Chm 213: Petroleum and Petrochemicals

1. Basic Information

Course Title (according to the bylaw)	**Petroleum and Petrochemicals**			
Course Code (according to the bylaw)	**Chm 213**			
Department/s participating in delivery of the course	**Chemistry Department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**0**	**0**	**2**
Course Type	اجباري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**microbiology and chemistry B.SC.**			
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 ....)	**Approved 18/6//2025 (Department council; meeting number, 37), and 09/7/2025 till 30/7/2025, (faculty council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

This course aims to enable the students to study the petroleum and petrochemical industry. Petroleum origin and its separation process and petrochemical industry such principals of petroleum chemistry. Uses of petroleum compounds in industrial fields as rubbers, fibers, Pesticides and industrial detergents.

3. Course Learning Outcomes CLOs

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
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 principal's properties of petroleum chemistry.
		A2	Describe the uses petroleum compounds.
		A3	Understand the petrochemical products from petroleum compounds.
		A4	To know the petroleum production and its petrochemical products.
		A5	State some of the important role of petrochemical.
2.10.	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare..	B1	Interpret the given chemical data to identify the components of petroleum crude oils
		B2	Modify the petrochemical uses for components of petroleum.
		B3	Construct the properties of petroleum process.
		B4	Work in a team effectively, manage time, collaborate and communicate with others positively.
4..5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	D1	Management, working in group & life-long learning
4.7	Deal responsibly and ethically with property rights, patents, and .scientific intellectual property	D2	Ethical behavior, community linked thinking.

4.Teaching and Learning Methods

1. **Lecture and presentations**
2. **Open discussions & Seminars**
3. **Problem Solving**

5.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 petroleum chemistry.	2	2	0	0	0
2	The theory of the origin of petroleum and petrochemical principals	2	2	0	0	0
3	Prospecting for petroleum and gas fields. And petrochemical products.	2	2	0	0	0
4	Chemical composition of petroleum. Methane products in petrochemical	2	2	0	0	0
5	Physical properties of the petroleum and its products. Ethane products in petrochemical	2	2	0	0	0
6	Petroleum processing. Acetylene products in petrochemical .	2	2	0	0	0
7	Separation processes types of petroleum oil.	2	2	0	0	0
8	Mid-Term Exam.	0	0	0	0	0
9	Conversion processes, thermal and chemical cracking.	2	2	0	0	0
10	Conversion processes, reforming and petroleum gas process.	2	2	0	0	0
11	Application of the petroleum products in rubbers, and fibers industries	2	2	0	0	0
12	Treating process and hydrofining.	2	2	0	0	0
13	Petrochemistry and its important.	2	2	0	0	0
14	Petrochemistry products preparation and applications.	2	2	0	0	0
15	Revision	2	2	0	0	0

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	8th week	**10**	**10 %**
3	Oral exam	fifteenth week	**10**	**10 %**
4	Written exam	Sixteenth week	**60**	**60 %**
Total			**100**	**100%**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course**	**1 Course notes** Lecture note approved by Department of Chemistry. **6-2 Required books** ❖ William L. Leffler, Richard Pattarozzi, Gorgon Sterling; Deep water petroleum 2nd, 2011. ❖ William L. Leffler; Petroleum Refining in Nontechnical Language 4th, 2008. ❖ Jon Gluyas, Richard Swarbrick; Petroleum Geoscience, 2008. ❖ Saeid Mokhatab , John Y. Mak , Jaleel V. Valappil , David A. Wood; Handbook of Liquefied Natural Gas, 2013.
	Other References	**1-** David S. G. Gones, Peters R. Dugado; Handbook of petroleum processesing, 2006. **2-** Games H. Gary, Galenn E. Handwerk; Petroleum refining 5th, 2001.
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank https://www.ekb.eg/web/guest/home *Journal* of *Chemical Education* (ACS) Petroleum Chemistry (ACS) http://www.springer.com/us/book/9783319145280 http://www.petrochemistry.eu/about-petrochemistry/products.html?filter_id=15 https://en.wikipedia.org/wiki/Oil_additive
	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 **Dr. Mohamed abo Riya**	**Program Coordinator** **Dr. Mohamed atef**

CHM 241: Analytical Chemistry (1)

1. Basic Information

Course Title (according to the bylaw)	**Analytical Chemistry (1)**			
Course Code (according to the bylaw)	**CHM 241**			
Department/s participating in delivery of the course	**Department of chemistrty**			
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	**second level** الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Hesham El-feky**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Approved 18/6//2025 (Department council; meeting number, 37), and 09/7/2025 until 30/7/2025, (faculty council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

This course aims to learn the quantitative chemical analysis and introduction to fundamental concepts to develop the required skills to perform chemical analysis. In addition to know the basic principles for the different methods of volumetric and gravimetric analyses. Students learn the different factors affecting the solubility product to determine the elements by precipitation gravimetry, obtain a strong foundation in analytical chemistry and its principles, Describe different types of volumetric analysis

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	**Text**	**Code**	**Text**
1.3	Demonstrate knowledge of analytical, structural, and instrumental techniques used in chemical analysis and compound characterization.	a1	To know the different factors affecting the process of precipitation.
		a2	Determine all the different units of concentration in the solution.
		a3	Memorize a strong foundation in analytical chemistry and its principles
		a4	Determine the fundamentals of volumetric and gravimetric analyses
		a5	Identify the different types of volumetric analysis
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various sources.	b1	Investigate the potential chemical hazards in laboratory experiments, including toxicity, flammability, reactivity, and environmental impact.
		b2	Analyze appropriate safety measures and operational protocols to minimize risks during the use of laboratory techniques and equipment.
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	b3	Make standard and primary standard solutions accurately for use in volumetric titrations.
		b4	Examine neutralization, precipitation, and redox titrations following standard laboratory procedures.
		b5	Relate appropriate indicators to determine end points in various volumetric analysis techniques.
		b6	Investigate concentrations and analyze titration results with proper error analysis and reporting.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	c1	Report the different methods of expressing concentrations, types of indicators and their theories.
		c2	Compare between different types of volumetric and gravimetric analyses
		c3	Interpret the analytical data to identify the concentration and the purityof inorganic compounds.
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in chemistry and microbiology.	c3	Interpret the analytical data to identify the concentration and the purityof inorganic compounds
3.10	Conduct chemical analyses, synthetic procedures, and microbial	c1	Report the different methods of expressing concentrations, types of indicators and their .theories

	assays according to standard laboratory protocols.		
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	d1	Management, working in group & life-long learning

4.Teaching and Learning Methods

1. Lecture and presentations
2. Practical section
3. Open discussions & Seminars
4. Problem Solving

5.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. Introduction to analytical chemistry, quantitative chemical analysis and its principles	**5**	**2**	**-**	**-**	**-**
	1.2. Standardization of hydrochloric acid by using sodium carbonate		**-**	**3**		
2	2.1. Methods of expressing concentrations.	**5**	**2**	**-**	**-**	**-**
	2.2. Determination the purity of sodium hydroxide and sodium carbonate by using hydrochloric acid		**-**	**3**		
3	3.1. Equivalent weight, standard solution and its requirements.	**5**	**2**	**-**	**-**	**-**
	3.2. Determination the purity of different mixtures such as (sodium bicarbonate with sodium hydroxide or sodium carbonate with sodium bicarbonate) by using hydrochloric acid		**-**	**3**		
4	4.1. Acids bases titration (1)	**5**	**2**	**-**	**-**	**-**
	4.2. Determination the purity of mixture of sodium hydroxide and ammonium hydroxide by using hydrochloric acid		**-**	**3**		
5	5.1. Acids bases titration (2).	**5**	**2**	**-**	**-**	**-**
	5.2. Determination the purity of mixture of phosphoric acid and hydrochloric acid by using sodium hydroxide .		**-**	**3**		
6	6.1. Theories of indicators used in acid-base titration.	**5**	**2**	**-**	**-**	**-**
	6.2. Determination the purity of aspirin via back titration.		**-**	**3**		
7	8.1. Precipitation titration.	**5**	**2**	**-**	**-**	**-**
	8.2. Determination the purity of ammonia via back titration		**-**	**3**		
8	**Mid -term exam.**					

9	9.1Theories of indicators used in precipitation titration.	**5**	**2**	**-**	**-**	**-**
	9.2 Determination the purity of mixture of Fe^{+3} and Fe^{+2} by using potassium permanganate		**-**	**3**		
10	10.1. Complexometric titration and detect end point and requirements of indicator.	**5**	**2**	**-**	**-**	**-**
	10.2. Determination the purity of mixture of sodium oxalate and oxalic acid by using potassium permanganate		**-**	**3**		
11	11.1. Introduction to gravimetric analysis and different types of Gravimetric Methods.	**5**	**2**	**-**	**-**	**-**
	11.2. Precipitation titration		**-**	**3**		
12	12.1. Study the different factors affecting the solubility product and the precipitation process.	**5**	**2**	**-**	**-**	**-**
	12.2. Precipitation titration		**-**	**3**		
13	13.1. Study different types of contamination.	**5**	**2**	**-**	**-**	**-**
	13.2. Iodometry and Iodometric titration		**-**	**3**		
14	14.1 Study different types of precipitant (organic and inorganic).	**5**	**2**	**-**	**-**	**-**
	14.2. Complexometric titration		**-**	**3**		
15	15.1.Revision	**5**	**2**	**-**	**-**	**-**
	15.2.Revision		**-**	**3**		

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	**Fifth week**	**15**	**15%**
2	Mid-Term Exam	**8th 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**	1. Lecture notes prepared by Faculty Members. 2. **Harris, D. C.** (2020). *Quantitative Chemical Analysis* (10th ed.). W. H. Freeman and Company. 3. **Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R.** (2021). *Fundamentals of Analytical Chemistry* (10th ed.). Cengage Learning.
	Other References	1. Day, R. A., & Underwood, A. L. (2013). Quantitative Analysis (6th ed.). Boston: Pearson.
	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	
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 **Dr. Hesham El-feky**	**Program Coordinator** **Dr. Mohamed atef**

Bot 253: Plant physiology (2) Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Plant physiology (2)**			
Course Code (according to the bylaw)	**Bot 253**			
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	**-**	**-**	**2**
Course Type	اجباري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	Prof.Dr. Radwan Khalil			
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 graduates will able understanding. The basic knowledge of plant water relationship, translocation of organic material, mineral nutrition and stress physiology.

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**
1.7	Understand how the chemical nature of biological molecules determines their function, with emphasis on major metabolic pathways and their interactions in microorganisms.	**a1**	Identify the basic knowledge on water relation to the plant growth
2.8	Link and integrate subject-specific principles—such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in microorganisms.	**b1**	interpret the factors affecting stomatal movement
		b2	interpret the different type of minerals and their role in plant growth
2.9	Evaluate the interrelationships between microorganisms and their ecosystems and predict their responses to environmental changes.	**b3**	Interpret between biotic and abiotic stress.
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**d1**	Use the computer and internet experiences for gaining knowledge.
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements.	**d2**	Effectively manage tasks, time, and resources.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d3**	Search for information and engage in life-long self-learning discipline.

4.Teaching and Learning Methods

- Interactive lectures
- Effective discussion strategy
- presentations
- guided self-learning

5.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 water relation in plant	**2**	**2**	**-**	**-**	**-**
2	Factors affecting water absorption rate:	**2**	**2**	**-**	**-**	**-**
3	Transpiration	**2**	**2**	**-**	**-**	**-**
4	Factors affecting stomatal movement:	**2**	**2**	**-**	**-**	**-**
5	Water balance in plants.	**2**	**2**	**-**	**-**	**-**
6	Mineral nutrition and transport of solutes	**2**	**2**	**-**	**-**	**-**
7	Mineral nutrition and transport of solutes	**2**	**2**	**-**	**-**	**-**
8	**Midterm exam and revision**	**0**	**0**	**-**	**-**	**-**
9	Food transport through phloem and its mechanism	**2**	**2**	**-**	**-**	**-**
10	Food transport through phloem and its mechanism	**2**	**2**	**-**	**-**	**-**
11	Stress physiology (biotic and abiotic)	**2**	**2**	**-**	**-**	**-**
12	Environmental factors affecting on stress physiology	**2**	**2**	**-**	**-**	**-**
13	Environmental factors affecting on stress physiology	**2**	**2**	**-**	**-**	**-**
14	Plant adaptation to stress	**2**	**2**	**-**	**-**	**-**
15	Plant adaptation to stress	**2**	**2**	**-**	**-**	**-**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	8	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)	**Course notes** Pessarakli, M. (Ed.). (2021). *Handbook of plant and crop physiology*. CRC press. Jalal, A., de Oliveira Junior, J. C., Ribeiro, J. S., Fernandes, G. C., Mariano, G. G., Trindade, V. D. R., & Dos Reis, A. R. (2021). Hormesis in plants: Physiological and biochemical responses. *Ecotoxicology and Environmental Safety*, *207*, 111225
	Other References	Bhatla, S. C., & Lal, M. A. (2018). *Plant physiology, development and metabolism*. Springer
	Electronic Sources (Links must be added)	www.eulc.edu.eg
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching	**Devices/Instruments**	**Labtop- data show –paper projector- microphone**
	Supplies	**White board - marker**
	Electronic Programs	
	Skill Labs/ Simulators	

and learning *	**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**

Name and Signature **Course Coordinator** Prof. Dr. Radwan Khalil	**Name and Signature** **Program Coordinator** **Dr\ Mohamed Atef**

Mic 271: Bacteriology Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Bacteriology**			
Course Code (according to the bylaw)	**Mic 271**			
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 الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	Prof. Dr. Mohamed Osman			
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 understand, the morphology and structure of bacterial cells. Microstructure of bacteria. Basis and methods of staining of bacteria, Isolation and identification of bacteria.

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 microbiological terminology, nomenclature, and contemporary classification systems based on modern trends and molecular approaches.	**a1**	Identify morphology and polymorphism of bacteria
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	**a2**	Describe microstructure of bacterial cells
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	**a3**	Explain growth and metabolism of bacteria
2.8	Link and integrate subject-specific principles—such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in microorganism's sciences.	**b1**	Apply computer search for bacterial identification
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c1**	Differentiate between species of bacteria based on cultural, metabolic and nutritional bases
3.9	Prepare, stain, and examine slides for microscopic identification of various microbial types.	**c2**	Desine growth curve of bacterial species
3.12	Assess laboratory risks and implement biosafety and chemical safety procedures effectively.	**c3**	Differentiate between the methods employed in examination of bacteria

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**
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	.Think independently, set tasks and solve microbiological problems

4. Teaching and Learning Methods

- lectures
- practical work
- visual presentations
- online learning

5.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 bacteria	**5**	**2**	**3**	**-**	**-**
2	Bacterial taxonomy	**5**	**2**	**3**	**-**	**-**
3	Properties of Bacteria	**5**	**2**	**3**	**-**	**-**
4	Forms and size of bacteria	**5**	**2**	**3**	**-**	**-**
5	Polymorphism, Know morphology of bacteria,	**5**	**2**	**3**	**-**	**-**
6	microstructure of bacterial cells	**5**	**2**	**3**	**-**	**-**
7	Reproduction of bacteria	**5**	**2**	**3**	**-**	**-**
8	**Midterm exam and revision**	**0**	**0**	**0**	**-**	**-**
9	growth and metabolism of bacteria,	**5**	**2**	**3**	**-**	**-**
10	cultural and physiological characteristics of bacteria	**5**	**2**	**3**	**-**	**-**
11	Variation of bacteria	**5**	**2**	**3**	**-**	**-**
12	Antibioses	**5**	**2**	**3**	**-**	**-**
13	Bacterial associations.	**5**	**2**	**3**	**-**	**-**
14	Systematic bacteriology	**5**	**2**	**3**	**-**	**-**
15	Revesion	**5**	**2**	**3**	**-**	**-**

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	**8**	**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)	**Course notes**
	Other References	Mahon, C. R., & Lehman, D. C. (2022). *Textbook of diagnostic microbiology-e-book*. Elsevier Health Sciences. Samaranayake, L. (2018). *Essential microbiology for dentistry-E-Book*. Elsevier Health Sciences
	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**	**Labtop –data show- 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** Prof. Dr. Mohamed Osman	**Name and Signature** **Program Coordinator** **Asst. Prof. Dr\ Mohamed Atef**

Mic 275: Phycology Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**Phycology**			
Course Code (according to the bylaw)	**Mic 275**			
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 الثاني			
Academic Program	**Microbiology and Chemistry B.SC.**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof.Dr. Mohamed Gomaa**			
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 bases of algal classification. Algal ecosystem. The different algal divisions with life cycles. Some economic importance of Egyptian algae.

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 microbiological terminology, nomenclature, and contemporary classification systems based on modern trends and molecular approaches.	**a1**	Define the different algal divisions
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	**a2**	Describe the reproduction and adaptation of algae with the habitats.
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	**a3**	Record systematic position and thallus of algae
2.8	Link and integrate subject-specific principles—such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in microorganisms.	**b1**	Interpret the difference in algal classification
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c1**	Isolation and identification of algae from different habitats
3.9	Prepare, stain, and examine slides for microscopic identification of various microbial types.	**c2**	differentiate between different algal species
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	Think independently, set tasks and solve microbiological problems

4. Teaching and Learning Methods

- lectures
- practical work
- discussion groups
- self-directed learning
- online learning

5. 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	5	2	3	-	-
2	Basic characteristics of algae	5	2	3	-	-
3	Ecology of algae	5	2	3	-	-
4	Morphological form and cell structure of algae	5	1	3	1	-
5	Algal reproduction and life cycles	5	2	3	-	-
6	Classification of algae	5	2	3	-	-
7	Cyanophyta	5	2	3	-	-
8	Midterm exam and revision	0	0	0	-	-
9	Chlorophyta	5	2	3	-	-
10	Bacillariophyta	5	2	3	-	-
11	Xanthophyta	5	2	3	-	-
12	Phaeophyta	5	2	3	-	-
13	Rhodophyta	5	1	3	1	-
14	Economic importance of algae	5	2	3	-	-
15	Revision	5	2	3	-	-

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Assignment 1	4	5	5%
2	Midterm exam	8	5	5%
3	Assignment 2	13	10	10%
4	Final Practical 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)	**Course notes** Sharma O.P, 2004. Text Book of Algae, Tata Mc. Graw Hill Co.
	Other References	Bilgrama K. S & Saha L. C. 1996. Text Book of Algae, C B S Publishers & Distributors.
	Electronic Sources (Links must be added)	http://www.phycology.net/ http://www.algaebase.org/ http://www.seaweed.ie/ http://www.brphycsoc.org/ (British Phycological Society) http://www.intphycsoc.org/ (International Phycological Society) http://www.isaseaweed.org/ (International Seaweed Association) International Journal on Algae -http://en.wikipedia.org/wiki/Algae -http://www.in.gov/idem/algae/ -http://www.e-algae.kr/main/
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment	**Devices/Instruments**	**Labtop- datashow- paper projector- microphone**
	Supplies	**White board- marker**

for teaching and learning *	**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 Mohamed Gomaa**	**Name and Signature** **Program Coordinator** **Asst. prof. Dr\ Mohamed atef**

Bot 213 : Principles of cytology and genetics Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**Principles of cytology and genetics**			
Course Code (according to the bylaw)	**Bot 213**			
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	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Prof. Dr\ Samir Hamdy**			
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)

A comprehensive knowledge of the fine structure of cells and cell types.

Understanding the physical and chemical nature of the hereditary material and the natural and abnormal variations of chromosomes during cell division and when the cell is subjected to mutagens.

Advanced understanding of 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**
1.5	**Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.**	**a1**	Describe the structure and function of different cell organelles.
		a3	Identify the Mendel's laws of heredity and the genetic interactions.
		a4	Describe the molecular bases of heredity and the genetic code.
1.7	**Understand how the chemical nature of biological molecules determines their function, with emphasis on major metabolic pathways and their interactions .in microorganisms**	**a2**	Describe the causes and mechanisms of chromosome variation.
2.8	**Link and integrate subject-specific principles—such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in microorganisms.**	**b1**	Compare the different methods of cell division.
		b2	Interpret the consequences of linkage and crossing over.
		b3	Apply the concept of multiple alleles in manipulating certain genetic issues.

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**
3.9	**Prepare, stain, and examine slides for microscopic identification of various microbial types.**	**c1**	Draw the ultrastructure of a given chromosome.
		c2	Solve genetic problems.
		c3	Investigate the effects of sex-linked genes.
		c4	Assess the importance of modern applications of genetics.
4.3	**Think independently, critically, and creatively to solve scientific and practical problems.**	**d1**	Work in groups to acquire the ability to communicate in a proactive way and develop his/her personality (self-confidence).
		d2	Use the internet in solving scientific problems.
		d3	Use computer programs to present their work in a variety of ways like seminars, reports and projects which will lead to grow the creativity talent in the student personality.

4. Teaching and Learning Methods

- lectures
- practical work
- presentations
- group discussions
- **E- learning**

5. 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 – Fine structure of the cell.	4	1	3	-	-
2	Cell division (amitosis, mitosis and meiosis).	4	1	3	-	-
3	Cell division (amitosis, mitosis and meiosis).	4	1	3	-	-
4	Chromosome ultrastructure.	4	1	3	-	-
5	Chromosome variations (variations in number).	4	1	3	-	-
6	Chromosome variations (variations in structure).	4	1	3	-	-
7	Mendel's laws of heredity.	4	1	3	-	-
8	Midterm and revision	0	0	0	-	-
9	Genetic Interaction.	4	1	3	-	-
10	Multiple alleles.	4	1	3	-	-
11	Linkage and crossing over.	4	1	3	-	-
12	Sex determination and sex linked genes.	4	1	3	-	-
13	Molecular bases of heredity and the genetic code.	4	1	3	-	-
14	Some modern applications of genetics.	4	1	3	-	-
15	Revision	4	1	3	-	-

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	**11**	**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** Snustad, D. P., & Simmons, M. J. (2015). *Principles of genetics*. John Wiley & Sons
	Other References	Piaget, J. (2013). *Principles of Genetic Epistemology: Selected Works vol 7* (Vol. 7). Routledge.
	Electronic Sources (Links must be added)	http://www.biologymad.com/frontpage.htm http://www.molecularcytogenetics.org/ http://learn.genetics.utah.edu/ http://www.dnaftb.org/ www.sciencedirect.com
	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**	**Labtop – data show – paper progector-interent**
	Supplies	**Marker –white board- microphone**
	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\ Samir Hamdy

Name and Signature
Program Coordinator
Asst. prof. Dr\ Mohamed Atef

Mic291: Microbiological laboratory techniques
Course Specification

1.Basic Information

Course Title (according to the bylaw)	**Microbiological laboratory techniques**			
Course Code (according to the bylaw)	**Mic 291**			
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	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Prof. Dr\ Hassan Emara**			
Course Specification Approval Date	**2/7/2025**			
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 general microbiological laboratory safety rules, Sterilization , DNA, RNA, and protein extractions from different samples. Polymerase chain reaction (PCR) . Students will gain hands-on experience in aseptic technique, microbial culture, isolation, staining, and identification.

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**	Mention the general characters prokaryotic cells– eukaryotic cells
		a2	Outline different types of culture media.
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various .sources	b1	Explain why we need to study laboratory safety rules.
		b2	Interpret the different between light and electron microscopes.
		b3	prove the characteristics of culture media
2.5	Break down, synthesize, reconstruct, and reformulate complex information such as biosynthetic pathways, macromolecular structures, or .microbial life cycles	b4	Apply methods for isolation of DNA and RNA
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	c1	Differentiate between sterilization and disinfection
		c2	Isolating microorganism from the environment
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and .microbial identification tools	c3	preparation different types of culture media
3.9	Prepare, stain, and examine slides for microscopic	c4	Examine with drawing fungal and bacterial slides and staining of bacteria and

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**
	identification of various microbial .types		preservation of cultures
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and w.professional tasks	d1	. Use computers and internet for communication, data handling and word processing

4.Teaching and Learning Methods

- Lecture presentations
- Practical work
- Self- directed learning
- Discussions sessions
- Assignments and Reports

5.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 Microbiology laboratory safety rules	**4**	**1**	**3**	**-**	**-**
2	Sterilization,Disinfections ,cleaning and decontamination	**4**	**1**	**3**	**-**	**-**
3	Types of sterilization (Dry heat and moist heat	**4**	**1**	**3**	**-**	**-**
4	Sterilization by filteration and radiation	**4**	**1**	**3**	**-**	**-**
5	Microscope ,Electron microscopes Types of light microscopes	**4**	**1**	**3**	**-**	**-**
6	Prokaryotic cells and Eukaryotic cells ,Bacteria & Gram staining	**4**	**1**	**3**	**-**	**-**
7	Non-cellular life (Viruses)	**4**	**1**	**3**	**-**	**-**
8	Midterm exam and revision					
9	Types of culture media.	**4**	**1**	**3**	**-**	**-**
10	Isolating microorganism from the environment.	**4**	**1**	**3**	**-**	**-**
11	DNA , RNA, and protein extraction from different samples	**4**	**1**	**3**	**-**	**-**
12	Differences between the extracted DNA from different tissues	**4**	**1**	**3**	**-**	**-**
13	Gene specific primers design	**4**	**1**	**3**	**-**	**-**
14	Polymerase chain reaction (PCR). Preparation of DNA gel electrophoresis buffers.	**4**	**1**	**3**	**-**	**-**
15	**Revision**	**4**	**1**	**3**	**-**	**-**

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** James, C., & Natalie, S. (2014). Microbiology. A laboratory manual. Pearson Education. Machina, H. K., & Wild, D. J. (2013). Electronic laboratory notebooks progress and challenges in implementation. *Journal of laboratory automation*, *18*(4), 264-268. Tremouilhac, P., Nguyen, A., Huang, Y. C., Kotov, S., Lütjohann, D. S., Hübsch, F., ... & Bräse, S. (2017). Chemotion ELN: an Open Source electronic lab notebook for chemists in academia. *Journal of cheminformatics*, *9*(1), 1-13. Haff, G. G., & Dumke, C. (2021). Laboratory manual for exercise physiology. Human Kinetics.
	Other References	Microbiology. 5th Edition, L. M. Prescott, 2002 Buchan, B. W., & Ledeboer, N. A. (2014). Emerging technologies for the clinical microbiology laboratory. *Clinical microbiology reviews*, *27*(4), 783-822.

		Moreno, I., Cicinelli, E., Garcia-Grau, I., Gonzalez-Monfort, M., Bau, D., Vilella, F., ... & Simon, C. (2018). The diagnosis of chronic endometritis in infertile asymptomatic women: a comparative study of histology, microbial cultures, hysteroscopy, and molecular microbiology. *American journal of obstetrics and gynecology*, *218*(6), 602-e1.
	Electronic Sources (Links must be added)	- American Journal of Microbiology Web sites www. sciencedirect.com (Science @ direct) www.eulc.edu.eg
	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**	**Progector- labtop- microphone- data show**
	Supplies	**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
Asst. prof. Dr\ Mohamed Atef

Chm 221: Industrial Inorganic chemistry (1)

1. Basic Information

Course Title (according to the bylaw)	**Industrial Inorganic chemistry (1)**			
Course Code (according to the bylaw)	**CHM 221**			
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**	**-**	**2**
Course Type	**Elective Course** اختياري			
Academic level at which the course is taught	**second level** الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
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 ....)	**Approved 18/6//2025 (Department council; meeting number, 37), and 09/7/2025 till 30/7/2025, (faculty council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

This course aims to enable the students to: Learn and study the general properties for inorganic materials, The difference between organic and inorganic compounds. Study the properties of some inorganic compounds (such as water, sodium hydroxide, metals, etc). Study the preparation of inorganic compounds and their application in various industries such as metals sodium hydroxide, ammonia, sulphuric acid, fertilizers and other, Identify the chemical formula of inorganic materials, know the various inorganic compounds that used in different applications and describe the preparation of inorganic materials which used in different industries.

3. Course Learning Outcomes CLOs

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	**Text**	**Code**	**Text**
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics.	A1	Define chemical concepts of applied inorganic chemistry
		A2	Describe the steps of extraction of copper from its ore
		A3	Explain the preparation methods of sodium hydroxides
		A4	Outline the process of the synthesis of sulphuric acid
		A5	Describe the steps of the fabrication of ammonia
		A6	Know the different types of fertilizers and their production methods
		A7	Identify the chemical formula of different inorganic materials, their preparation and their applications in different industries
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	A1	Define chemical concepts of applied inorganic chemistry
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	B1	Compare between the physical and chemical properties of inorganic materials.
		B2	Label the method for extraction metal and oxides from its ores
		B3	Report on the different inorganic compounds and their preparation methods
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	Management, working in group & life-long learning

4.Teaching and Learning Methods

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

5.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 inorganic chemistry	**2**	**2**	**-**	**-**	**-**
2	Classify inorganic compounds and their applications.	**2**	**2**	**-**	**-**	**-**
3	Extractive of copper metal from its ores .	**2**	**2**	**-**	**-**	**-**
4	Refine copper metal and its applications	**2**	**2**	**-**	**-**	**-**
5	Manufacture of Sodium Hydroxide and chlorine using chlor-alkali and their applications	**2**	**2**	**-**	**-**	**-**
6	Manufacture of Sodium Hydroxide and chlorine using diaphragm and membrane cells	**2**	**2**	**-**	**-**	**-**
7	Raw Materials, nitrogen fixation and application of ammonia	**2**	**2**	**-**	**-**	**-**
8	**Mid -term exam.**					
9	Manufacture of ammonia using Haber and Carl Bosch process	**2**	**2**	**-**	**-**	**-**
10	Raw Materials, production of sulphur trioxide and application of sulphuric acid	**2**	**2**	**-**	**-**	**-**
11	Manufacture of sulphuric acid using lead-chamber process	**2**	**2**	**-**	**-**	**-**
12	Manufacture of sulphuric acid using contact process	**2**	**2**	**-**	**-**	**-**
13	Manufacture of nitrogen, potassium, phosphate, and NPK Fertilizers	**2**	**2**	**-**	**-**	**-**
14	Manufacture of nitrogen, potassium, phosphate, and NPK Fertilizers using co precipitation	**2**	**2**	**-**	**-**	**-**
15	Revision	**2**	**2**	**-**	**-**	**-**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-Term Exam	8th week	**10**	**10%**
2	Final Oral Exam	Seventh week	**10**	**10%**
3	Semester work	Fifteenth week	**20**	**20%**
5	Final Written Exam	seventeenth week	**60**	**60%**
Total			**100**	**100%**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course**	4. Lecture notes prepared by the course instructor(s). 5. J.D. Lee, Concise Inorganic Chemistry, 5th Edn. Blackwell Science, Australia, 1996 6. F.A. Cotton, G. Wilkinson, C.A.Murillo, M. Bochmann, Advanced Inorganic Chemistry, 6th Edn, John Wiley&Sons, Inc., New York, 1999. 4 N.N. Greenwood, A. EarnShaw, Chemistr y of Elements,2nd Edn, Butterworth Heinemann, USA 1997.
	Other References	http://www.public.asu.edu/~jpbirk/CHM-115_BLB/Chpt24 http://ocw.mit.edu/courses/chemistry/5-112-principles-of-chemical-science-fall-2005/ http://www.docbrown.info/page07/appendixtrans11.htm
	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)	
Supportive facilities &	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board

equipment for teaching and learning *	**Electronic Programs**	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

Course Coordinator **Dr. Ayman Awad Ali**	**Program Coordinator** **Dr. Mohamed atef**

Second term

CHM 212: Aromatic and Polynuclear Chemistry

1. Basic Information

Course Title (according to the bylaw)	**Aromatic and Polynuclear Chemistry**			
Course Code (according to the bylaw)	**CHM 212**			
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**	**-**	**2**
Course Type	**Compulsory course** اجباري			
Academic level at which the course is taught	**Second level** الفرقة الثانية			
Academic Program	**Microbiology& Chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Amal Mohamed**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Approved 18/6/2025 (Department Council; meeting number, 37), and 09/7/2025 till 30/7/2025, (faculty Council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

This course aims to enable the students to define the Concept of Aromaticity, Students how substituents influence the position of new groups on aromatic rings and cover the structure, properties, and reactions of aromatic hydrocarbons and their halogenated derivatives.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	A1	Define the Aromaticity
		A2	Identify the different types of aromatic compounds.
		A3	Describe the difference between the aromatic and non-aromatic organic compounds.
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics.	A4	Name the aromatic derivatives.
		A5	Draw the structure of different aromatic derivatives.
		A6	Tell the most applications for the studied topics
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	B1	Explain the possible conversions in aromatic organic compounds
		B2	Differentiate between aromatics and non-aromatic compounds
		B3	Predicts suitable conditions appropriate to complete a chemical reaction.
		B5	Distinguish the different types of aromatic organic compounds
4.3	4.3 Think independently, critically, and creatively to solve scientific and practical problems.	D1	Management, working in group & life-long learning
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	D2	Ethical behavior, community linked thinking.

4. Teaching and Learning Methods

1. E- learning.
2. Visual Presentations.
3. Interactive Lectures.
4. Interactive Workshops

5.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	2	2	-	-	-
2	Aromaticity	2	2	-	-	-
3	Structure of Benzene	2	2	-	-	-
4	Nomenclature of Benzene Derivatives	2	2	-	-	-
5	Preparation and reactions of benzene	2	2	-	-	-
6	Aryl halides	2	2	-	-	-
7	Nitro compounds	2	2	-	-	-
8	Aromatic amines	2	2	-	-	-
9	Mid- Term Exam	0	0	-	-	-
10	Diazonium salts	2	2	-	-	-
11	Aldehydes and Ketones	2	2	-	-	-
12	Aromatic carboxylic acids	2	2	-	-	-
13	Phenols	2	2	-	-	-
14	Polynuclear compounds	2	2	-	-	-
15	Revision	2	2	-	-	-

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	9th week	**10**	**10%**
3	Final Oral Exam	seventeenth week	**10**	**10%**
4	Final Written Exam	Sixteenth week	**60**	**60%**
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 instructors and proved by chemistry department. "*Organic Chemistry for competitive examinations*", Arun Bahl, Penjab University, INDIA, 2009
	Other References	*Journal* of *Chemical Education* (ACS) http://www.public.asu.edu/~jpbirk/CHM-115_BLB/Chpt24/ http://ocw.mit.edu/courses/chemistry/5-112-principles-of-chemical-science-fall-2005/ http://www.docbrown.info/page07/appendixtrans11.htm
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank
	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	
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

Course Coordinator	Program Coordinator
Prof. Dr. Amal Mohamed	Dr. Mohamed atef

CHM 222: Chemistry of Representative Elements

1. Basic Information

Course Title (according to the bylaw)	**Chemistry of Representative Elements**			
Course Code (according to the bylaw)	**CHM 222**			
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	**second level** الفرقة/المستوي الثاني			
Academic Program	**Microbiology and Chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Sahar Mohammed**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Approved 18/6/2025 (Department council; meeting number, 37), and 09/7/2025 until 30/7/2025, (faculty council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

The course on the Chemistry of Representative Elements provides a comprehensive exploration of the fundamental principles and properties of the main group elements in the periodic table, specifically focusing on hydrogen and groups: S- block (1 to 2) and P-block (14-18). It covers the electronic configurations, atomic and ionic radii, ionization enthalpies, and electronegativities, reactions, ores and applications of these elements, highlighting trends and anomalies within each group. The course delves into the chemical reactivity of these elements, including their oxidation states, types of compounds formed, and their behavior in various chemical reactions. Key topics include the properties and reactions of alkali and alkaline earth metals (Li, Na, Be and Mg), the unique characteristics of nonmetals such as aluminum, boron, carbon, nitrogen and phosphorus,

and the behavior of halogens and noble gases. Additionally, the course emphasizes the significance of these elements in industrial applications and everyday life, providing students with a solid foundation in inorganic chemistry and its practical part in this course: the separation and identification of inorganic salt.

3. Course Learning Outcomes CLOs

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	**Text**	**Code**	**Text**
1.1	1 Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	A1	Outline the physical and chemical properties of elements and their compounds and their classification in the periodic table.
		A2	Describe the preparation, reactions, types and applications of S and P block elements in periodic table
		A3	Define chemical concepts of the main group S and P block elements.
1.10	**Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics**	A4	.Understand the electronic configuration, oxidation state of elements in S and P block and the position of elements in periodic table
		A5	Identify the ores, raw materials and extraction of elements in S and P block elements and their compounds.
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	B1	Show the physical and chemical properties of inorganic salts
		B2	Differentiate between different inorganic salt
		B3	Investigate the basic cations in the mixture of inorganic salts
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and .microbiological investigations	C1	Report the properties, preparation, types and applications of S and P elements.
		C2	Design the flowchart of the reactions of S and P elements.
		C3	Report the difference between the groups of S and P elements.
		C4	Discover the structure and composition of the S and P block elements and their compounds.
3.10	**Conduct chemical analyses, synthetic procedures, and microbial assays according to .standard laboratory protocols**	C1	Report the properties, preparation, types and applications of S and P elements.
4.8	**Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks**	D1	Think independently, set tasks

4.Teaching and Learning Methods

1. Lecture and presentations
2. Practical section
3. Open discussions & Seminars
4. Problem Solving

5.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. Overview of the periodic table.	**5**	**2**	**-**	**-**	**-**
	1.2. Identification different inorganic salts		**-**	**3**		
2	2.1. Hydrogen and hydrides	**5**	**2**	**-**	**-**	**-**
	2.2. Separation different inorganic salts of group I and II		**-**	**3**		
3	3.1. General properties, chemical reactions and applications of element in group IA (1).	**5**	**2**	**-**	**-**	**-**
	3.2. Separation different inorganic salts of group II and III		**-**	**3**		
4	4.1. General properties and chemical reactions and applications of elements in group IIA (2)	**5**	**2**	**-**	**-**	**-**
	4.2. Separation different inorganic salts of group I and III		**-**	**3**		
5	5.1. General properties and chemical reactions and applications of elements in group IIIA /(13)	**5**	**2**	**-**	**-**	**-**
	5.2. Separation different inorganic salts of group II and IV		**-**	**3**		
6	6.1. Ores, main compounds and extraction of elements in groups IA, IIA and IIIA	**5**	**2**	**-**	**-**	**-**
	6.3. Separation different inorganic salts of group III and IV		**-**	**3**		
7	8.1. General properties and chemical reactions and applications of elements in group IVA /14.	**5**	**2**	**-**	**-**	**-**
	8.2. Separation different inorganic salts of group I and IV		**-**	**3**		
8	9.1. General properties and chemical reactions and applications of elements in group VA /15	**5**	**2**	**-**	**-**	**-**

	9.2. Separation different inorganic salts of group II and V		-	3		
9	Mid -term exam.					
10	10.1. General properties and chemical reactions and applications of elements in group VIA / 16	5	2	-	-	-
	10.2. Separation different inorganic salts of group III and V		-	3		
11	11.1. Ores, main compounds and extraction of elements in groups IVA, VA and VIA	5	2	-	-	-
	11.2. Separation different inorganic salts of group IV and V		-	3		
12	12.1. General properties and chemical reactions and applications of elements in group VIIA / 17	5	2	-	-	-
	12.2. Separation different inorganic salts of group V and VI		-	3		
13	13.1. General properties and chemical reactions and applications of elements in group VIIIA / 18	5	2	-	-	-
	13.2. Separation different inorganic salts of group II, III, and VI		-	3		
14	14.1. Ores, main compounds and extraction of elements in groups VIIA, and VIIIA	5	2	-	-	-
	14.2. Separation different inorganic salts of group IV and VI		-	3		

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	15	15%
2	Mid-Term Exam	9th 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**	7. Lecture notes prepared by the course instructor(s). 8. J.D. Lee, Concise Inorganic Chemistry, 5th Edn. Blackwell Science, Australia, 1996. 9. 1-F.A. Cotton, G. Wilkinson, C.A.Murillo, M. Bochmann, Advanced Inorganic Chemistry, 6th Edn, John Wiley&Sons, Inc., New York, 1999. 10. 2- N.N. Greenwood, A. EarnShaw, Chemistry of Elements,2nd Edn, Butterworth Heinemann, USA 1997. 11. Journal of Chemical Education (ACS), Inorganic Chemistry (ACS).
	Other References	http://ocw.mit.edu/courses/chemistry.
	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 **Dr. Sahar Mohammed**	**Program Coordinator** **Dr. Mohamed Atef**

Mic262: Mycology Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	**Mycology**			
Course Code (according to the bylaw)	**Mic 262**			
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 الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of 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 of this course the graduate will able understanding the general characteristics of Fungi. Modern techniques of used in fungal taxonomy. Different groups of Fungi. Economic importance of Fungi. Life Cycles of some fungal species.

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 microbiological terminology, nomenclature, and contemporary classification systems based on modern trends and molecular approaches.	a1	Describe the whole structure of fungi
		a2	Identify various classes of fungi
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	a3	explain life Cycles of some fungal species
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	a4	. Outline the economic importance of fungi
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry.	b1	Compare between different groups of fungi
		b2	Interpret benefits of different fungal species
		b3	Report the fungal identification keys
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	c1	Prepare slides of various fungal groups
3.9	Prepare, stain, and examine slides for microscopic identification of various microbial types.	c2	Investigate different methods of fungal classification
		c3	Analyze different fungal life cycles.

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**
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	Use computer, internet & communications
		d2	Management, working in group & life-long learning

4. Teaching and Learning Methods

- Interactive lectures
- Practical work
- presentations
- effective discussion strategy
- E- learning

5. 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 basic terminology	**5**	**2**	**3**	**-**	**-**
2	definitions in fungal sciences	**5**	**2**	**3**	**-**	**-**
3	Introductory to the general organization of the fungal cell structures	**5**	**2**	**3**	**-**	**-**
4	Studying the various ways of fungal reproduction	**5**	**2**	**3**	**-**	**-**
5	studying the fungi in the marine, soil and air environment	**5**	**2**	**3**	**-**	**-**
6	Studying the evolution of various fungal groups	**5**	**2**	**3**	**-**	**-**
7	Evaluating the conventional and advanced methods applied in fungal classification	**5**	**2**	**3**	**-**	**-**
8	Ascomycotina , Basidiomycotina ,deutromycotina	**5**	**2**	**3**	**-**	**-**
9	**Midterm exam and revision**	**0**	**0**	**0**	**-**	**-**
10	Ascomycotina , Basidiomycotina ,deutromycotina	**5**	**2**	**3**	**-**	**-**
11	Emphasis on the diversity in the fungal morphology and life cycles of various groups	**5**	**2**	**3**	**-**	**-**
12	Emphasis on the diversity in the fungal morphology and life cycles of various groups	**5**	**2**	**2**	**1**	**-**
13	Evaluating how do fungi influence the biochemical cycles in different habitats	**5**	**2**	**3**	**-**	**-**
14	Studying the economic importance of some fungi	**5**	**2**	**3**	**-**	**-**
15	**revision**	**5**	**2**	**3**	**-**	**-**

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)	**Course notes** Dix NJ & Webster J. 1995 Fungal Ecology. Chapman Hall. Ch 9
	Other References	**Recommended books.** Gunde-Cimerman N. et al 2009. Halotolerant and halophilic fungi. Mycological Research 113: 1231-1241. Ingold CT & Hudson HJ 1993. The Biology of Fungi. Chapman Hall. Ch 6.
	Electronic Sources (Links must be added)	Mycological Research, An International Journal of general mycology, A publication of the British Mycological Society, Elsevier.
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**

	Other (to be mentioned)	- Canadian Journal of botany & Egyptiain Journal of Botany& www.google.com & www.scincedirect.com
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer and Data show
	Supplies	**Marker – labtop- board- microphone** Slide and paper projector
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	**Visual lab**
	Other (to be mentioned)	

Name and Signature
Course Coordinator
Prof.Dr. Hassan Emara,

Name and Signature
Program Coordinator
Asst. prof. Dr\ Mohamed Atef

Mic 282: Molecular biology Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Molecular biology**			
Course Code (according to the bylaw)	**Mic 282**			
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 الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of 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 the genetic materials , DNA replication and DNA mutation and repair. The genetic expression, gene regulation and different Plasmid isolation techniques, PCR and its applications– DNA sequencing 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**
1.7	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 the chemistry of nucleotides and nucleic acids
		a2	Explain the genetic expression, gene regulation and different plasmid isolation
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems.	a3	State the PCR and its applications– DNA sequencing techniques
2.8	Link and integrate subject-specific principles—such as gene expression and regulation, biochemical pathways, molecular interactions, and physiological control mechanisms in microorganisms.	b1	Apply DNA extraction and isolation
		b2	Develop Design Primers, Restriction enzymes
		b3	Compare the different methods of DNA/RNA/Proteins electrophoresis separation (DNA gel electrophoresis, pulsed field gel electrophoresis, polyacrylamide gel electrophoresis (PAGE) and two dimensional page of proteins
		b4	Compare the different methods of DNA/RNA/Proteins blotting techniques (southern,Nourtherns and western techniques)
		b5	Compare the different types of Polymerase chain reaction (Randomly amplified polymorphic DNA fingerprinting, nested RT-PCR, real-time PCR and differential display

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**
		b6	Report gene expressions and their estimations (Microarray)
		b7	Compare the different methods of DNA sequencing techniques.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	**c1**	Prepare the samples for DNA, RNA, and protein extractions.
		c2	Prepare DNA extraction buffers and extract DNA, RNA, and protein from different tissues
		c3	Prepare DNA gel electrophoresis buffers and differentiate between the extracted DNA from different tissues
		c4	Preform run of DNA and RNA gel electrophoresis and photograph the gel
		c5	Investigate the difference between different restriction enzymes using DNA gel electrophoresis
		c6	Recommend different solutions for polymerase chain reaction (PCR) troubleshoots
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c8**	Summarize different methods of blotting techniques with drawing
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	**c7**	Prepare different PCR gene specific primers
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	Work in groups to acquire the knowledge on preparation of samples and different buffers which give the student the ability to communicate in a proactive way which will be able to develop his/her personality (self-confidence).
		d3	Use computer programs to present their work in a variety of ways like seminars, reports (hard copy and electronically) and project (electronically or tangibly) will lead to grow the creativity talent in the student personality.

4. Teaching and Learning Methods

- Interactive lectures
- Practical work
- Visual presentations
- Discussion strategy
- E-learning

5.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 genetic materials**	**4**	**1**	**3**	**-**	**-**
2	**The genetic materials**	**4**	**1**	**3**	**-**	**-**
3	**DNA replication**	**4**	**1**	**3**	**-**	**-**
4	**DNA replication**	**4**	**1**	**3**	**-**	**-**
5	**DNA mutation and repair**	**4**	**1**	**2**	**1**	**-**
6	**DNA mutation and repair**	**4**	**1**	**3**	**-**	**-**
7	**The genetic expression**	**4**	**1**	**3**	**-**	**-**
8	**The genetic expression**	**4**	**1**	**3**	**-**	**-**
9	**Midterm exam**	**0**	**0**	**0**	**-**	**-**
10	**Gene regulation**	**4**	**1**	**3**	**-**	**-**
11	**Gene regulation**	**4**	**1**	**3**	**-**	**-**
12	**PCR and its applications**	**4**	**1**	**3**	**-**	**-**
13	**PCR and its applications**	**4**	**1**	**3**	**-**	**-**
14	**DNA sequencing techniques**	**4**	**1**	**3**	**-**	**-**
15	**revision**	**4**	**1**	**3**	**-**	**-**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Assignment 1	5	5	5%
2	Midterm exam	9	5	5%
3	Assignment 2	14	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)	**Course notes** Slack, J. M., & Dale, L. (2021). *Essential developmental biology*. John Wiley & Sons. Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J., & Johnson, G. (2022). *Cell biology E-book*. Elsevier Health Sciences.
	Other References	Samaranayake, L. (2018). *Essential microbiology for dentistry-E-Book*. Elsevier Health Sciences.
	Electronic Sources (Links must be added)	a- Egyptian Journal of Virology b- American Journal of Microbiology Web sites www. sciencedirect.com (Science @ direct
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching	**Devices/Instruments**	**Data show**
	Supplies	**Labtop – internet – board- marker- microphone**
	Electronic Programs	
	Skill Labs/ Simulators	

and learning *	**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\ Samir Hamdy**		**Name and Signature** **Program Coordinator** **Asst. prof. Dr\ Mohamed Atef**

Mic 272: Actinomycetes Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Actinomycetes**			
Course Code (according to the bylaw)	**Mic 272**			
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	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**Microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Asst .Prof. Dr. Ghada Eid Dawwam**			
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 this course, the graduate will be able to understand the general characteristics of actinomycetes: Distribution and abundance, environmental influences on actinomycetes, the taxonomy of actinomycetes, production of antibiotics by Streptomyces, the importance of actinomycetaceae, and the activity and function of actinomycetes.

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 microbiological terminology, nomenclature, and contemporary classification systems based on modern trends and molecular approaches.	**a1**	Describe the general characteristics of actinomycetes.
		a2	Identify the classification of actinomycetes.
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	**a3**	Explain the activity and function of actinomycetes.
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	**a4**	Outline the economic importance of actinomycetes.
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	**b1**	Compare between different families of actinomycetes.
		b2	Interpret the benefits of actinomycetes
		b4	Confirm the production of different secondary metabolites by actinomycetes.
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c1**	Isolation of actinomycetes on different media.
3.9	Prepare, stain, and examine slides for microscopic identification of various microbial types.	**c2**	Investigate the biochemical and molecular characteristics of actinomycetes.
		c3	Analyze the production of secondary metabolites by actinomycetes.

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**
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	Use computer, internet & communications
		d2	Management, working in group & life-long learning

4.Teaching and Learning Methods

1- **Interactive lectures**
2. **Practical work**
3. **Visual presentation**
4. **Discussion strategy**
5. **E- learning**

5. 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	General characteristics of actinomycetes	**4**	**1**	**3**	**-**	**-**
2	Structure and Life Cycle of Actinomycetes.	**4**	**1**	**3**	**-**	**-**
3	Studying the Taxonomy of Actinomycetes.	**4**	**1**	**3**	**-**	**-**
4	Studying the Taxonomy of Actinomycetes.	**4**	**1**	**3**	**-**	**-**
5	Evaluating the Distribution and abundance of actinomycetes.	**4**	**1**	**3**	**-**	**-**
6	Evaluating the Distribution and abundance of actinomycetes.	**4**	**1**	**3**	**-**	**-**
7	Determining the Environmental influences on Actinomycetes.	**4**	**1**	**3**	**-**	**-**
8	Determining the other Environmental influences on Actinomycetes.	**4**	**1**	**3**	**-**	**-**
9	Midterm exam and revision	**0**	**0**	**0**	**-**	**-**
10	Studying the Production of secondary metabolites by Actinomycetes.	**4**	**1**	**3**	**-**	**-**
11	Studying the Production of antibiotics by Streptomyces.	**4**	**1**	**3**	**-**	**-**
12	Evaluating the Activity and function of actinomycetes.	**4**	**1**	**3**	**-**	**-**
13	Evaluating the Activity and function of actinomycetes.	**4**	**1**	**3**	**-**	**-**
14	Estimating the Application of Actinomycetes.	**4**	**1**	**3**	**-**	**-**
15	REVISION	**4**	**1**	**3**	**-**	**-**

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	Assignment 1	14	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** Kurtboke, I. (Ed.). (2024). *Actinomycetes in Marine and Extreme Environments: Unexhausted Sources for Microbial Biotechnology*. CRC Press.
	Other References	Balagurunathan, R., Radhakrishnan, M., Shanmugasundaram, T., Gopikrishnan, V., & Jerrine, J. (2020). *Protocols in actinobacterial research*. New York: Springer US.
	Electronic Sources (Links must be added)	- Parra, J., Beaton, A., Seipke, R. F., Wilkinson, B., Hutchings, M. I., & Duncan, K. R. (2023). Antibiotics from rare actinomycetes, beyond the genus Streptomyces. *Current Opinion in Microbiology*, *76*, 102385. - Oyedoh, O. P., Yang, W., Dhanasekaran, D., Santoyo, G., Glick, B. R., & Babalola, O. O. (2023). Sustainable agriculture: Rare-actinomycetes to the rescue. *Agronomy*, *13*(3), 666. - Veilumuthu, P., & Christopher, J. G. (2023). Diversity of actinomycetes in Tomato plants. *Indian Journal of Agricultural Research*, *57*(1), 95-102.

		- Xiong, Z., Wang, R., Xia, T., Zhang, S., Ma, S., & Guo, Z. (2023). Natural products and biological activity from actinomycetes associated with marine algae. *Molecules*, *28*(13), 5138.
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	- Tunvongvinis, T., Jaitrong, W., Samung, Y., Tanasupawat, S., & Phongsopitanun, W. (2024). Diversity and antimicrobial activity of the tropical ant-derived actinomycetes isolated from Thailand. *AIMS Microbiology*, *10*(1), 68-82. RANTE, H., MANGGAU, M. A., ALAM, G., PAKKI, E., ERVIANI, A. E., HAFIDAH, N., ... & ALI, A. (2024). Isolation and identification of Actinomycetes with antifungal activity from karts ecosystem in Maros-Pangkep, Indonesia. *Biodiversitas Journal of Biological Diversity*, *25*(2).
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Data show**
	Supplies	**Marker- microphone- board- laptop -** Slide and paper projector
	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 Dawwam

Name and Signature
Program Coordinator
Dr. Mohamed Atef

Mic 292:yeasts Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**yeasts**			
Course Code (according to the bylaw)	**Mic 292**			
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	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثاني			
Academic Program	**microbiology and chemistry B.SC.**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Dr\ Rasha YEHYA**			
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 understand, the morphology and structure of yeasts. Ecology of yeasts, Nutrition and growth, Reproduction of yeasts, Different types of yeasts, Biotechnological importance of yeasts, Environmental factors influencing yeasts.

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	know morphology and polymorphism of yeasts
		a2	describe different types of yeasts
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae.	a3	explain growth and reproduction of yeasts
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	a4	Outline the economic importance of yeasts

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**
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**	Apply computer search for yeasts identification
		b2	Confirm character of yeasts by more than one test
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	**b3**	Solve problem relevant to condition of growth
		b4	Compare between different types of yeasts
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c1**	Prepare a specific media for yeast .growth
3.9	Prepare, stain, and examine slides for microscopic identification of various microbial types.	**c2**	Isolation of yeasts from different sources.
		c3	Investigate the biochemical characteristics of yeasts
		c4	Recommend the conditions that affect heat sensitivity of yeasts.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d1**	Think independently, and solve problems on scientific basis.
		d2	Acquire self- and life-long learning.
		d3	work in a team

4. Teaching and Learning Methods

1- lectures
2. practical work
3. presentations

4. **discussion sessions**
5. **E- learning**

5.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	History and general characters of yeasts	**4**	**1**	**3**	**-**	**-**
2	History and general characters of yeasts	**4**	**1**	**3**	**-**	**-**
3	Studying the structure of yeasts	**4**	**1**	**3**	**-**	**-**
4	Studying the ecology of yeasts	**4**	**1**	**3**	**-**	**-**
5	Studying nutrition and growth of yeasts	**4**	**1**	**3**	**-**	**-**
6	Studying nutrition and growth of yeasts	**4**	**1**	**3**	**-**	**-**
7	Studying Reproduction of yeasts	**4**	**1**	**3**	**-**	**-**
8	Studying Reproduction of yeasts	**4**	**1**	**3**	**-**	**-**
9	Midterm exam and revision	**0**	**0**	**0**	**-**	**-**
10	Studying different types of yeasts	**4**	**1**	**3**	**-**	**-**
11	Studying different types of yeasts	**4**	**1**	**3**	**-**	**-**
12	Studying the biotechnological importance of yeasts	**4**	**1**	**3**	**-**	**-**
13	Determining the environmental factors influencing yeast growth	**4**	**1**	**3**	**-**	**-**
14	Determining the environmental factors influencing yeast growth	**4**	**1**	**3**	**-**	**-**
15	Revesion	**4**	**1**	**3**	**-**	**-**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Assignment 1	5	15	15%
2	Midterm exam	9	5	5%
3	Final Practical/Clinical/… Exam	16	25	25%
4	Final Oral Exam	16	5	5%
5	Final Written Exam	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**
	Other References	Mukherjee, A., Verma, J. P., Gaurav, A. K., Chouhan, G. K., Patel, J. S., & Hesham, A. E. L. (2020). Yeast a potential bio-agent: future for plant growth and postharvest disease management for sustainable agriculture. *Applied microbiology and biotechnology*, *104*, 1497-1510.
	Electronic Sources (Links must be added)	
	Learning Platforms (Links must be added)	**Thinqi + E book platform of benha university**
	Other (to be mentioned)	Darvishi, F., Ariana, M., Marella, E. R., & Borodina, I. (2018). Advances in synthetic biology of oleaginous yeast Yarrowia lipolytica for producing non-native chemicals. *Applied microbiology and biotechnology*, *102*(14), 5925-5938. Walker, G. M., & Walker, R. S. (2018). Enhancing yeast alcoholic fermentations. *Advances in applied microbiology*, *105*, 87-129.
Supportive facilities & equipment	**Devices/Instruments**	**Data show –paper projector – laptop**
	Supplies	**Marker – board – microphone**
	Electronic Programs	

for teaching and learning *	**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** **Dr\ Rasha Yehya**	**Name and Signature** **Program Coordinator** **Dr\ Mohamed atef**

CHM 234: Photo and Kinetic Chemistry

1. Basic Information

Course Title (according to the bylaw)	**Photo and Kinetic Chemistry**			
Course Code (according to the bylaw)	**CHM 234**			
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	**Elective course**			
Academic level at which the course is taught	**second level** الفرقة/المستوي الثاني			
Academic Program	**Microbiology and Chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Safinaz Mohamed Reda**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Approved 18/6//2025 (Department council; meeting number, 37), and 09/7/2025 until 30/7/2025, (faculty council; meeting number, 515)**			

2. Course Overview (Brief summary of scientific content)

This course aims to learn the define principle of kinetic term, chemical kinetics, basic kinetic laws, theories of reaction rates, kinetic reaction mechanism, photochemical reactions, kinetics of photochemical reactions and theories of rate of reaction. Teach students the methods of measurement photochemical quantum yield and order of reaction. The student should demonstrate knowledge and understanding of state the difference between thermal and photo-reactions. Define laws of photochemical reactions. List steady state mechanism to some photochemical reactions. Identify kinetics of complex chemical reactions.

3. Course Learning Outcomes CLOs

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
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	State the difference between thermal, photo-reactions and kinetic terms
		A2	Define laws of photochemical reactions, kinetic laws and kinetic reaction mechanism
		A3	Outline steady state mechanism to some photochemical reactions and kinetic reaction
		A4	Identify kinetics of complex chemical reactions.
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	B1	Confirm photochemical quantum yield to measure efficacy of photochemical reactions
		B2	Compare between order and molecularity of chemical reactions.
		B3	Interpret factors affecting on the rate of reactions
		B5	Discover mechanism of chain and non-chain reactions
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	C1	Investigate some problems on kinetics laws and complex reactions.
		C2	Examine thermodynamic parameters and activation energy for some reactions
		C5	Label the phase diagram of two component system.
3.3	**Solve biological and chemical problems using various practical approaches, including computational tools, modeling, .and simulation**	C3	Analyze the knowledge that the student studied to calculate the rate constant, half-life and order of reaction
		C6	Differentiate between the theories of reaction rates and collision theory
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	d3	Computing the knowledge that the student studied to calculate the rate constant, half-life and order of reaction
		D6	Using internet between the theories of reaction rates and collision theory

4.Teaching and Learning Methods

1. Lecture and presentations
2. Practical section
3. Open discussions & Seminars
4. Problem Solving

5. 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.a) Introduction in inorganic chemistry and its application in our life Introduction to principle of chemical kinetics and photochemical reactions. b) Kinetic terms.	**5**	**2**	**-**	**-**	**-**
	1.2.a) Determination of absolute density of liquids.		**-**	**3**		
2	2.1. a) Definition of rate of reactions and laws of photochemical reactions. b) Kinetics laws (Zero, first, second).	**5**	**2**	**-**	**-**	**-**
	2.2. Catalytic decomposition of H_2O_2.		**-**	**3**		
3	3.1. a) Factors affecting on rate of reactions b) Quantum efficiency. c) Kinetics laws (third, higher, fractional).	**5**	**2**	**-**	**-**	**-**
	3.2. Sabonification of ethyl acetate in a basic medium.		**-**	**3**		
4	4.1. a)Rate laws b) Factor affecting on quantum yield. c) Theories of reaction rates.	**5**	**2**	**-**	**-**	**-**
	4.2. Clock reaction.		**-**	**3**		
5	5.1. a) kinetics of Complex chemical reactions. b) Experimental determination of quantum yield.	**5**	**2**	**-**	**-**	**-**
	5.2. Determination the number of ligand in a copper ammonia complex.		**-**	**3**		
6	6.1 a) Kinetic of reaction mechanism.	**5**	**2**	**-**	**-**	**-**

	b) Experimental determination of quantum yield.					
	6.2. Catalytic salt effect.		-	3		
7	8.1. a) High and low quantum yields.	5	2	-	-	-
	8.2. Determination of the critical temperature of the phenol-water system.		-	3		
8	9.1. a) Methods of determination of order of reactions (half- life time, graphical method and variation rate method). b) Steady treatment for chain and non-chain of photoreactions	5	2	-	-	-
	9.2. Construction of the thermal diagram of phenol and naphthalene.		-	3		
9	**Mid -term exam.**					
10	10.1. Theories for rate of reactions (Arrhenius equation and significance of activation energy).	5	2	-	-	-
	10.2. Distribution of acetic acid between benzene and water strength of the hydrogen bond		-	3		
11	11.1. Mechanism of chain reactions.	5	2	-	-	-
	11.2 Determination of the strength of the hydrogen bridge responsible for the dimerisation of acetic acid in benzene.		-	3		
12	12.1. Kinetics of complex reactions and photochemical reactions.	5	2	-	-	-
	12.2 Adsorption of oxalic acid on a charcol.		-	3		
13	11.1. Steady state treatment to some photoreactions	5	2	-	-	-
	13.2. Adsorption of acetic acid on a charcol.		-	3		
14	14.1Types of photochemical reactions	5	2	-	-	-
	14.2 Determination of activation energy		-	3		
15	15.1. Kinetics of thermal reactions	5	2	-	-	-
	15.2 Revision.		-	3		

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	15	15%
2	Mid-Term Exam	9th 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	1-Lecture notes prepared by the course instructor(s). 2- J.P., Basic chemical kientics, Tata Mc Graw-Hill Publishing Company Limited, New York, 1990. 3- S. Murov, Handbook of Photochemistry, New York: Marcel Dekker Inc. New York, 1973 4-A. kitai, Luminescent Materials and Applications, Canada: John Wiley and Sons, 2008. 5- J. Albani, Stucture and Dyanmics of Macromolecules: Absorption and Fluorescence, London: Elsevire .2004.
	Other References	*Journal* of *Chemical Education* (ACS)
	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	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. Safinaz Mohamed Reda

Program Coordinator

Dr. Mohamed atef

Chm 246: Chemistry of Water treatment (2)

1. Basic Information

Course Title (according to the bylaw)	**Chemistry of Water treatment (2)**			
Course Code (according to the bylaw)	**CHM 246**			
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	**Elective Course** اختياري			
Academic level at which the course is taught	**Second level** الفرقة/المستوي الثاني			
Academic Program	**Microbiology and Chemistry BSc Program**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Hesham El-feky**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Approved 18/6//2025 (Department council; meeting number, 37), and 09/7/2025 until 30/7/2025, (faculty council; meeting number, 515)**			

2.Course Overview (Brief summary of scientific content)

This course enables the student to gain knowledge about the chemical principles and processes involved in treating water for various uses. Specifically, the student will learn about: Sources and Types of Water, Different elements present in water, Water Quality Parameters, Chemical Processes in Water Treatment and Water Treatment Technologies.

3.Course Learning Outcomes CLOs

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	**Text**	**Code**	**Text**
1.3	Demonstrate knowledge of analytical, structural, and instrumental techniques used in chemical analysis and compound characterization.	A1	To know the main problems in water treatment today (such as pollution, scarcity, and new contaminants).
		A2	Locate the latest chemical methods used in water purification.
		A3	Memorize new technologies in water treatment (such as membranes, nanomaterials, and advanced oxidation).
		A4	State how modern techniques help in monitoring and improving water quality.
		A5	Determine the importance of sustainability and environmental protection in water treatment.
1.12	**Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and .chemistry**	A3	Memorize new technologies in water treatment (such as membranes, nanomaterials, and advanced oxidation
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare	B1	Appraise the main physical and chemical properties used to evaluate water quality (pH, turbidity, dissolved oxygen, hardness, salinity, etc.).
		B2	Assess the standard methods of measuring and monitoring pollutants in water.
		B3	Summarize how chemical changes occur during water treatment processes (coagulation, oxidation, chlorination, adsorption, etc.).
		B4	Recommended professional standards and guidelines for water quality monitoring and reporting.
		B5	Assess water quality data in a clear, organized, and reliable way.
3.1.	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines..	C1	Interpret mechanisms for treatment processes such as coagulation–flocculation, oxidation–reduction, adsorption, ion exchange, and disinfection.
		C2	Construct the steps involved in contaminant removal at molecular and process levels.
		C3	Report and discover the treatment mechanisms to create the most efficient approach.
3.10	**Conduct chemical analyses, synthetic procedures, and**	C2	Construct the steps involved in contaminant removal at molecular and process levels

Program Outcomes (NARS/ARS)		Course Learning Outcomes	
Code	Text	Code	Text
	microbial assays according to standard laboratory protocols		
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and .societal needs	D2	Working in groups

4.Teaching and Learning Methods

1. Lecture and presentations
2. Open discussions & Seminars
3. Problem Solving

5.Course Schedule

umber 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 determind**
1	1.1. Introduction to water sources and Maximum containment level (MCL). Types of inorganic and organic pollutants and their methods of determination.	**2**	**2**	**-**	**-**	**-**
2	2.1. Physical properties of water samples such as TDS, TSS, TS, pH, Turbidity, Transparency and EC.	**2**	**2**	**-**	**-**	**-**
3	3.1. Chlorine chemistry of water	**2**	**2**	**-**	**-**	**-**
4	4.1. Methods for determining chlorine in water	**2**	**2**	**-**	**-**	**-**
5	5.1. Dissolved oxygen in water and its determination methods (Clark method)	**2**	**2**	**-**	**-**	**-**
6	6.1. Electrochemical method for determining the DO in water (weinkler method).	**2**	**2**	**-**	**-**	**-**
7	8.1. Chemical properties of water samples such as hardness of water, alkalinity and total cationic content.	**2**	**2**	**-**	**-**	**-**
8	9.1. Treating water samples from pollutants by chemical adsorption using inorganic materials. / organic polymers materials.	**2**	**2**	**-**	**-**	**-**
9	**Mid -term exam.**					
10	10.1. Screening, Coaggulation, flocculation, sedimentation process for water treatment	**2**	**2**	**-**	**-**	**-**

11	11.1. Studying other methods of water treatment such as Reverse osmosis, Desalination and ultracentrifugation.	**2**	**2**	**-**	**-**	**-**
12	12.1. Designing membranes and filters for treatment.	**2**	**2**	**-**	**-**	**-**
13	13.1. Studying different factors affecting on removing pollutants such as time, pH, concentration, amount of adsorbent, ionic strength, and point of zero charge	**2**	**2**	**-**	**-**	**-**
14	14.1 Studying kinetics of adsorption process such as pseudo first order, pseudo second order and intraparticle diffusion model.	**2**	**2**	**-**	**-**	**-**
15	15.1. Revision	**2**	**2**	**-**	**-**	**-**

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	9th week	**10**	**10%**
3	Final Written Exam	seventeenth week	**60**	**60%**
4	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**	1. Principles and Applications of Aquatic Chemistry (2nd ed., 2025) — Morel, Hering & Sigg A modern classic in aquatic chemistry, detailing equilibrium chemistry, reaction kinetics, and natural water processes from a chemical perspective. 2. MWH's Water Treatment: Principles and Design — Crittenden, Trussell, Hand, Howe & Tchobanoglous (Updated 3rd Edition, 2022) Regarded as a comprehensive engineering and chemistry treatment guide, covering emerging challenges like pharmaceuticals and regulatory updates 3. A Problem-Solving Approach to Aquatic Chemistry (2nd ed., 2022) — Jensen Emphasizes applied problem-solving in aquatic chemical processes 4. Environmental Nanotechnology for Water Purification (2020) — Islam Explores the use of nanotechnology in modern water treatment systems
	Other References	http://www.intechopen.com/books/water-treatment http://water.epa.gov/drink/contaminants/
	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)	
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 **Dr. Hesham El-feky**	**Program Coordinator** **Dr. Mohamed Atef**

BPh 240: Fundamental of Biophysics Course Specification (2024-2025)

1. Basic Information

Course Title (according to the bylaw)	**Fundamental of Biophysics**			
Course Code (according to the bylaw)	**BPh 240**			
Department/s participating in delivery of the course	**Department of Physics**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	2	**-**	2
Course Type	**Elective**			
Academic level at which the course is taught	**Second Year/Second Level**			
Academic Program	**Microbiology and Chemistry B.Sc.**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr Moustafa Ibrahim**			
Course Specification Approval Date	**7/30/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council: .. Faculty council; 30/7/2025			

2. Course Overview (Brief summary of scientific content)

This course provides a foundational understanding of the physical principles governing biological systems. It explores how concepts from physics, such as thermodynamics, mechanics, and electromagnetism, can be applied to understand the structure, function, and dynamics of living organisms at the molecular and cellular levels. The course will introduce students to the physical and chemical properties of biological macromolecules, molecular forces, and key biophysical techniques used in research.

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**
1.2	Acquire essential knowledge in mathematics, physics, biology, and other supporting sciences necessary for understanding the latest advances in microbiology and chemistry.	a1	Recognize and describe the fundamental principles of molecular biology and cellular structure that are relevant to biophysics
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems.	a2	Explain the principles of thermodynamics and kinetics as they apply to energy conversion and biochemical reactions within living systems.
2.2	Analyse, assess, and interpret quantitative and qualitative scientific data from various sources	b1	Apply the mathematical and physical laws (e.g., Fick's laws, Nernst equations) to solve quantitative problems related to membrane transport and ionic equilibria.
		b2	Differentiate and analyze the physical mechanisms governing the operation of molecular motors and nerve impulse conduction.
		b3	Identify and utilize the fundamental principles behind key biophysical instrumentation and techniques (e.g., spectroscopy, microscopy).
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	c1	Apply the physical laws (e.g., Peer Lambert law, Young law) to teach students how to link between practical and theoritical parts
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret	c2	Differentiate and analyze the physical mechanisms governing the physical quantities such as viscosity,

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**
	experimental data in chemistry and microbiology.		and light interaction, which is related to the electrical signal interactions
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	d1	Communicate effectively scientific concepts, data, and quantitative analyses of biophysical phenomena using appropriate terminology.

4.Teaching and Learning Methods

1- Interactive Lectures: We used a combination of presentations, discussions, and short question-and-answer sessions to engage students and clarify complex topics.

2- Multimedia Resources: The use of visual aids, such as videos of radiotherapy equipment in operation, anatomical models, and animations of radiation interactions, will be employed to enhance understanding.

Lab sessions:

1- Structured Practical Exercises: Each lab session will have a clear set of objectives, guiding students through practical tasks like patient positioning, equipment setup, and basic dose calculations.

2- Simulated Clinical Environment: The lab will be set up to mimic a real radiotherapy department, using phantoms, immobilization devices, and treatment planning software. This "end-to-end" simulation allows students to follow a treatment pathway from start to finish in a safe, controlled setting.

3- Small Group Work: Students will work in small teams to foster collaboration and teamwork, mirroring the multidisciplinary nature of a real radiotherapy department.

4- We first demonstrate a skill or procedure, followed by supervised student practice with immediate feedback.

5- Problem-Based Learning: Lab tasks will be designed as practical problems that students must solve, encouraging critical thinking and problem-solving skills.

5.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 Biophysics: Scope And Cell Membrane Review.	**3**	**1**	**2**	**-**	**-**
2	Review of Molecular Biology And Cell Structure.	**3**	**1**	**2**	**-**	**-**
3	Membrane Transportaitions	**3**	**1**	**2**	**-**	**-**
4	Different Solutions And Osmosis	**3**	**1**	**2**	**-**	**-**
5	General Properties of Electrodes	**3**	**1**	**2**	**-**	**-**
6	Types Of Electrodes	**3**	**1**	**2**	**-**	**-**
7	General Introduction To Potentails	**3**	**1**	**2**	**-**	**-**
8	Types Of Potentials: Action And Resting	**3**	**1**	**2**	**-**	**-**
9	Midterm Exam / Review And Assessment	**0**	**0**	**0**	**-**	**-**
10	EMG	**3**	**1**	**2**	**-**	**-**
11	ECG	**3**	**1**	**2**	**-**	**-**
12	EEG	**3**	**1**	**2**	**-**	**-**
13	Radiation: Introduction	**3**	**1**	**2**	**-**	**-**
14	Radiation: Doseimetry	**3**	**1**	**2**	**-**	**-**
15	Radiation: Interaction and Applications	**3**	**1**	**2**	**-**	**-**

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work (Discussion, class activities and quizzes)	Throughout semester	15	15%
2	Mid-Term written exam	9th week	5	5%
3	Final Oral exam	15th week	5	5%
3	Final Practical exam	15th week	25	25%
4	Final Written Exam	16th week	50	50%
Total			**1**00	**1**00 %

*** 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)	• Lecture notes prepared by the course instructor(s) and approved by the department council • Power point presentations uploaded to the university website • **Biological Physics: Energy, Information, Life** by P. Nelson. **Biophysics: An Introduction** by R. Glaser.
	Other References	• **Physical Biology of the Cell** by R. Phillips, J. Kondev, and J. Theriot. • **Biological Physics: Energy, Information, Life** by P. Nelson. **Biophysics: An Introduction** by R. Glaser.

	Electronic Sources (Links must be added)	• EKB.com (Egyptian Knowledge Bank) • Thinqi.com • Relevant peer-reviewed articles from biophysical journals (e.g., Biophysical Journal) and open-access educational resources (must be linked)https://www.estro.org/
	Learning Platforms (Links must be added)	• University e-learning platform • Astro Learning Center: https://www.astro.org/ASTRO/media/Learning-Center/documents/astro-learning-center.pdf
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	• Whit boad
	Supplies	• Laporatory experiments
	Electronic Programs	• Microsoft Office Suite (Word, Excel, PowerPoint) for reports and presentations
	Skill Labs/ Simulators	•
	Virtual Labs	• Virtual lab simulation (sometimes)
	Other (to be mentioned)	Group discussion

*** 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** **Dr. Samia Farouq**	**Name and Signature** **Program Coordinator** **Asst. Prof. Dr. Mohamed Atef**

Zoo 297: parasitology Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**parasitology**			
Course Code (according to the bylaw)	**Zoo 297**			
Department/s participating in delivery of the course	**Department of zoology**			
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 الثاني			
Academic Program	**Microbiology and chemistry BSC program**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha university**			
Name of Course Coordinator	**Prof. Dr. Gazaa Hassan Morsy Hassan**			
Course Specification Approval Date	**7/1/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	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 enable the students to know the Parasite biology, life cycles, host-parasite relationship, environmental, host factors regulating parasitic diseases, the epidemiology and transmission patterns of parasites as an essential prerequisite for the development of effective control programs.

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	Recognize the physiological and biochemical aspects of microorganisms.	A1	Define the morphological characteristics, life cycles, methods of transmission of medically important helminths.
		A2	List morphological characteristics, life cycles, methods of transmission of medically important protozoa.
		A3	Describe morphological characteristics, life cycles and recognize diseases caused or transmitted by medically important arthropods.
1.5	Demonstrate the complexity and the diversity of microorganisms through the study of genetics, developmental stages and evolution	A4	Discuss the geographical distribution of important parasites.
		A5	Host-parasite interaction, how parasites harm their hosts and the major immunological responses underlying this.
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	Analyse problems based exercises.
		B2	Apply the suitable diagnostic techniques concerning the parasitic problems encountered (microscopy, serology or molecular …etc)
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	C1	Assess the parasites, their different stages or their body parts.
3.9	Prepare, stain, and examine slides for microscopic	C2	Perform mounted slides and their content

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**
	identification of various microbial types.		
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	**D1**	Use information and communication technology effectively.
		D2	Work in a team effectively, manage time, collaborate and communicate with others positively.

4.Teaching and Learning Methods

- Lectures
- Practical work
- Presentations

5.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	**4**	**1**	**3**	**-**	**-**
2	Trematodes	**4**	**1**	**3**	**-**	**-**
3	Cestodes	**4**	**1**	**3**	**-**	**-**
4	Nematodes	**4**	**1**	**3**	**-**	**-**
5	Protozoa	**4**	**1**	**3**	**-**	**-**
6	Malaria	**4**	**1**	**3**	**-**	**-**
7	Leishmaniasis	**4**	**1**	**3**	**-**	**-**
8	Trypanosomiasis	**4**	**1**	**3**	**-**	**-**
9	**Midterm exam and revision**	**0**	**0**	**0**	**-**	**-**
10	Amoebiasis	**4**	**1**	**3**	**-**	**-**
11	Giardiasis	**4**	**1**	**3**	**-**	**-**
12	Coccidial and Opportunistic parasitic infections by, e.g. Toxoplasma, Cryptosporidum, Pneumocystis and Microsporidial species	**4**	**1**	**3**	**-**	**-**
13	Soil transmitted helminths	**4**	**1**	**3**	**-**	**-**
14	Schistosomiasis	**4**	**1**	**3**	**-**	**-**
15	Filariasis	**4**	**1**	**3**	**-**	**-**

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (Semester work)	5th week	-	-
2	Midterm exam	9th week	5	5%
	Final Practical/Clinical/… Exam	16th week	25	25%
	Final Oral Exam	16th week	5	5%
	Assignments / Project /Portfolio/ Logbook	12th week	15	15%
	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**
	Other References	Loker, Eric S. and Bruce V. Hofkin 2015. Parasitology: A Conceptual Approach, Garland Science, Taylor & Francis Group, New York and London. ISBN 978-0-8153-4473-5 • Desowitz, R.S. 1987. New Guinea Tapeworms and Jewish Grandmothers: Tales of Parasites and People, W.W. Norton and Company, New York. ISBN 978-0-393-30426-8
	Electronic Sources (Links must be added)	• Zimmer, C. 2000. Parasite Rex: Inside the Bizarre World of Nature's Most Dangerous Creatures, The Free Press, New York. ISBN 978-0-7432-0011-0 -Sullivan, John, T. 2009. A Color Atlas of Parasitology 8th ed. Available via Ward's Science. ISBN 0-9665807-7-X
	Learning Platforms (Links must be added)	**Thinq + E book platform of benha university**
	Other (to be mentioned)	-
Supportive facilities	**Devic ments**	Lab. Chemicals,.

& equipment for teaching and learning *		
	Supplies	slide, microtome, tissue sample and microscope
	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**

Course coordinator
Prof. Dr. Gazaa Hassan Morsy Hassan

Name and Signature
Program Coordinator
Asst. prof. Mohamed atef