors.
		B2	Compare between different Biotic factors.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B3	Outline Plant disease reduce yield of food and crops.
		B4	Report the life cycle of Plant diseases.
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines.	C1	Isolation of the causal pathogens on different media.
		C2	Prepare Pathogenicity tests.
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	C3	Analyze the toxic compounds pathogens produced.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	D1	Assess Disease management by chemical
		D2	Assess Disease management by host resistance
		D3	Confirm Biological control of plant disease.

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	What are the cause of plant diseases(Abiotic factors),	**4**	**1**	**3**	**-**	**-**
2	What are the cause of plant diseases (Biotic factors),Fungi	**4**	**1**	**3**	**-**	**-**
3	What are the cause of plant diseases (Biotic factors),Bacteria	**4**	**1**	**3**	**-**	**-**
4	What are the cause of plant diseases (Biotic factors),Viruses	**4**	**1**	**3**	**-**	**-**
5	Types of plant diseases(damping off, vascular disease)	**4**	**1**	**3**	**-**	**-**
6	Types of plant diseases(cankers, galls)	**4**	**1**	**3**	**-**	**-**
7	Types of plant diseases(Root rot, postharvest disease)	**4**	**1**	**3**	**-**	**-**
8	**Midterm exam and revision**	**0**	**0**	**0**	**-**	**-**
9	Prevent or manage plant diseases. (Avoid)	**4**	**1**	**3**	**-**	**-**
10	Prevent or manage plant diseases(Exclude)	**4**	**1**	**3**	**-**	**-**
11	Prevent or manage plant diseases(Eradication)	**4**	**1**	**3**	**-**	**-**
12	How do protect plant by chemical and host resistance	**4**	**1**	**3**	**-**	**-**
13	Biological control of plant disease	**4**	**1**	**3**	**-**	**-**
14	Integrated approach to disaese management	**4**	**1**	**3**	**-**	**-**
15	REVISION	**4**	**1**	**3**	**-**	**-**

5. Teaching and Learning Methods

1- Interactive lectures
2. Practical work
3. presenrations
4. e-learning

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	8	5	5%
2	Assignment 1	12	15	15%
3	Final Practical/Clinical/… Exam	16	25	25%
4	Final Oral Exam	16	5	5%
5	Final written exam	From week 17	50	50%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	J. Chojak-Koźniewska et al. Interactive effects of salt stress and Pseudomonas syringae pv. lachrymans infection in cucumber: involvement of antioxidant enzymes, abscisic acid and salicylic acid Environ. Exp. Bot. (2017) Horst R.K., *Plant In: Westcott's Plant Disease Handbook. Boston, MA: Springer,* 2001:65–530. [Google Scholar] Shkalikov V.A., Beloshapkina O.O., Bukreev D.D., Gorbachev I.V., Dzhalilov F.S.U., Korsak I.V., Minaev V. Yu., Stroykov Yu. M. *Plant protection from disease. M.: Kolos, 2010. 404 p.* 2010. Jiang L., Jeong J.C., Lee J.-S., Park J.M., Yang J.-W., Lee M.H., Choi S.H., Kim C.Y., Kim D.-H., Kim S.W., et al. Potential of Pantoea dispersa as an Effective Biocontrol Agent

		for Black Rot in Sweet Potato. Sci. Rep. 2019;9:16354. Paul N.C., Park W., Lee S., Chung M.N., Lee H.-U., Yang J.-W. Occurrence of Sweetpotato (Ipomoea batatas) Wilt and Surface Rot Disease and Determining Resistance of Selected Varieties to the Pathogen in Korea. Plants. 2020;9:497.
	Other References	
	Electronic Sources (Links must be added)	
	Learning Platforms (Links must be added)	**Thinq + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Computer- data show –microphone- projector**
	Supplies	**White board- marker**
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	**Visual lab**
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature
Course Coordinator
Prof. Dr.Hassan Emara

Name and Signature
Program Coordinator
Dr\ Mohamed atef

Mic 491: Industrial microbiology Course Specification (2025)

1.Basic Information

Course Title (according to the bylaw)	**Industrial microbiology**			
Course Code (according to the bylaw)	**Mic 491**			
Department/s participating in delivery of the course	**Botany and microbiology department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**-**	**3**
Course Type	اجباري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**B.SC. in microbiology and chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Prof. Dr\Mahmoud Amer**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

By Finishing of this course the graduate will able understanding the general idea of industrial microorganism. The production of antibiotics , enzymes , organic acids. The biogas , single cell protein and vitamins.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Determine the best microbes in manufacture.
		A2	Determine the optimum condition of media for industrial microorganisms.
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	B1	Confirm the microbial production as antibiotics, vitamins and enzymes in commercial side.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	C1	Prepare small units for microbial industry.
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	C2	Examine the active substances are produced biologically and create an industrial microbe in the bioconversion of waste into commercial products.
3.11	11operate and maintain specialized laboratory instruments, including autoclaves, centrifuges, spectrophotometers, and laminar flow hoods.	C3	Differentiate between the natural microbial compounds and the synthetic substances in application of medicine.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	D1	Working in groups to choose the best industrial microbe.
		D2	Working in groups to choose the optimum media for increasing the production.

4. Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments/ Projects/ ...)	**Other** (to be determined)
1	Studying the important features of industrial microorganisms	**5**	**2**	**3**	-	-
2	Studying different types of fermentation processes.	**5**	**2**	**3**	-	-
3	Assessment of factors influencing bioethanol production	**5**	**2**	**3**	-	-
4	Evaluating the microbial transformation of steroids	**5**	**2**	**3**	-	-
5	Preparation of some steroid hormones and derivatives.	**5**	**2**	**3**	-	-
6	Estimating the ability of microorganisms to produce antibiotics	**5**	**2**	**3**	-	-
7	Detection and recovery of some antibiotics	**5**	**2**	**3**	-	-
8	**Midterm exam**	**-**	**-**	**-**	-	-
9	Studying the production of polysaccharides (Dextran production).	**5**	**2**	**3**	-	-
10	Determining the organic acids production by microorganisms	**5**	**2**	**3**	-	-
11	Assessment of factors affecting production and recovery of some organic acid.	**5**	**2**	**3**	-	-
12	Studding vitamin production by some microorganisms.	**5**	**2**	**2**	-	-
13	Estimating the production of microbial enzymes as (amylase, protease, and pectinase)	**5**	**2**	**3**	-	-
14	Estimating the production of microbial enzymes as (amylase, protease, and pectinase)	**5**	**2**	**3**	-	-
15	**Revision**	**5**	**2**	**3**	-	-

5.Teaching and Learning Methods

- lectures
- lectures presentations
- discussion groups
- practical work
- **self-learning (going to library)**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	**8**	**5**	**5%**
2	Assignments / Project /Portfolio/ Logbook	**12**	**15**	**15%**
3	Final Practical/Clinical/… Exam	**16**	**25**	**25%**
4	Final Oral Exam	**16**	**5**	**5%**
5	Final written exam	**From week 17**	**50**	**50%**

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Course notes** Geis, P. A. (Ed.). (2020). *Cosmetic microbiology: A practical approach*. CRC Press. Saini, R. K., & Keum, Y. S. (2019). Microbial platforms to produce commercially vital carotenoids at industrial scale: an updated review of critical issues. *Journal of industrial microbiology and biotechnology*, *46*(5), 657-674.
	Other References	Vees, C. A., Neuendorf, C. S., & Pflügl, S. (2020). Towards continuous industrial bioprocessing with solventogenic and acetogenic clostridia: challenges, progress and perspectives. *Journal of Industrial Microbiology & Biotechnology: Official Journal of the Society for Industrial Microbiology and Biotechnology*, *47*(9-10), 753-787
	Electronic Sources (Links must be added)	www.eulc.edu.eg - Mycologist An International Journal of general mycology, A publication of the British Mycological Society, Elsevier
	Learning Platforms (Links must be added)	**Thinq + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Computer- data show- projector- microphone**
	Supplies	**White board- marker**
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	**Visual lab**
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature
Course Coordinator
Prof. Dr \ Mahmoud Amer

Name and Signature
Program Coordinator
Dr\ Mohamed atef

Mic 495: Antibiotics Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	**Antibiotics**			
Course Code (according to the bylaw)	**Mic 495**			
Department/s participating in delivery of the course	**Botany and microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	**3**	-	**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	Prof. Dr. Mohamed Osman			
Course Specification Approval Date	**1/7/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

By Finishing of this course the graduate will able to understand, Sources of Antibiotics, Classification of antibiotics on the basis of chemical structure, Classification of Antibiotics according to mode of actions, Antibiotics inhibiting protein synthesis, Antibiotics inhibiting cell wall, Antibiotics inhibiting nucleic acid synthesis, Antibiotics affecting cytoplasmic membrane, Antibiotics affecting folic acid synthesis, Antifungal, Antiviral, Side effect of Antibiotics, Distribution &Absorption & Bioavailability and Transformation.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Describe the general characteristics of antibiotics.
		A2	Identify the classification of antibiotics.
		A3	Explain the activity and function of antibiotics.
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	B1	Compare between different types of antibiotics
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B2	Report the life cycle of antibiotics.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	C1	Isolation of actinomycetes on different media.
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	C2	Investigate the biochemical and molecular characteristics of antibiotics.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays	C3	Analyze the production of secondary

4.Course Schedule

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	according to standard laboratory protocols.		metabolites of antibiotics by actinomycetes.
4.7	Deal responsibly and ethically with property rights, patents, and scientific intellectual property.	**D1**	Use computer, internet & communications
		D2	Management, working in group & life-long learning

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments/ Projects/ ...)	**Other** (to be determined)
1	Sources of Antibiotics	**4**	**1**	**3**	-	-
2	Classification of antibiotics on the basis of chemical structure	**4**	**1**	**3**	-	-
3	Classification of Antibiotics according to mode of actions	**4**	**1**	**3**	-	-
4	Antibiotics inhibiting protein synthesis	**4**	**1**	**3**	-	-
5	Antibiotics inhibiting cell wall	**4**	**1**	**3**	-	-
6	Antibiotics inhibiting nucleic acid synthesis	**4**	**1**	**2**	**1**	-
7	Antibiotics affecting cytoplasmic membrane	**4**	**1**	**3**	-	-
8	**Midterm exam and revision**	**-**	**-**	**-**	-	-
9	Antibiotics affecting folic acid synthesis	**4**	**1**	**3**	-	-
10	Antifungal	**4**	**1**	**3**	-	-
11	Antiviral	**4**	**1**	**3**	-	-
12	Side effect of Antibiotics	**4**	**1**	**3**	-	-
13	Distribution, Absorption, Bioavailability and Transformation	**4**	**1**	**2**	**1**	-
14	Distribution, Absorption, Bioavailability and Transformation	**4**	**1**	**3**	-	-
15	**revision**	**4**	**1**	**3**	-	-

5.Teaching and Learning Methods

- Lecture presentations
- Practical work
- Discussion sessions.
- Self-directed learning

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	8	5	5%
2	Assignments / Project /Portfolio/ Logbook	13	15	15%
3	Final Practical/Clinical/… Exam	16	25	25%
4	Final Oral Exam	16	5	5%
5	Final Written Exam	17	50	50%

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Course notes**
	Other References	1) Arenz, S., & Wilson, D. N. (2016). Bacterial protein synthesis as a target for antibiotic inhibition. *cold spring harbor perspectives in medicine*, *6*(9), a025361. 2) KERSTEN, Helga; KERSTEN, Walter. Inhibitors of nucleic acid synthesis: biophysical and biochemical aspects. 2013. 3) Sarkar, P., Yarlagadda, V., Ghosh, C., & Haldar, J. (2017). A review on cell wall synthesis inhibitors with an emphasis on glycopeptide antibiotics. *Medchemcomm*, *8*(3), 516-533. 4) HETA, Saimir; ROBO, Ilma. The side effects of the most commonly used group of antibiotics in periodontal treatments. *Medical Sciences*, 2018, 6.1: 6. **5)** Zainab, Syeda Maria, et al. "Antibiotics and antibiotic resistant genes (ARGs) in groundwater: A global review on dissemination, sources, interactions, environmental and human health risks." *Water research* 187 (2020): 116455
	Electronic Sources (Links must be added)	
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Computer- microphone- data show- paper projector**
	Supplies	**White board – marker**
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	**Visual lab**
	Other (to be mentioned)	

Name and Signature **Course Coordinator** Prof. Dr. Mohamed Osman		**Name and Signature** **Program Coordinator** **Dr\ Mohamed atef**

Mic 497: Bio-fertilizers Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**Bio-fertilizers**			
Course Code (according to the bylaw)	**Mic 497**			
Department/s participating in delivery of the course	**Botany and microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	**3**	**-**	**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**B.SC. in microbiology and chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Asst. Prof, Dr\ Ghada Eid**			
Course Specification Approval Date	**1/7/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview (Brief summary of scientific content)

By Finishing of this course the graduate will able understanding the different types of biofertilizers, Mechanism of action of biofertilizers, biofertilizers formulations and application of biofertilizers.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Describe the different types of biofertilizers
		A2	Identify the phytoprotection mechanism by biofertilizers
		A3	explain the mechanism of action of biofertilizers
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	B1	Compare between different types of biofertilizers
		B2	Interpret benefits of bionanofertilizers.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B3	Report the mode of action of biofertilizers
		B4	Confirm the improvement of plant response by nanobiofertilizers.
3.1	lan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines.	C1	Isolation of different types of biofertilizers on their specific media.
		C2	Investigate the plant growth promoting activities of different isolates.
		C3	Analyze the impact of action of biofertilizers on different crops.
4.4	Work cooperatively in teams; manage time; collaborate effectively; and communicate with clarity and professionalism.	D1	-Use computer, internet & communications.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	D2	**Management, working in group & life-long learning**
		D3	**Ethical behavior, community linked thinking.**

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Definition of biofertilizers	**4**	**1**	**3**	**-**	**-**
2	Types of Biofertilizers	**4**	**1**	**3**	**-**	**-**
3	Studying the role of biofertilizers for an ideal sustainable agricultural system	**4**	**1**	**3**	**-**	**-**
4	Studying the role of biofertilizers for an ideal sustainable agricultural system	**4**	**1**	**3**	**-**	**-**
5	Estimating the ability of microorganisms for different plant growth promoting activities as nitrogen fixation, insoluble phosphate solubilization, production of different hormones as (IAA, gibberellins and cytokinin) and siderophores production	**4**	**1**	**2**	**1**	**-**
6	Estimating the ability of microorganisms for different plant growth promoting activities as nitrogen fixation, insoluble phosphate solubilization, production of different hormones as (IAA, gibberellins and cytokinin) and siderophores production	**4**	**1**	**3**	**-**	**-**
7	Estimating the ability of microorganisms for different plant growth promoting activities as nitrogen fixation, insoluble phosphate solubilization, production of different hormones as (IAA, gibberellins and cytokinin) and siderophores production	**4**	**1**	**3**	**-**	**-**
8	**Midterm exam and revision**	**0**	**0**	**0**	**-**	**-**
9	Evaluating the indirect effect of biofertilizers as bicontrol agents for different plant pathogens.	**4**	**1**	**3**	**-**	**-**
10	Evaluating the indirect effect of biofertilizers as bicontrol agents	**4**	**1**	**3**	**-**	**-**

	for different plant pathogens.					
11	Studying the ability of biofertilizes to resist a biotic stress as drought and salinity.	**4**	**1**	**2**	**1**	**-**
12	Studying the ability of biofertilizes to resist a biotic stress as drought and salinity.	**4**	**1**	**3**	**-**	**-**
13	Determinating the impact of plant growth promoting organisms on different plant growth characteristics (morphological).	**4**	**1**	**3**	**-**	**-**
14	Determinating the impact of plant growth promoting organisms on different plant growth characteristics (morphological).	**4**	**1**	**3**	**-**	**-**
15	Determinating the impact of plant growth promoting organisms on different plant growth characteristics (physiological).	**4**	**1**	**3**	**-**	**-**

5.Teaching and Learning Methods

1- Interactive lectures.
2. Practical work.
3. presentations
4. self- learning.

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks

1	Exam 1 (semester work)	**4**	**5**	**5%**
2	Midterm exam	**8**	**5**	**5%**
3	Final Practical/Clinical/… Exam	**16**	**25**	**25%**
4	Final Oral Exam	**16**	**5**	**5%**
5	Final Written Exam	**From week 17**	**50**	**50%**
6	Assignments / Project /Portfolio/ Logbook	**14**	**10**	**10%**

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Course notes** Notes approved from botany and microbiology department - Corlett R.T., Hughes A.C., Mammals in forest ecosystems. *Routledge Handb. For. Ecol. Routledge, Oxford, UK*., 264–278, 2015.
	Other References	Mahanty, T., Bhattacharjee, S., Goswami, M., Bhattacharyya, P., Das, B., Ghosh, A., & Tribedi, P. (2017). Biofertilizers: a potential approach for sustainable agriculture development. *Environmental Science and Pollution Research*, *24*, 3315-3335. Kumar, R., Kumawat, N., & Sahu, Y. K. (2017). Role of biofertilizers in agriculture. *Popular kheti*, *5*(4), 63-66. Malusà, E., Pinzari, F., & Canfora, L. (2016). Efficacy of biofertilizers: challenges to improve crop production. *Microbial Inoculants in Sustainable Agricultural Productivity: Vol. 2: Functional Applications*, 17-40. Thomas, L., & Singh, I. (2019). Microbial biofertilizers: types and applications. *Biofertilizers for sustainable agriculture and environment*, 1-19.
	Electronic Sources (Links must be added)	- Timmusk, S., Behers, L., Muthoni, J., Muraya, A., Aronsson, A-.C., Perspectives and challenges of microbial application for crop improvement. *Front. Plant Sci.*, 8, 49, 2017. - Stamenković, S., Beškoski, V., Karabegović, I., Lazić, M., Nikolić, N., Microbial fertilizers: A comprehensive review of current findings and future perspectives. *Span. J. Agric. Res.*, 16, e09R01. - Lesueur, D., Deaker, R., Herrmann, L., Bräu, L., and Jansa, J., The production and potential of biofertilizers to improve crop yields, in: *Bioformulations for Sustainable Agriculture*, N.K. Arora *et al*. (Eds.), pp. 71–92, Springer, India, 2016. -D'Annunzio R., Lindquist E., MacDicken K.G., Global

		Forest land-use change from 1990 to 2010: an update to a global remote sensing survey of forests. *Food Agric. Organ. United Nations. Rep. from FAO Eur. Comm. Jt. Res. Centre.*, 1–6, 2014.
	Learning Platforms (Links must be added)	**Thinq + E book platform of benha university**
	Other (to be mentioned)	Cranfield, D.E., Glazer, A.N., Falkowski, P.G. The evolution and future of earth's nitrogen cycle. *Sci.*, 330, 192–196, 2010. FAO (2017). The future of food and agriculture: Trends and challenges. Rome.
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer and Data show -Slide and paper projector- microphone
	Supplies	White board – marker
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	**Visual lab**
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature course Coordinator **Asst. Prof, Dr\ Ghada Eid**	**Name and Signature Program Coordinator** **Dr\ Mohamed Atef**

Chm 400: Nanochemistry and Applications

1.Basic Information

Course Title (according to the bylaw)	**Nanochemistry and Applications**			
Course Code (according to the bylaw)	**Chm 400**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2		**-**	**2**
Course Type	اختياري			
Academic level at which the course is taught	**Fourth level** الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Dr. Ayman Awad Ali**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

The objective of this course is to provide students with an overview of the origin of inorganic nanomaterials, the types and the properties of nanomaterials. The course aims to teach students the preparation of inorganic compounds, especially nanomaterials using different techniques such as solid state, hydrothermal decomposition, precipitation/coprecipitation, sol-gel, hydrothermal and other methods. This course is designed to help students characterize inorganic nanomaterials using different tools. It aims to know the different applications of nanomaterials such as water treatment, preparation, building materials, ceramic pigment, drug delivery, energy, battery and other applications.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	**A1**	Define the origin of nanomaterials and their types.
		A2	Identify methods of the preparation of nanomaterials
		A3	Describe chemical and physical characterization tools of nanomaterials.
		A4	Determine the pathways and steps of synthesis of nanomaterials compounds
		A5	Recognize the different shapes and properties of nanomaterials
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	**B1**	Analyze the chemical composition of the nanomaterials using different tools
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	**B2**	Relate the preparation methods for different types of nanomaterials.
		B3	Label the steps of preparation of nanomaterials
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	D1	Working in groups to choose the best nanomaterial

4- Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignment	Other (to be determined)
1	Introduction about nanomaterials	2	2	-	-	-
2	Types of inorganic nanomaterials	2	2	-	-	-
3	Properties and application of nanomaterials	2	2	-	-	-
4	Synthesis of nanomaterials using solid state method	2	2	-	-	-
5	Synthesis of nanomaterials using precipitation and precipitation-co	2	2	-	-	-
6	Synthesis of nanomaterials using thermal decomposition method	2	2	-	-	-
7	Synthesis of nanomaterials using sol gel method	2	2	-	-	-
8	Synthesis of nanomaterials hydrothermal method	2	2	-	-	-
9	term exam-Mid					
10	Synthesis of nanomaterials using emlustion precipitation and -co precipitation method	2	2	-	-	-
11	Synthesis of nanomaterials using combustion method	2	2	-	-	-
12	Open discussion about the preparation of different inorganic compounds using different methods	2	2	-	-	-
13	Characterization of nanomaterials	2	2	-	-	-
14	nanomaterials Characterization of	2	2	-	-	-
15	Application of nanomaterials in different field					

5. Teaching and Learning Methods

1. Lectures
2. Presentations
3. Open Discussion
4. Problem Solving

5. Brainstorming

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	**20**	**20%**
2	Mid-Term Exam	ninth week	**10**	**10%**
3	Final Written Exam	seventeenth week	**60**	**60%**
4	Final Practical Exam	-	**-**	**-**
5	Final Oral Exam	Sixteenth week	**10**	**10%**
Total			**100**	**100%**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course**	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.**
	Other References	**1.** Sahoo, S. K., & Rai, P. K. Nanochemistry: Synthesis, Properties, and Applications of Nanomaterials (2nd ed.). Wiley, 2023. **2.** Zhang, Y., & Yang, Z. Nanochemistry and Nanomaterials: Fundamentals, Applications, and Characterization Techniques (1st ed.). Elsevier, 2023. **3.** Gupta, S., & Mishra, R. Advanced Nanochemistry: Synthesis, Functionalization, and Application of Nanomaterials (1st ed.). CRC Press, 2023. **4.** A. A. Ali and , I. S. Ahmed, Sol-gel auto-combustion fabrication and optical properties of cobalt orthosilicate: Utilization as coloring agent in polymer and ceramic, Mater. Chem. Phys., 238 (2019) 121888
	Electronic Sources (Links must be added)	**https://www.google.com/** **https://www.ekb.eg/en/web/guest/login** **https://www.wikipedia.org/**
	Other (to be mentioned)	• Nature Nanotechnology Journal of Nanoscience and Nanotechnology
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Data show**
	Supplies	**Using a whiteboard, a microphone in lectures, laptops, Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator
Dr. Ayman Awad Ali

Program Coordinator
Dr. Mohamed atef

Chm 439: Basis of Quantum and Statistical Dynamics Chemistry

1. Basic Information

Course Title (according to the bylaw)	**Basis of Quantum and Statistical Dynamics Chemistry**			
Course Code (according to the bylaw)	**Chm 439**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**-**		**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Kamal. A. Soliman**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview

This course provides a foundation in quantum mechanics and statistical thermodynamics as applied to chemical systems. It explores the relationship between microscopic quantum behaviour and macroscopic chemical properties, highlighting how fundamental principles govern the structure, energy, and behaviour of matter at the atomic and molecular levels. The course emphasizes the theoretical basis of chemical phenomena, bridging quantum theory with thermodynamic concepts to explain real-world chemical behaviour.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems.	**A1**	Define the elementary principles of quantum mechanics.
		A2	To know the principles of statistical thermodynamics.
		A3	Identify simple quantum-chemical calculations.
2.7	Postulate and NR44deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	**B1**	Solve Schrödinger equation and connect quantum theory with group theory.
		B2	Analyze data of statistical thermodynamics from classical and quantum views.

4.Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical/ .....)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	The time- independent and time-dependent Schrodinger equation	2	2	-	-	-
2	Operators - Commutations relations	2	2	-	-	-
3	Postulates and Theorems of Quantum Mechanics	2	2	-	-	-
4	Some analytically soluble problems - Time-independent and dependent Perturbation theory	2	2	-	-	-
5	The variation theorem- Huckel theory of conjugated hydrocarbons - Symmetry elements and symmetry operations	2	2	-	-	-
6	Reducible and Irreducible representations	2	2	-	-	-
7	Midterm exam	2	2	-	-	-
8	Molecular vibrations- Bonding theory	2	2	-	-	-
9	Kinetic theory of gases- Principles of equipartition of energy- Classical calculations of heat capacity	2	2	-	-	-
10	The partition function- Separation of energy components	2	2	-	-	-
11	The electronic, translational, rotational, and vibrational partition function	2	2	-	-	-
12	Entropy at absolute zero- Entropies of gases	2	2	-	-	-
13	Tests of the third law of thermodynamics- The Boltzmann-Maxwell equation	2	2	-	-	-
14	Thermodynamic probability and statistical calculations of entropy- Vibrational, nuclear spin, and rotational entropies- Comparison of third law and statistical entropy	2	2	-	-	-
15	Revision	2	2	-	-	-

5.Teaching and Learning Methods

- **Lecture and presentations**
- **Open discussions & Seminars**
- **Problem Solving**
- **Online learning**

6- Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	fourteenth week	20	**20 %**
2	Mid-Term Exam	Seventh week	10	**10 %**
3	Final Oral Exam	sixteenth week	10	**10 %**
4	Final Written Exam	sixteenth week	60	**60 %**
Total				**100 %**

7- Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.** **•"Quantum Chemical Methods: A Practical Guide" by Tomasz R. Jankowski (2023)** **•"Modern Statistical Mechanics" by N. David Mermin (2022)**
	Other References	**•"Principles of Quantum Chemistry: Theory and Computation" by David L. Andrews (2023)** **•"Quantum Chemistry and Dynamics of Molecular Systems" by Volker P. Drude (2022)**
	Electronic Sources (Links must be added)	http://www.quimica.urv.es/w3qf/ http://web.uconn.edu/~ch351vc/ *http://web.nmsu.edu/~snsm/classes/chem537/*
	Learning Platforms (Links must be added)	
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Data show**
	Supplies	**Using a whiteboard** **Using a microphone in lectures** **Using laptops** **Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator	Program Coordinator
Prof. Dr. Kamal. A. Soliman	**Dr. Mohamed Atef**

Ent 412 Insect borne disease:Course Specification

1.Basic Information

Course Title (according to the bylaw)	**Insect borne disease**			
Course Code (according to the bylaw)	**Ent 412**			
Department/s participating in delivery of the course	**Department of Entemology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	**2**		**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry B.Sc. Program**			
Faculty/Institute	**Science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Dr. Heba Fathy**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

This course covers the nature, identification, and management of plant diseases transmitted by insects. It introduces the mechanisms of pathogen transmission (viruses, bacteria, phytoplasmas, and fungi), interactions among vectors, pathogens, and host plants, and methods for disease prevention and control. Emphasis is placed on economically important insect vectors and their associated diseases in major crops.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.4	Show familiarity with biological and microbiological terminology, nomenclature, and contemporary classification systems based on modern trends and molecular approaches.	a1	Recognize the main insect vectors (aphids, whiteflies, leafhoppers, thrips) and their transmitted plant pathogens.
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	a2	Describe the mechanisms of pathogen transmission (virus, bacteria, fungi, phytoplasma).
		a3	Explain the ecological and biochemical relationships between insect vectors, pathogens, and host plants.
2.9	Evaluate the interrelationships between microorganisms, plants,animals and insects and their ecosystems and predict their responses to environmental changes.	b1	Apply laboratory techniques to identify insect vectors and plant pathogens.
		b2	Collect, preserve, and examine insect specimens and infected plant samples safely and accurately.
		b3	Prepare scientific reports and presentations of disease case studies.
4.4	Work cooperatively in teams; manage time; collaborate effectively; and communicate with clarity and professionalism.	d1	Work effectively in a group to conduct investigations or discussions.
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	d2	Use ICT tools for literature search and data presentation.
		d3	Demonstrate responsibility, ethics, and time management during laboratory and fieldwork.

4.course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical/ .....)	Self-learning (Tasks/ Assignments / Projects/ ...)	Other (to be determined)
1	Introduction: Damage Caused by Insects	3	lectures	Practical		
2	Role of insects as disease vectors	3	lectures	Practical		
3	Virus transmission by whiteflies	4 3	lectures	Practical	Detection of viral symptoms	
4	Virus transmission by aphids	3	lectures	Practical		
5	Leafhopper- and planthopper-transmitted phytoplasmas	3	lectures	Practical		
6	Fungal transmission by aphids	3	lectures	Practical		
7	Arthropod Vectors of Bacterial Pathogens (I)	3	lectures	Practical		
8	Mid term	-	-	-		
9	Arthropod Vectors of Bacterial Pathogens (II)	3	lectures	Practical		
10	Mid Term Exam	3	lectures	Practical		
11	Arthropod and Nematode Plant Diseases	3	lectures	Practical		
12	Vector-pathogen-host relationships	3	lectures	Practical		
13	Epidemiology and disease forecasting	3	lectures	Practical		
14	Disease prevention and control methods	3	lectures	Practical		
15	IPM	3	lectures	Practical		

5.Teaching and Learning Methods

- Lectures and multimedia presentations
- Laboratory and field sessions
- Group discussions and seminars
- Case studies and practical demonstrations

5.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (Semester work)			
2	Exam 2 ..... (Semester work)	**8**	**5**	**5 %**
3	Final Written Exam	**15**	**50**	**50 %**
	Final Practical/Clinical/… Exam	**14**	**25**	**25 %**
	Final Oral Exam	**13**	**5**	**5 %**
	Assignments / Project /Portfolio/ Logbook	**5-12**	**15**	**15 %**
	Field training			
	Other (Mention)			

*** The methods mentioned are examples, the organization may add and/or delete**

6.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Harris, K. F. & Maramorosch, K. (2014). *Aphids as Virus Vectors.* Academic Press, Elsevier, London, UK. ISBN 978-0-12-328320-7.
	Other References	Matthews, R. E. F. (2013). *Plant Virology (5th Edition).* Academic Press, Elsevier, London, UK. ISBN 978-0-12-374153-0.
	Electronic Sources (Links must be added)	**Online Courses, College Classes, & Test Prep Courses - Study.com**
	Learning Platforms (Links must be added)	

	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	
	Supplies	
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	
	Other (to be mentioned)	

Name and Signature
Course Coordinator

Dr. Heba Fathy

Name and Signature
Program Coordinator
Mohamed atef

Introduction to Bioinformatics
Com 427

1-Basic Information

Course Title (according to the bylaw)	**Introduction to Bioinformatics**			
Course Code (according to the bylaw)	**Com 427**			
Department/s participating in delivery of the course	**Mathematics and computer science Department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	**2**		**2**
Course Type	**Compulsory Course**			
Academic level at which the course is taught	Four Level			
Academic Program	**B.Sc. Microbiology and Chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Islam Ahmeed**			
Course Specification Approval Date	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Appendix**			

2- Course Overview (Brief summary of scientific content)

This course introduces the principles and applications of bioinformatics in modern biological research. It covers fundamental concepts such as sequence analysis, databases, and computational tools for studying genes and proteins. Students will gain basic skills in applying bioinformatics methods to analyze biological data.

3- Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	**A1**	**Understanding the basic concepts of bioinformatics and its role in biological research.**
		A2	**Knowing the main databases and tools used in sequence analysis.**
		A 3	**Understanding algorithms applied in genomics and proteomics studies.**
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various sources.	**B1**	**Ability to analyze biological data using computational methods**
2.5	Break down, synthesize, reconstruct, and reformulate complex information such as biosynthetic pathways, macromolecular structures, or microbial life cycles.	**B2**	**Develop skills in evaluating different bioinformatics tools for problem solving**
		B3	**Apply logical reasoning to interpret biological sequences and structures.**
4.1	Use information and communication technology effectively for data handling,	**D1**	**Use bioinformatics software for sequence alignment and database searching.**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	scientific writing, and digital communication.	**D2**	**Apply computational skills to real biological case studies.**
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	**C4**	**Develop teamwork and communication skills in bioinformatics projects.**

4.Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical/ .....)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	What is bioinformatics	3	1	2		
2	Why is bioinformatics important?	3	1	2		
3	Communication skills	3	1	2		
4	Bioinformatician's skill set	3	1	2		
5	Cells	3	1	2	1	
6	DNA, RNA, and the Flow of Information	3	1	2		
7	Base frequencies in duplex molecules	3	1	2		
8	First-order Markov chains	3	1	2	1	
9	Mid-Term Exam					
10	2nd order Markov Chains	3	1	2		
11	Note on programming languages	3	1	2	1	
12	Dideoxy sequencing	3	1	2		
13	Sequence assembly and combination locks	3	1	2		
14	Hybrid method	3	1	2	1	
15	Revisions	3	1	2		

5.Teaching and Learning Methods

- **Lecture Presentations**
- **Practical Assessment**
- **Self-Directed Learning**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm Exam	Weak 9	10	10%
2	Final Written Exam	Start of 17th week	50	50%
3	Final Practical Exam	Weak 16	25	25%
4	Oral Exam	Weak 16	5	5%
5	Practical Assessment 1	Weak 5	2	2%
6	Assessment 2	Weak 8	3	3%
7	Practical Assessment 3	Weak 11	5	5%
8	Assessment 4	Weak 14	5	5%

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course (must be written in full according to the scientific documentation method)	Introduction to Bioinformatics with R by Edward Curry, Addison Wesley, 2020.
	Other References	Maeder, Roman, Programming in Mathematica, Addison Wesley, 2016.
	Electronic Sources (Links must be added)	- http://www5.in.tum.de/lehre/vorlesungen/sci_comp/ws04/TUTORIAL/
	Learning Platforms (Links must be added)	-
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	Devices/Instruments	- Data Show and Projector - Whiteboard - Laptop
	Supplies	Course handouts – Reference sheets
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Course Coordinator	Updated 2025/2026	Program Coordinator
Prof. Dr. Islam Ahmeed		Prof. Dr. Mohamed atef

Chm 406: Nanochemistry and Biological Applications

1.Basic Information

Course Title (according to the bylaw)	**Nanochemistry and Biological Applications**			
Course Code (according to the bylaw)	**Chm 406**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**-**	**3**
Course Type	**compulsory Course** اجباري			
Academic level at which the course is taught	**Forth level** الفرقة/المستوي الرابع			
Academic Program	**B.Sc. Microbiology and Chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Dr. Ayman Awad Ali**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

The objective of this course is to provide students with an overview of the origin of inorganic nanomaterials, the types and the properties of nanomaterials. The course aims to teach students the preparation of inorganic compounds, especially nanomaterials using different techniques. The thin film fabricated using different methods. The course aims to teach students some properties such as color, band gap, etc. This course is designed to help students characterize inorganic nanomaterials using different tools. It aims to know the different applications of nanomaterials such as water treatment, preparation, building materials, ceramic pigment, drug delivery, energy, battery and biological applications.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	**A1**	Define the nanomaterials, properties and their types.
		A2	Describe methods of the preparation of nanomaterials
		A3	Identify the characterization tools of nanomaterials.
		A4	Describe the steps of fabrication of nanomaterials
		A5	Describe methods of the preparation of thin film
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	**B1**	Formulate chemical composition of nanomaterials
		B2	Report on the methods of preparation of nanomaterials
		B3	Report on the types, shapes, band gap, color and other properties of nanomaterials
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	**C1**	Analyze the shape and chemical composition of the nanomaterials
		C2	Relate the pathways of the synthesis of nanomaterials
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	**C3**	Label the steps of preparation of nanomaterials
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	**D1**	Work in groups

4.Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignment	Other (to be determined)
1	Introduction about nanomaterials	**4**	2	2	-	-
2	Synthesis of nanomaterials using different methods	**4**	2	2	-	-
3	Synthesis of nanomaterials using emulsion precipitation	**4**	2	2	-	-
4	Synthesis of nanomaterials using combustion method	**4**	2	2	-	-
5	Synthesis of nanomaterials using citrate method	**4**	2	2	-	-
6	Synthesis of nanomaterials microwave method	**4**	2	2	-	-
7	Synthesis method of thin film nanomaterials (1)	**4**	2	2	-	-
8	Synthesis method of thin film nanomaterials (2)	**4**	2	2	-	-
9	term exam-Mid					
10	Open discussion about the preparation of different inorganic compounds using different methods	**4**	2	2	-	-
11	Characterization of nanomaterials	**4**	2	2	-	-
12	nanomaterials Characterization of	**4**	2	2	-	-
13	Characterization of nanomaterials	**4**	2	2	-	-
14	Application of nanomaterials in different field	**4**	2	2	-	-
15	Application of nanomaterials in different field	**4**		2		

4.Teaching and Learning Methods

- Lectures
- Presentations

- Open Discussion
- Problem Solving
- Brainstorming

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-Term Exam	seventh week	5	5 %
2	Semester Work	Fourteenth week	15	15 %
3	Oral exam	Sixteenth week	5	5 %
4	Practical Exam	Sixteenth week	25	25 %
5	Written exam	Seventeenth week	50	50%
Total			100	100%

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course**	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.**
	Other References	**5.** Sahoo, S. K., & Rai, P. K. Nanochemistry: Synthesis, Properties, and Applications of Nanomaterials (2nd ed.). Wiley, 2023. **6.** Zhang, Y., & Yang, Z. Nanochemistry and Nanomaterials: Fundamentals, Applications, and Characterization Techniques (1st ed.). Elsevier, 2023. **7.** Gupta, S., & Mishra, R. Advanced Nanochemistry: Synthesis, Functionalization, and Application of Nanomaterials (1st ed.). CRC Press, 2023. **8.** A. A. Ali and , I. S. Ahmed, Sol-gel auto-combustion fabrication and optical properties of cobalt orthosilicate: Utilization as coloring agent in polymer and ceramic, Mater. Chem. Phys., 238 (2019) 121888
	Electronic Sources (Links must be added)	**https://www.google.com/** **https://www.ekb.eg/en/web/guest/login** **https://www.wikipedia.org/**
	Other (to be mentioned)	• Nature Nanotechnology Journal of Nanoscience and Nanotechnology
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Data show**
	Supplies	**Using a whiteboard, a microphone in lectures, laptops, Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator

Dr. Ayman Awad Ali

Program Coordinator

Dr. Mohamed Ataf

Chm 486: Material science (1)

1.Basic Information

Course Title (according to the bylaw)	**Materials Science (1)**			
Course Code (according to the bylaw)	**Chm 486**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**-**	**3**
Course Type	**compulsory Course** اجباري			
Academic level at which the course is taught	**fourth level** الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Prof. Dr. Wafaa Abdallah**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview

This course introduces students to the fundamental principles of materials science, focusing on the structure, properties, and applications of various material types. It explores the classification of materials—including metals, ceramics, polymers, composites, and advanced materials—and examines how their physical and chemical properties influence performance in different applications. Topics include chemical bonding in ceramics, types of ceramic materials, and their fabrication and processing techniques. The course also covers key material properties

such as mechanical strength, electrical conductivity, optical behavior, and magnetic characteristics in metals, semiconductors, and ceramics.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	State the relation between structure, properties, processing and performance of different materials.
		A2	Define the concepts of materials science tetrahedron.
		A3	Identify the different types of materials.
		A4	Explain the preparation methods of different materials including metals and ceramics.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	**B1**	Label the electrical conductivity, dielectric constant and dielectric loss.
		B2	Analyze some mechanical and magnetic properties.
		B3	Use computers and internet for information and communication technology effectively.
		B4	Solve problems on the scientific basis taught in this course.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	**C1**	Interpret the given chemical data to identify properties of materials.
		C2	Compare the different types of materials (metals, semiconductors and ceramics).
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	**C3**	Confirm the properties and preparation methods
		C4	Formulate the applications of different materials.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	**D1**	Working in groups to choose the different materials

4.Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical / .....)	Self-learning (Tasks/ Assignments / Projects/ ...)	Other (to be determined)
1	**1.1** Introduction to materials science. **1.2** Determination of molecular weight of high molecular weight polymers by using viscosity.	5	2	3	-	-
2	**2.1** Types of materials	5	2	-	-	-
	2.2 Determination of radius of molecules by using viscosity		-	3		
3	**3.1** Properties of ceramic materials part (1)	5	2	-	-	-
	3.2 Determine the percentage of calcium oxide in cement.		-	3		
4	**4.1** Properties of ceramic materials part (2)	5	2	-	-	-
	4.2 Determine the ionic volume by conductivity.		-	3		
5	**5.1** Preparation methods of ceramic materials	5	2	-	-	-
	5.2 Determine the ionic radius by conductivity		-	3		
6	**6.1** Introduction of superconductors materials.	5	2	-	-	-
	6.2 Preparation of nano zinc oxide.		-	3		
7	**8.1** Electrical properties of different materials part (1)	5	2	-	-	-
	8.2 Characterization of nano zinc.		-	3		
8	**9.1** Electrical properties of different materials part (2)	5	2	-	-	-
	9.2 Adsorption by solids from solution		-	3		
9	Mid-term exam					
10	**10.1** Mechanical properties of different materials	5	2	-	-	-
	10.2 Determination of Heat of solution		-	3		
11	**11.1** Defects of solids.	5	-	3	-	-
	11.2 Determination of strength of H-bond of acetic acid.		2	-		
12	**12.1** Optical properties of different materials.	5	2	-	-	-
	12.2 Determination of partial molar volume of pure solvent.		-	3		
13	**13.1** Magnetic properties of materials.	5	2	-	-	-
	13.2 Determination of partial molar volume of solution.		-	3		
14	**14.1** Different applications of materials.	5	2	3	-	-
15	Revision	5	2	3	-	-

5.Teaching and Learning Methods

- **Lecture and presentations**
- **Practical section**
- **Open discussions & Seminars**
- **Problem Solving**
- **Online learning**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fourteenth week	15	15%
2	Mid-Term Exam	ninth week	5	5%
3	Final Written Exam	seventeenth week	50	50%
4	Final Practical Exam	Sixteenth week	25	25%
5	Final Oral Exam	Sixteenth week	5	5%
Total			100	100%

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.**
	Other References	**Callister, W. D., & Rethwisch, D. G. Materials Science and Engineering: An Introduction (12th ed.). Wiley, 2023.**
	Electronic Sources (Links must be added)	**https://www.google.com/** **https://www.ekb.eg/en/web/guest/login** **https://www.wikipedia.org/**
	Other	
Supportive facilities & equipment for teaching	**Devices/Instruments**	**Microphone in lectures and Data show**
	Supplies	**Using a whiteboard** **Using a microphone in lectures** **Using laptops**

anrning *		**Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	**Praxilabs**
	Other (to be mentioned)	

Course Coordinator
Prof. Dr. Wafaa Abdallah

Program Coordinator
Dr. Mohamed atef

Mic492 Medical microbiology:
Course Specification

1.Basic Information

Course Title (according to the bylaw)	Medical microbiology			
Course Code (according to the bylaw)	Mic492			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	3	0	3
Course Type	اجباري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Prof. Dr. Mahmoud Amer			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

By Finishing of this course the graduate will able understanding the host –parasite relationship regarding the human host and the numerous causal pathogens. Important disease caused by virus and bacteria and fungi taking in consideration their underlying mechanisms. The immunological, serological and biochemical basis for detection of human microbial pathogens. The possible and recommended methods for microbial pathogen control

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological	a1-	Know the different pathogenic microorganisms that infect human
		a2	Determine the characteristics of major microbial pathogens infecting human.
		a3-	Know the different treatments for controlling bacteria, viruses and fungi with their underlying mechanisms.
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	b1	Report the medically important microbial pathogens responsible for famous epidemics over the world.
		b2	Compare between characteristics of different bacterial species, viral species and fungal species.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b3	Interpret the pathogenicity of different microbial diseases.
3.2	Use modern laboratory instruments, equipment, and technologies safely and	c1	**Examine the different bacterial pathogens using biochemical and molecular characters**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	efficiently in chemical and microbiological investigations.		
3.4	Handle chemical materials and biological samples safely, considering their physical, chemical, and biological hazards.	c2	Examine the active substances that are produced biologically and their effects on pathogens
3.12	Assess laboratory risks and implement biosafety and chemical safety procedures effectively.	c3	Differentiate between the natural microbial compounds and their effects on microbes
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	d1-	Working in groups to choose the best industrial microbe
		d2	Working in groups to choose the optimum media for increasing the production
		d3	Using the computer and internet experiences forward the applied work

4- Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction of Medical Microbiology	**5**	**2**	**3**		
2	Infection and disease	**5**	**2**	**3**		
3	Disease production by microbes .	**5**	**2**	**3**		
4	Microbial pathogenicity, Microbial virulence	**5**	**2**	**3**		
5	Host resistance to microbial infection,	**5**	**2**	**3**		
6	Non-specific host defence mechanisms	**5**	**2**	**3**		
7	Specific immune response	**5**	**2**	**3**		
8	Mid term and revision	**0**	**0**	**0**		
9	Humoral immunity – Antibody mediated immunity .	**5**	**2**	**3**		
10	Gram- positive bacteria , Gram-negative bacteria,.	**5**	**2**	**3**		
11	General properties of viruses,	**5**	**2**	**3**		
12	Methods of cultivation of viruses	**5**	**2**	**3**		
13	Laboratory diagnosis of viral diseases .	**5**	**2**	**3**		
14	Myxoviruses, Retroviruses, Hepatitis viruses, DNA viruses, .	**5**	**2**	**3**		
15	Tumor viruses and oncogenesis, Coronavirus (COVID-19). Candida organisms, Aspergillosis, Dermatophytosis	**5**	**2**	**3**		

5.Teaching and Learning Methods

- Self-learning
- e learning
- Cooperative learning strategy.
- field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	8	5	5%
2	Assignments / Project /Portfolio/ Logbook	12	15	15%
3	Final Practical/Clinical/… Exam	16	25	25%
4	Final Oral Exam	16	5	5%
5	Final written exam	From week 17	50	50%

*** The methods mentioned are examples, the organization may add and/or delete**

7. Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	For a **Medical Microbiology** course, the most widely accepted and essential references are: 1. **Medical Microbiology** – Murray, Rosenthal, and Pfaller (Latest Edition, Elsevier) 2020. 2. Encyclopedia of Virology by Allan Granoff (Editor); Robert G. Webster (Editor) Call Number: QR358 .E539 1999 ISBN: 0122270304 Publication Date: 1999-08-20 3. A Clinician's Dictionary of Pathogenic Microorganisms by James H. Jorgensen; Michael A. Pfaller Call Number: QR81. J67 2004 ISBN: 1555812805 Publication Date: 2004-01-01

		Coe Library Stacks 4. **Jawetz, Melnick, & Adelberg's Medical Microbiology** – Carroll et al. (McGraw-Hill, Latest Edition)
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinqi+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature
Course Coordinator
Prof. Dr. Mahmoud Amer

Name and Signature
Program Coordinator

Dr\ Mohamed atef

Mic 482 : Molecular plant microbe interaction
Course Specification

1. Basic Information

Course Title (according to the bylaw)	**Molecular plant microbe interaction**			
Course Code (according to the bylaw)	**Mic 482**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**0**	0	2
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الرابع**			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Prof. Dr.Hassan Emara			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview (Brief summary of scientific content)

By Finishing this course the graduate will be able to diagnose How do pathogen penetrate plants, The microbial pathogens structure and function, How pathogen survive in absence of host plant. How do pathogen fined plants, How do pathogen establish infections, How do pathogen penetrate plants defend themselves, what are the genetic interaction between plants and pathogens, How can create disease-resistance plants.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

4.Course Schedule

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.7	Understand how the chemical nature of biological molecules determines their function, with emphasis on major metabolic pathways and their interactions in microorganisms.	A1	Describe Structure and function of microbe.
		A2	Mention Entry and colonization of host.
		A3	Outline Plant defense
2.8	Link and integrate subject-specific principles such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in plants and microorganisms.	B1	Explain How do pathogen penetrate plants.
		B2	know How do pathogen fined plants.
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	B3	know How do pathogen establish infections.
		B4	Explain How do pathogen penetrate plants defend themselves
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	D1	Assess Histological structure
		D2	Explain Disease severity
		D3	know How can create disease-resistance plants.

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Plant disease The microbial pathogens	**2**	**2**	**-**		
2	Plant disease The microbial pathogens structure	**2**	**2**	**-**		
3	Plant disease The microbial pathogens function	**2**	**2**	**-**		
4	Entry and colonization of the host	**2**	**2**	**-**		
5	How do plant interact with pathogens	**2**	**2**	**-**		
6	Ecological interaction	**2**	**2**	**-**		
7	Physiological interaction	**2**	**2**	**-**		
8	Genetic interaction	**2**	**2**	**-**		
9	Mid term	**0**	**0**	**-**		
10	Rapid assays for pathogens	**2**	**2**	**-**		
11	Immunoassay	**2**	**2**	**-**		
12	DNA-based testes ,including PCR	**2**	**2**	**-**		
13	Standard microscopic examination and culturing	**2**	**2**	**-**		
14	. Standard microscopic examination and culturing	**2**	**2**	**-**		
15	REVISION	**2**	**2**	**-**		

5.Teaching and Learning Methods

1- Self-learning

2. e learning
3. Cooperative learning strategy.
4. field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	9	10	10%
2	Assignments / Project /Portfolio/ Logbook	12	20	20%
3	Final Oral Exam	16	10	10%
4	Final Written Exam	From week 17	60	60%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Zhou, J.-M. & Zhang, Y. Plant immunity: danger perception and signaling. Cell 181, 978–989 (2020)** **Beganovic M, McCreary EK, Mahoney MV, Dionne B, Green DA, Timbrook TT. Interplay between Rapid Diagnostic Tests and Antimicrobial Stewardship Programs among Patients with Bloodstream and Other Severe Infections. The Journal of Applied Laboratory Medicine. 2019;3(4):601–616. doi: 10.1373/jalm.2018.026450.** **Laupland KB, Church DL. Population-Based Epidemiology and Microbiology of Community-Onset Bloodstream Infections. Clinical Microbiology Reviews. 2014;27(4):647–664. doi: 10.1128/CMR.00002-14.** **de Hoog HS, Dukik K, Monod M, et al Toward a novel multilocus phylogenetic taxonomy for the dermatophytes. Mycopathologia. 2017;182(1–2):5–31.** **Yang G, Zhang M, Li W.. Direct species identification of common pathogenic dermatophyte fungi in clinical specimens by semi-nested PCR and restriction fragment length polymorphism. Mycopathologia. 2008;166(4):203–208.** **Teklebirhan G, Bitew A.. Prevalence of dermatophytic infection and the spectrum of**

		dermatophytes in patients attending a tertiary hospital in Addis Ababa, Ethiopia. Int J Microbiol. 2015;2015:653419. **Dogra S, Shaw D, Rudramurthy SM. Antifungal drug susceptibility testing of dermatophytes: laboratory findings to clinical implications. Indian Dermatol Online J. 2019;10(3):225–233.**
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the cours**

Name and Signature **Course Coordinator** **Prof. Dr. Hassan Emara**	**Name and Signature** **Program Coordinator** **Dr\ Mohamed atef**

Mic 484: Genetic Engineering Course Specification (2025)

1.Basic Information

Course Title (according to the bylaw)	Genetic Engineering			
Course Code (according to the bylaw)	Mic 484			
Department/s participating in delivery of the course	Botany and Microbiology			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	**Other (specify)**	**Total**
	2	**0**	0	2
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الرابع**			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Samir Hamdy**			
Course Specification Approval Date	**1/7/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 And Emergency session (516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

by finishing of this course the graduate will able understanding advanced understanding of pcr,electrophoresis ,DNA,gene therapy extraction & mendel's laws and other concepts of classical genetics like genetic interaction, linkage and multiple alleles.a spot light on some modern applications of genetics.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Describe the DNA Technology.
		A2	Identify the Restriction Enzymes.
		A3	Explain the Gene Cloning.
		A4	Outline the DNA library- Gene Bank.
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.		
		B1	Compare between Gene Cloning and Embryo Cloning,.
		B2	Interpret the benefits of Gene Therapy.
		B3	Report the Polymerase chain reactions.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B4	Confirm the DNA Sequencing.
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	D1	Use computer, internet & communications
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements.	D2	Management, working in group & life-long learning
4.9	Adapt to new technologies, methodologies, and research trends	D3	Ethical behavior, community linked thinking.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	in the constantly evolving field of microbiology and show a passion for continuous learning.		

4- Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction- DNA Technology.	**2**	**2**	**-**	**-**	**-**
2	Restriction Enzymes	**2**	**2**	**-**	**-**	**-**
3	Genetic Vectors	**2**	**2**	**-**	**-**	**-**
4	DNA library- Gene Bank	**2**	**2**	**-**	**-**	**-**
5	Gene Cloning- Embryo Cloning	**2**	**2**	**-**	**-**	**-**
6	Dot Blot Technique	**2**	**2**	**-**	**-**	**-**
7	Polymerase chain reactions	**2**	**2**	**-**	**-**	**-**
8	Gel Electrophoresis	**2**	**2**	**-**	**-**	**-**
9	Midterm exam	**-**	**-**	**-**	**-**	**-**
10	Gene Therapy	**2**	**2**	**-**	**-**	**-**
11	DNA Sequencing	**2**	**2**	**-**	**-**	**-**
12	Probes	**2**	**2**	**-**	**1**	**-**
13	Transgenic Plants	**2**	**2**	**-**	**-**	**-**
14	. DNA hybridization	**2**	**2**	**-**	**-**	**-**
15	Applications of genetic engineering and disorders	**2**	**2**	**-**	**-**	**-**

5.Teaching and Learning Methods

- Self-learning
- e learning
- Cooperative learning strategy.
- field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (Semester work)	4	10	%10
2	Midterm exam	9	10	10%
3	Final Oral Exam	16	10	10%
4	Final Written Exam	From week 17	60	60%
5	Assignments / Project /Portfolio/ Logbook	13	10	10%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Nicholl, D. S. (2023). *An introduction to genetic engineering*. Cambridge University Press. Berry, R. M. (2013). *The ethics of genetic engineering*. Routledge. Klabukov, I. (2016). Engineering Biology Problems Book
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show –projector-microphone
	Supplies	Marker- board- laptop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

Name and Signature Course Coordinator **Prof. Dr. Samir Hamdy**		**Name and Signature Program Coordinator** **Dr\ Mohamed atef**

Mic 496: Water and Food Microbiology Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	**Water and Food Microbiology**			
Course Code (according to the bylaw)	**Mic 496**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**0**	**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Hesham Yassin**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515): 9/7/2025** **and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

By finishing this course, the graduate will be able to understand the role of microorganisms in foods and have a basic understanding of the microbial phenomena occurring in food products. The theoretical part deals with the contamination of raw materials. The factors affecting the growth of microorganisms. The study of preservation methods. The spoilage patterns of different food products and food poisoning. The course focuses on food spoilage as well as on microbial food safety aspects.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	a1	explain the behaviour of micro-organisms in food products and the factors influencing this behaviour
		a2	know how to adapt food processes to extend the shelf life and increase microbial safety through the obtained knowledge of the microbial aspects of food preservation
		a3	- Determine the microbial quality of food products through microbial analysis
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	b1	- Interpret results from microbial analysis
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b2	. solve problems related with preservation of foods in developing countries and being able to offer a solution for this problem
		b3	Develop a specific microbial analysis methods of a food product into the broad spectrum of possible

4- Course Schedule

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
			microbial analysis.
3.4	Handle chemical materials and biological samples safely, considering their physical, chemical, and biological hazards.	c1	Examine microbial growth in foods
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	c2	investigate individual organisms in food samples, isolate and enumerate of microorganisms in foods.
3.12	Assess laboratory risks and implement biosafety and chemical safety procedures effectively.	c3	analyze the species, genera, and microbial groups that are important in the food industry.
		c4	Analyse procedures and techniques can be used for controlling microbial contamination of foods and food contact equipment.
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	d1	Working in groups in isolation and identification of food microorganisms
		d2	Working in groups to choose the optimum condition for accuracy of tests
		d3	Using the computer and internet experiences forward the applied work

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction to food, water, and air environment.	**3**	**1**	2		
2	Introduction to microbes in food, water, and air.	**3**	**1**	2		
3	Characteristics of predominant microorganisms in food, water, and air.	**3**	**1**	2		
4	Sources of microorganisms in food, water, and air.	**3**	**1**	2		
5	Microbial growth response in food, water, and air.	**3**	**1**	2		
6	Factors influencing microbial growth.	**3**	**1**	2		
7	Microbial metabolism of food components	**3**	**1**	2		
8	Methods of detection, isolation, and identification of microorganisms from food, water, and air.	**3**	**1**	2		
9	Midterm exam and revision	**0**	**0**	**0**		
10	Beneficial uses of microorganisms in food	**3**	**1**	2		
11	Microorganisms used in food fermentation	**3**	**1**	2		
12	Bacteriophages	**3**	**1**	2		
13	Microbiology of fermented food production, Control of microorganisms in food, water, and air.	**3**	**1**	2		
14	Intestinal beneficial bacteria, Probiotics Microbial food, water, and air borne diseases.	**3**	**1**	2		
15	Revision	**3**	**1**	2		

5.Teaching and Learning Methods

- Self-learning
- E- learning
- Cooperative learning strategy.
- field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Assignment 1	6	5	5%
2	Midterm exam	9	5	5%
3	Assignment 2	13	10	10%
4	Final Practical/Clinical/… Exam	16	25	25%
5	Final Oral Exam	16	5	5%
6	Final Written Exam	From week 17	50	50%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Matthews, K. R., Kniel, K. E., & Montville, T. J. (2017). Food microbiology: an introduction. John Wiley & Sons. Da Silva, N., Taniwaki, M. H., Junqueira, V. C., Silveira, N., Okazaki, M. M., & Gomes, R. A. R. (2018). Microbiological examination methods of food and water: a laboratory manual. CRC Press. Erkmen, O., & Bozoglu, T. F. (2016). Food microbiology, 2 volume set: Principles into practice. John Wiley & Sons. Doyle, M. P., Diez-Gonzalez, F., & Hill, C. (Eds.). (2020). Food microbiology: fundamentals and frontiers. John Wiley & Sons.
	Other References	
	Electronic Sources (Links must be added)	-

	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Marker- board- laptop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** **Prof. Dr. Hesham Yassin**		**Name and Signature** **Program Coordinator** **Dr. Mohamed Atef**

Mic 498: Microbial Biotechnology Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	**Microbial Biotechnology**			
Course Code (according to the bylaw)	**Mic 498**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3	0	2
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الرابع**			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Hassan Emara**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

By Finishing of this course the graduate will able to introduces the role of microorganisms in biotechnology and molecular biology, highlighting their applications in industrial and environmental processes. It covers microbial contributions to **renewable energy production** (biogas, biofuels, ethanol), **industrial metabolites** (citric acid, enzymes), and **nanotechnology** (microbial nanoparticles). Emphasis is placed on the use of microbes as model systems in molecular biology and genetic engineering. The course also explores their importance in sustainable development and innovation in biotechnology.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	a1	**Describe the general characteristics of microorganisms.**
		a2	**Identify the role of microorganisms in molecular biology.**
		a3	**Explain the activities and functions of microorganisms.**
2.3	Construct integrated lines of reasoning to support hypotheses, confirm evidence, and interpret recent research advancements (e.g., microbial biotechnology, nanotechnology applications, environmental microbiology).	b1	**Compare between the chemical and microbial production of gases, fuels and nanoparticles**
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and	b2	**Interpret the benefits of microorganisms.**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	healthcare.		
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	c1	Isolate of different microorganisms.
		c2	Investigate the biochemical and molecular characteristics of microorganisms.
4.7	Deal responsibly and ethically with property rights, patents, and scientific intellectual property.	d1	Use computer, internet & communications
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	d2	Management, working in group & life-long learning
		d3	Ethical behavior, community linked thinking.

4- Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction to microbiology and biotechnology	**4**	**1**	**3**		
2	The role of microorganisms in molecular biology	**4**	**1**	**3**		
3	The role of microorganisms in molecular biology	**4**	**1**	**3**		
4	Production of biogases by microorganisms	**4**	**1**	**3**		
5	Production of biogases by microorganisms	**4**	**1**	**3**		
6	Production of biofuels	**4**	**1**	**3**		
7	Nonoparticles from microorganisms	**4**	**1**	**3**		
8	Uses of microorganisms to produce different enzymes	**4**	**1**	**3**		
9	Midterm exam and revision	**0**	**0**	**0**		
10	Uses of microorganisms to produce different enzymes	**4**	**1**	**3**		
11	Citric acid production	**4**	**1**	**3**		
12	Citric acid production	**4**	**1**	**3**		
13	Ethanol production	**4**	**1**	**3**		
14	. Ethanol production	**4**	**1**	**3**		
15	. REVISION	**4**	**1**	**3**		

5.Teaching and Learning Methods

- Self-learning
- e learning
- Cooperative learning strategy.
- field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	9	5	5%
2	Assignments / Project /Portfolio/ Logbook	12	15	15%
3	Final Practical/Clinical/… Exam	16	25	25%
4	Final Oral Exam	16	5	5%
5	Final written exam	From week 17	50	50%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Christy, P. M., Gopinath, L. R., & Divya, D. (2014). A review on anaerobic decomposition and enhancement of biogas production through enzymes and microorganisms. *Renewable and Sustainable Energy Reviews*, *34*, 167-173. Demain, A. L. (2014). Importance of microbial natural products and the need to revitalize their discovery. *Journal of industrial microbiology and biotechnology*, *41*(2), 185-201. Alamgir, A. N. M., & Alamgir, A. N. M. (2018). Bioactive compounds and pharmaceutical excipients derived from animals, marine organisms, microorganisms, minerals, synthesized compounds, and pharmaceutical drugs. *Therapeutic Use of Medicinal Plants and their Extracts: Volume 2: Phytochemistry and Bioactive Compounds*, 311-406. Hassan, M. Awada, Y. E. S. Kamal, Mohamed Roji Sarmidia Ramlan Aziza, and A. Hesham. "Antibiotics as microbial secondary metabolites: Production and application." *J Sci Eng 2012; 59 (1): 101* 111 (2012).
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

Name and Signature
Course Coordinator
Dr. Hassan Emara

Name and Signature
Program Coordinator
Dr\ Mohamed atef

Chm 424: Chemistry of Lanthanides and Actinides (2)

4. Basic Information

Course Title (according to the bylaw)	**Chemistry of Lanthanides and Actinides (2)**			
Course Code (according to the bylaw)	**Chm 424**			
Department/s participating in delivery of the course	**Botany and microbiology Department and Chemistry Department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**-**		**2**
Course Type	**compulsory Course** اجباري			
Academic level at which the course is taught	الفرقة/المستوي الرابع			
Academic Program	**B.Sc. Microbiology and Chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Naglaa Mashaal**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

5. Course Overview

This course aims to provide students with a thorough understanding of the chemical properties, electronic configuration, chemical bonding, periodic behavior, and reactivity of lanthanides and actinides elements. This course aims to study the Principles and Techniques for Extracting and Separating Lanthanides and Actinides. It explores their unique characteristics, such as lanthanide contraction, structure, coordination chemistry, and the radioactive properties of actinides, while emphasizing their applications in areas like nuclear energy, materials science, and industry. The course also addresses the environmental and toxicological concerns associated with these elements, equipping students with practical skills in laboratory techniques and safety protocols.

6. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	**A1**	Describe the periodicity and atomic properties of Lanthanides and Actinides
		A2	Identify Knowledge of the chemical reactivity and bonding in Lanthanide and Actinide compounds
		A3	Recognize the principles and techniques for extracting and separating Lanthanides and Actinides
		A4	Describe the Role of Lanthanides and Actinides in nuclear chemistry and energy
		A5	Exploring the Environmental, Health, and Safety Aspects of Lanthanides and Actinides
		A6	Outline the knowledge of Lanthanide and Actinide applications in modern industry and technology.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	**B1**	Report on the methods and laboratory techniques for obtain, extraction and characterizing Lanthanide and Actinide compounds
		B2	Label different applications of Lanthanide and Actinide compounds in various fields
		B3	Report on chemical bonding, Chemical Behavior and reactivity of lanthanides and actinides elements
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	**C1**	Evaluating the Environmental and Safety Impacts of Lanthanide and Actinide Compounds
		C2	Designing Experimental Approaches for the isolation and characterization of Lanthanides and Actinides
		C3	Applying analytical methods to quantify and identify Lanthanide and Actinide species in complex mixtures
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements.	**D1**	Using internet, compare between the different properties of lanthanides and actinides elements
		D2	working in groups, Report on the advanced methods for the separation of lanthanides and actinides elements

4. Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical/ .....)	Self-learning (Tasks/ Assignments / Projects/ ...)	Other (to be determined)
1	Introduction to Lanthanides and Actinides: Overview and Classification	2	2	-	-	-
2	Electronic Configuration and Periodic Trends of Lanthanides and Actinides	2	2	-	-	-
3	Extraction and Separation Techniques for Lanthanides and Actinides	2	2	-	-	-
4	Chemical Bonding in Lanthanide and Actinide Compounds	2	2	-	-	-
5	Lanthanide Contraction and Its Implications on Chemical Behavior	2	2	-	-	-
6	The Chemistry of Lanthanide Complexes: Structure and Reactivity	2	2	-	-	-
7	Actinides: The Chemistry of Uranium, Thorium, and Beyond	2	2	-	-	-
8	**Mid-Term**					
9	Radioactive Properties of Actinides and Their Chemical Implications	2	2	-	-	-
10	The Role of Lanthanides and Actinides in Nuclear Chemistry and Energy Production	2	2	-	-	-
11	Lanthanide and Actinide Coordination Chemistry and Applications	2	2	-	-	-
12	Lanthanide and Actinide Oxides and Their Industrial Applications	2	2	-	-	-
13	Environmental Impact and Toxicology of Lanthanides and Actinides	2	2	-	-	-
14	Future Trends in the Chemistry and Applications of Lanthanides and Actinides	2	2	-	-	-
15	Revision	2	2	-	-	-

5. Teaching and Learning Methods

- **Lecture and presentations**
- **Open discussions & Seminars**
- **Problem Solving**
- **Online learning**

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-Term Exam	eightth week	10	10 %
2	Semester work	fourteenth week	20	20 %
3	Final Oral Exam	sixteenth week	10	10 %
4	Final Written Exam	sixteenth week	60	60 %
Total				%100

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Lecture notes prepared by the course instructor(s) approved from Chemistry Department. - Wang, Q., Liu, Z., Song, Y.-F., & Wang, D. (2023). *Recent Advances in the Study of Trivalent Lanthanides and Actinides by Phosphinic and Thiophosphinic Ligands in Condensed Phases.* Molecules, 28(17), 6425. - Goodwin, C. A. P., & Corbey, J. F. (2024). *Ligand–Metal Complementarity in Rare-Earth and Actinide Chemistry.* Inorganic Chemistry.
	Other References	- Maria, L., & Marçalo, J. (2024). *Synthesis, Properties and Applications of Lanthanide and Actinide Molecular Compounds.* Inorganics, 12(12), 328.
	Electronic Sources (Links must be added)	http://www.quimica.urv.es/w3qf/ http://web.uconn.edu/~ch351vc/ *http://web.nmsu.edu/~snsm/classes/chem537/*
	Learning Platforms (Links must be added)	
	Other (to be mentioned)	
Supportive facilities & equipment for teaching	**Devices/Instruments**	**Data show**
	Supplies	**Using a whiteboard** **Using a microphone in lectures** **Using laptops**

and learning *		**Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator **Dr. Naglaa Mashaal**	**Program Coordinator** **Dr. Mohamed Ataf**

Chm 431: Principle of Surface Chemistry

Course Specification (2025)

1-Basic Information

Course Title (according to the bylaw)	**Principle of Surface Chemistry**			
Course Code (according to the bylaw)	**Chm 431**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**-**	**-**	**2**
Course Type	**Compulsory Course** اجباري			
Academic level at which the course is taught	**Four level** الفرقة/المستوي الرابع			
Academic Program	**Microbiology and chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Marwa Sameeh**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**9/12/2015 (faculty member council meeting no. 390), updated 10/1/2018 (Faculty council; meeting number, 419), 8/3/2023 (Faculty council; meeting number, 484), updated 18/6/2025 (Department council; meeting number, 37), updated 14/7/2025, (faculty council; meeting number, 515),**			

2-Course Overview (Brief summary of scientific content)

This course aims to understand the concepts of surface phenomena, colloid systems, and catalysis. Explore surface tension, its relationship with temperature, and measurements for various interfaces (solid/liquid, solid/gas, liquid/liquid). Learn about the colloid state, its classifications, and the behavior of colloid systems. Study catalysis, including types, components, preparation methods, and its role in different reactions.

3-Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems.	A1	Investigate the relation between surface and solid crystal structure on the catalyst behavior and the surface properties of different materials and the colloid state of matter.
		A2	Define the concepts of surface, colloid and catalysis.
		A3	Investigate the different applications of thin films of liquid on solid materials.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B1	Analyze the given chemical data to identify the activity of catalyst.
		B2	Explain the different theories of catalysis, different types of colloid systems.
4.3	Analyze, synthesis, assess and interpret quantitatively and qualitatively science relevant data.	D1	Use computer, internet & communications
4.9	Differentiate between the different states of matter, elements and chemical compounds based on the recognition and quantification of properties.	D2	Management, working in group & life-long learning

4-Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	**Training (Practical)**	**Self-learning (Tasks/ Assignments)**	**Other (to be determined**
1	○ Introduction to surface chemistry, catalysis, colloid state.	**2**	**2**	-	-	-
2	2.2. Surface tension and its relation with curvature and effect of temperature on it.	**2**	**2**	-	-	-
3	3.1. Measurements of surface tension and surface activity	**2**	**2**	-	-	-
4	b. Surface excess and how be measured, solid/liquid interface, spreading coefficient, Liquid/liquid interface and application of thin films	**2**	**2**	-	-	-
5	7.1. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (1).	**2**	**2**	-	-	-
6	6.2. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (2).	**2**	**2**	-	-	-
7	8.1. Introduction to Colloid state, types of colloid systems, preparation of them and purification.	**2**	**2**	-	-	-

8	**Mid-term**					
9	9.1. The properties of colloid solutions (electrical, optical and kinetic properties, protection of colloid systems).	**2**	**2**	-	-	-
10	10.2. Introduction to catalysis.	**2**	**2**	-	-	-
11	11.2. The components of catalyst part (1).	**2**	**2**	-	-	-
12	12.2. The components of catalyst part (2).	**2**	**2**	-	-	-
13	13.1. Materials used as catalyst (metals, semiconductor, insulators).	**2**	**2**	-	-	-
14	14.1. Preparation of catalyst, function of catalyst.	**2**	**2**	-	-	-
15	15.1. Revision	**2**	**2**	-	-	-

5.Teaching and Learning Methods

6- **Lecture and presentations**
7- **Practical section**
8- **Open discussions & Seminars**
9- **Self-learning Tasks**
10- **Problem Solving**

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	**20**	**20%**
2	Mid-Term Exam	Seventh week	**10**	**10%**
3	Final Written Exam	seventeenth week	**60**	**60%**
4	Final Oral Exam	Sixteenth week	**10**	**10%**
Total			**100**	**100%**

*** The methods mentioned are examples, the organization may add and/or delete**

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	3. Richard M. Pashley and Marilyn E. Karaman`` Applied Colloid and Surface Chemistry 4. Introduction to Surface Chemistry and Catalysis" by Gabor A. Somorjai and Yimin Li, 2nd Edition, Wiley, 2019.
	Other References	https://pmc.ncbi.nlm.nih.gov/articles/PMC5513586/ https://link.springer.com/journal/10634
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank https://www.ekb.eg/web/guest/home https://www.sciencedirect.com/topics/materials-science/electron-microscopy
	Learning Platforms (Links must be added)	https://benhasci.ekb.eg/ https://ebook1.bu.edu.eg/
	Other (to be mentioned)	chemwiki.ucdavis.edu/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry www.chem1.com/acad/webtext/elchem/ chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/electro.php
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board
	Electronic Programs	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Course Coordinator	Program Coordinator
Dr. Marwa Sameeh	**Dr. Mohamed Atef**

Chm 466: Principle of Organic Spectroscopy

1.Basic Information

Course Title (according to the bylaw)	**Principle of organic spectroscopy**			
Course Code (according to the bylaw)	**Chm 466**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**0**	**0**	**2**
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثالث			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Mohamed abo Riya**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

To know the general principles of infrared (IR) and ultraviolet (UV) nuclear magnetic resonance (NMR) and mass spectroscopy.Learn the physical fundamentals underlying IR, NMR, Mass and UV spectroscopy techniques.Explore the instrumentation used in IR, NMR, Mass and UV spectroscopy.Apply IR, NMR, Mass and UV spectroscopy for the structural elucidation of organic compounds.

3.Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.3	Demonstrate knowledge of analytical, structural, and instrumental techniques used in chemical analysis and compound characterization.	A1	Explain Physical basics of IR, NMR, Mass and UV spectroscopy.
		A2	State The characteristic absorptions in an infrared and NMR spectrum.
		A3	Define IR, Mass and NMR spectrum Spectra.
		A4	Descripe How to measure the ultraviolet (or UV–visible) spectrum of organic compounds and the fragmentation of organic compounds.
		A5	Identify The λmax from UV–visible spectra.
		A6	Outline The electronic energy differences between orbitals in the molecule.
2.1	Test, evaluate, and critique scientific information using evidence-based reasoning and recent developments in microbiology and chemistry.	B1	Analyze and investigate the relevant terms used in basic IR, NMR, Mass and UV spectroscopy.
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	B2	Show both wavenumber and λmax using IR, NMR, mass and UV respectively.
		B3	Investigate IR, NMR, Mass and UV spectroscopy.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	d1	Use computers and internet for information and communication technology effectively.
		d2	Community linked thinking on the scientific basis taught in this course.
		d3	Life-long learning new information about new techniques.
		d4	Compute the different applications of spectroscopic techniques in chemistry and biology.

4.Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignments)	Other (to be determined
1	Introduction to IR, NMR, Mass and UV Spectroscopy.	**2**	**2**		-	-
	Estimation the acidity of milk		-			
2	Molecular vibrations, active and inactive IR vibrations. Theories of IR, NMR, Mass and UV Spectroscopy	**2**	**2**		-	-
	Estimation the molecular weight of dicarboxylic acids		-			
3	Measurement of the IR spectrum. NMR rules and chemical shift.	**2**	**2**		-	-
	Estimation of the molecular weight of tricarboxylic acids		-			
4	Infrared spectroscopy of hydrocarbons and characteristic absorptions of alcohols and amines. Mass spectrum rules.	**2**	**2**		-	-
	Estimation the aniline purity		-			
5	Characteristic absorptions of carbonyl compounds and C-N bonds. Sets of protons and its splitting.	**2**	**2**		-	-
	Estimation the casein percentage in milk		-			
6	Reading and interpreting IR spectra. General Rules for Fragmentation of Organic Compounds.	**2**	**2**		-	-
	Estimation of Acetic Acid in Vinegar		-			
7	Introduction to UV Spectroscopy, spectral region and ultraviolet light and electronic transitions. Integration of NMR spectroscopy	**2**	**2**		-	-
	Estimation of Citric Acid in Lemon Juice		-			
8	Mid Term	-	-	-	-	-
9	ultraviolet light and electronic transitions. Fragmentation pattern of compounds containing lone pair of electrons.	**2**	**2**		-	-
	Estimation of Benzoic Acid		-			
10	Obtaining an Ultraviolet Spectrum.	**2**	**2**		-	-
	Estimation of Amino Acids (e.g., Glycine). Factors affecting chemical shift in NMR spectroscopy.		-			
11	Interpreting UV–Visible Spectra part	**2**	**2**		-	-

	(1). Fragmentation pattern of compounds alcohols and ethers.					
	Estimation of glucose solution concentration		-			
12	Interpreting UV–Visible Spectra part (2). Chemical shift or organic compounds groups and its position in NMR spectra.	**2**	**2**		-	-
	Estimation of Aspirin (Acetylsalicylic Acid)		-			
13	UV-Visible analysis in biology and medicine. Fragmentation pattern of compounds phenols amines.	**2**	**2**		-	-
	Estimation of Vitamin C (Ascorbic Acid)		-			
14	Applications of IR, NMR, Mass and UV Spectroscopy in Chemical Analysis	**2**	**2**		-	-
	Estimation of Formaldehyde		-			
15	General revision on IR, NMR, Mass and UV Spectroscopy	**2**	**2**		-	-
	General revision		-			

5.Teaching and Learning Methods

1. **Lecture and presentations**
2. **Practical section**
3. **Open discussions & Seminars**
4. **Self-learning Tasks**
5. **Problem Solving**

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	fourteenth week	**2**0	**20 %**
2	Mid-Term Exam	Eightth week	**1**0	**10 %**
3	Final Oral Exam	sixteenth week	**1**0	**10 %**

4	Final Written Exam	sixteenth week	**60**	**60 %**
Total				**100 %**

7. Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	6-1 Course notes Lecture notes prepared by the course instructor(s). 6-2 Required books Spectroscopic Methods in Organic Chemistry , SpringerLink, 2022 6-3 Recommended books Practical Organic Spectroscopy , M. Duer, Cambridge University Press, 2022 Organic Spectroscopy by William Kemp.
	Other References	http://en.wikipedia.org/wiki/Infrared_spectroscopy http://en.wikipedia.org/wiki/Raman_spectroscopy
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank https://www.ekb.eg/web/guest/home
	Learning Platforms (Links must be added)	https://benhasci.ekb.eg/ https://ebook1.bu.edu.eg/
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board
	Electronic Programs	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

Course Coordinator	Program Coordinator
Dr. Mohamed abo Riya	Dr.mohamed atef

Mic 402: Research and Essay
Course Specification
(2025)

1. Basic Information

Course Title (according to the bylaw)	**Research and Essay**			
Course Code (according to the bylaw)	**Mic 402**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	3		0	3
Course Type	**اجباري**			
Academic level at which the course is taught	**الفرقة/المستوي الرابع**			
Academic Program	**BSc Program of microbiology and Chemistry**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Asst. Prof. Dr. Ghada Eid Abdelgaid Dawwam			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2. Course Overview (Brief summary of scientific content)

The course introduces students to the fundamental concepts, principles, terms, theories and applications of research methods. The various stages of research will be introduced and discussed: Problem Statement, Research Questions / Hypotheses, Theoretical framework, Review of Literature, Data collection, Data Analysis, Findings and Discussion, Summary, Recommendations, Conclusions and References. It will be emphasised that these stages and parts of the research process are cyclical rather than linear. The differences between the various research designs Quantitative, Qualitative and Mixed Methods will be explained and discussed. Referencing and citations conventions will also be particularly pointed out.

The course will combine theory and practice throughout the term and students will be given an opportunity to write a research proposal, conduct a small-scale research poroject and write it up (instructors should always bear in mind that this is an introduction to research for EFL, B.A. students not M.A. or Ph.D.).

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	a1	Define research and its fundamental concepts.
		a2	Explain components of a research proposal.
1.3	Demonstrate knowledge of analytical, structural, and instrumental techniques used in chemical analysis and compound characterization.	a3	Select a research design that is appropriate to a research topic.
		a4	Distinguish between a variety of research methods and designs: Quantitative, Qualitative, Mixed
2.1	Test, evaluate, and critique scientific information using evidence-based reasoning and recent developments in microbiology and chemistry.	b1	Read and critically review the literature of a particular research topic.
2.3	Construct integrated lines of reasoning to support hypotheses, confirm evidence, and interpret recent research advancements (e.g., microbial biotechnology, nanotechnology applications, environmental microbiology).	b2	Discuss primary characteristics of data analysis
		b3	Discuss the findings with reference to the research objectives, questions/hypotheses and the relevant literature
3.1	Plan and conduct investigations using standard scientific	c1	Evidence of some critical thinking and creative thinking

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	methods, prepare structured reports, and present findings according to established scientific guidelines.		
		c2-	ills in the light of the knowledge and skills obtained from the course
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in microbiology and chemistry	c3	Observe research ethics(such as avoiding plagiarism, acknowledging and giving credit where credit is due, using data for research purposes only, etc.).
3.6	Search, evaluate, and interpret scientific literature critically to support research, innovation, and evidence-based practices.	c1	Evidence of some critical thinking and creative thinking
4.1	Use information and communication technology effectively for data handling, scientific writing, and digital communication.	**D1**	Working in groups to choose the best topics for research
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**D2**	Working in groups to edit the article .
		D3	Using the computer and internet experiencis forward the applied work

4.Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction	**3**		**3**		
2	Research: Fundamental Concepts (definition, terms, philosophy, aims, objectives, difference between research subject and research topic, etc.).	**3**		**3**		
3	Starting a Research Project :Study problem(stating the problem), formulating research questions/hypotheses, etc.	**3**		**3**		
4	The Literature and Theoretical Framework (central ideas of how to read and review the relevant literature).	**3**		**3**		
5	How to quote and cite sources correctly and validly.	**3**		**3**		
6	Data: description and collection methods. Differences between Quantitative, Qualitative and Mixed Methods	**3**		**3**		
7	Writing a research proposal (they need to write a proposal at this level and keep working on it as the course proceeds).	**3**		**3**		
8	Methods of data collection: General Introduction .	**3**		**3**		
9	Questionnaires, Interviews, Observation, Focus Group Discussions, etc. (practice doing one of these methods)	**3**		**3**		
10	Data Analysis: Key Ideas and Methods	**3**		**3**		
11	Results and Discussion: How to	**3**		**3**		

	present and discuss findings					
12	Summary	3		3		
13	Recommendations/Implications	3		3		
14	conclusion	3		3		
15	Final exam and project submission/presentation	3		3		

5.Teaching and Learning Methods

- Self-learning
- e learning
- Cooperative learning strategy.
- field study strategy

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	8	25	25%
2	Final exam (discussion)	16	50	50%
3	Presentation	16	25	25%

*** The methods mentioned are examples, the organization may add and/or delete**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	2- Malik, A. R., Pratiwi, Y., Andajani, K., Numertayasa, I. W., Suharti, S., & Darwis, A. (2023). Exploring Artificial Intelligence in Academic Essay: Higher Education Student's Perspective. *International Journal of Educational Research Open*, *5*, 100296. 3- Robson, K. (2021). An essay on the challenges of doing education research in Canada. *Journal of Applied Social Science*, *15*(2), 183-196. 4- Seyoum, W. M., Yigzaw, A., & Bewuketu, H. K. (2022). STUDENTS'ATTITUDES AND PROBLEMS ON QUESTION-BASED ARGUMENTATIVE ESSAY WRITING INSTRUCTION. *Journal of English Language Teaching and Learning*, *3*(2), 58-63.
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** Asst. Prof. Dr. Reham Mohamed Mostafa	**Name and Signature** **Program Coordinator** Dr. Mohamed Atef