CHM 343: Analytical Chemistry (2)

1. Basic Information

Course Title (according to the bylaw)	**Analytical Chemistry (2)**			
Course Code (according to the bylaw)	Chm 343			
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	**Third level** الفرقة/المستوي الثالث			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Hesham H. El-Feky**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2. Course Overview (Brief summary of scientific content)

This course aims to know the theory of solvent extraction for organic and inorganic compounds, including influencing factors., Learn quantitative analysis techniques for materials obtained after separation, Gain knowledge about chromatography instruments, their types, and practical applications. Develop hands-on skills in analytical methods for practical problem-solving in chemical analysis., Investigate general properties of chromatography instrument and its applications and describe some chemical concepts about the extraction and separation technique.

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**	Describe the theoretical principles underlying chromatographic separation methods (e.g., partition, adsorption, ion-exchange, size-exclusion, and affinity chromatography) and solvent extraction processes.
		A2	Describe standard procedures and instrumentation used in various chromatographic techniques (e.g., TLC, HPLC, GC) and in solvent extraction, including sample preparation and method optimization
		A3	Explain chromatograms and extraction results to identify, characterize, and quantify chemical compounds in complex mixtures.
		A4	Memorize the advantages, limitations, and suitability of different chromatographic and extraction techniques for specific analytical problems.
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various sources.	**B1**	create reagents and samples for precipitation reactions according to standard analytical protocols.
		B2	design gravimetric determinations using precipitation methods with proper filtration, washing, drying, and weighing techniques.
		B3	Apply experimental conditions (e.g., supersaturation, temperature, pH) to obtain pure, crystalline precipitates with minimal contamination.
2.6	Interpret scientific data presented in graphs, figures, tables, spectroscopic charts, and other formats.	**B4**	Analyze analyte amounts and purity from gravimetric data, applying necessary corrections for co-precipitation or incomplete precipitation.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	**C1**	Organize relevant mathematical expressions to calculate chromatographic parameters such as retention factor (k), selectivity (α), resolution (Rs), and number of theoretical plates (N).

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**
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in microbiology and chemistry	**C2**	Report extraction efficiency and distribution ratios from experimental data using appropriate mathematical models.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	**C3**	Interpret the performance of chromatographic and extraction systems by interpreting calculated parameters in relation to separation quality and method optimization.

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignments)	Other (to be determined
1	1.1. Introduction to Chromatography	5	2	-	-	-
	1.2. Introduction to gravimetric analysis.		-	3		
2	2.1. Types of chromatography according to type of phases and according to the mechanism of separation	5	2	-	-	-
	2.2. Determination the percent of water hydrated in barium chloride salt		-	3		
3	3.1. Types of chromatography according to the mechanism of separation.	5	2	-	-	-
	3.2. Determination the purity of barium in barium sulfate		-	3		
4	4.1. Liquid chromatography-HPLC-chromatography	5	2	-	-	-
	4.2. Determination the purity of sulfate in barium sulfate		-	3		
5	5.1. Gas chromatography	5	2	-	-	-
	5.2. Determination the purity of lead in lead chromate .		-	3		
6	6.1. Paper and thin layer chromatography -theoretical plate theory	5	2	-	-	-
	6.2. Determination the purity of chromate in lead chromate .		-	3		
7	8.1.Introduction on solvent extraction	5	2	-	-	-
	8.2. Determination the purity of calcium in calcium oxalate		-	3		
8	**Midterm exam**					

9	9.1. Solubility products	5	2	-	-	-
	9.2. Determination the purity of oxalate in calcium oxalate		-	3		
10	10.1. Factors affect the solubility products	5	2	-	-	-
	10.2. Determination the purity of magnesium in magnesium carbonate		-	3		
11	11.1General properties of solvents & ligands in extraction process	5	2	-	-	-
	11.2Determination the purity of iron in ferric oxide		-	3		
12	12.1.Study the different type ١. of chelate formation -	5	2	-	-	-
	12.2 Determination the purity of mixture of Ca^{+2} and Mg^{+2}.		-	3		
13	13.1. Factors affect the separation and extraction	5	2	-	-	-
	13.2. Determination the purity of mixture of Fe^{+2} and Fe^{+3}.		-	3		
14	14.1. Application of extraction	5	2	-	-	-
	14.2. Preparation of hematite		-	3		
15	15.1.Revision	5	2	-	-	-
	15.2. Revision		-	3		

5-Teaching and Learning Methods

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

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	١٥	١٥%
2	Mid-Term Exam	eighth week	٥	٥%
3	Final Written Exam	seventeenth week	٥٠	٥٠%
٤	Final Practical Exam	Sixteenth week	٢٥	٢٥%
٥	Final Oral Exam	Sixteenth week	٥	٥%
Total			١٠٠	١٠٠%

7- Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	1. Lecture notes prepared by the course instructor(s), proved from Chemistry department 2. Snyder, Lloyd R., Kirkland, Joseph J., Dolan, John W. Introduction to Modern Liquid Chromatography (4th ed.) Wiley, 2023. ISBN: 978-1119820496 (Comprehensive reference for LC theory, instrumentation, and applications.) 3. **Petersson, Gunnar, and Ake Björklund.** *Chromatographic Methods in Analysis* CRC Press, 2022. ISBN: 978-1032104098 *(Covers GC, LC, TLC, and method validation in detail.)*
	Other References	https://doi.org/10.1016/j.aca.2022.339285 https://doi.org/10.1016/j.chroma.2021.462603
	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	Program Coordinator
Ass. Prof. Dr. Hesham El-Feky	**Dr. Mohamed atef**

Mic 381 Virology Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	**Virology**			
Course Code (according to the bylaw)	**Mic 381**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	3	0	3
Course Type	**اجباري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	**Microbiology and Chemistry**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Sabah Abo Elmaaty**			
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 characters of viruses**.** Shapes, structure and classification of viruses. Viruses transmission**.** Laboratory diagnosis of viruses. The economic importance of viruses. Bacteriophages and their applications vaccination and antiviral drugs. Plant diseases caused by viruses.

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	a.1	Define viruses and understand the classification of viruses.
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae	a.2	Identify the pathogenicity of viruses.
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles	a.3	Identify the classification and nomenclature of viruses host resistance to viral diseases.
		a.4	Describe the viral evolution that is an important aspect of the epidemiology of viral diseases such as influenza (influenza virus), AIDS (HIV), and hepatitis (e.g. (HCV)
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.	b.1	Evaluate viral disease severity and incidence through morphological and anatomical approaches. Instructional
		b.2	Report the viral disease in field, greenhouses and under plant growth controlled conditions. Educational
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	c.1	Examine the viral disease symptoms. Judge the conditions that affect viral disease symptoms appearance. Make biological, physical and serological chracterization for plant viruses
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays,	c.2	Purify the virus from infected samples, maintain and preserved it.

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**
	molecular biology techniques, and microbial identification tools.		
3.11	operate and maintain specialized laboratory instruments, including autoclaves, centrifuges, spectrophotometers, and laminar flow hoods	**c.3**	Make the histological examination by light microscopy and apply the recent trends in detection and diagnosis e.g. PCR based techniques and serological techniques
		c.1	Examine the viral disease symptoms. Judge the conditions that affect viral disease symptoms appearance. Make biological, physical and serological characterization for plant viruses. Nucleic acid based techniques and sequencing analysis
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d.1**	Working in groups to choose the best method for virus detection
		d.2	Create designs, and presentations for all creative projects and studying needs related to virology. Working in groups to indicate the optimum condition for viral disease symptoms.
		d.3	Using the computer and internet experiences forward the applied work

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction and History	**5**	**2**	**3**		
2	What are Viruses	**5**	**2**	**3**		
3	Giant Viruses: Mimiviruses, Pandoraviruses, and order Megavirales	**5**	**2**	**3**	√	
4	Viruses are ubiquitous on Earth	**5**	**2**	**3**		
5	The Cultivation of Viruses	**5**	**2**	**3**	√	
6	General properties of viruses	**5**	**2**	**3**		
7	Virus transmission	**5**	**2**	**3**		
8	Midterm Exam and Revision	**0**	**0**	**0**		
9	Virus structure	**5**	**2**	**3**		
10	Classification and nomenclature of viruses	**5**	**2**	**3**		
11	Virus replication	**5**	**2**	**3**		
12	Bacteriophages	**5**	**2**	**3**		
13	Phage Therapy	**5**	**2**	**3**	√	
14	Economic Importance and Use For Vaccination	**5**	**2**	**3**		
15	Antiviral Drugs	**5**	**2**	**3**		

5-Teaching and Learning Methods

1- Self-learning
2. e learning
3. Cooperative learning strategy.
4. field study strategy

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Assignment 1	6	5	5%
2	Midterm exam	8s	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)	Text book: Ian Cooper. (2005). Virus Diseases and Crop Biosecurity. Published by Springer, P.O. Box 17, 3300 AA Dordrecht, The Netherlands. 148pp. -Comparative Plant Virology (2009), Roger Hull ,acid free paper a- Matthews, R.E.F. (1970): Plant virology (Student edition) Academic Press, New York, London, p.273-274. b- Matthews R.E.F. (1991): Disease symptoms and effects on metabolism. In: Matthews R.E.F.: Plant virology, 3rd edition, Academic Press, Inc. pp.402. c- Matthews, R.E.F. (1992): Fundamentals of plant virology, Academic Press, New York, London, pp.402. d- Matthews, R.E.F. (1993): Diagnosis of plant virus diseases. CRC Press, Boca Raton, Florida 374 pp.

		e- Alan J. Cann. (2005): Principles of Molecular Virology. 4th Edition. Elsevier Academic Press 525 B Street, Suite 1900, San Diego, California 92101-4495, USA. 315pp f. Marsh M., editor (2005) Membrane Trafficking in Viral Replication, Springer. g. Flint J. et al. (2020). Principles of Virology 5th edition ASM Press eBook ISBN 9781683673583.
	Other References	**Holmes, E.C. (2009).** The Evolution and Emergence of RNA Viruses. Oxford University Press, in: Oxford Series in Ecology and Evolution (OSEE). **Bidlack, J., & Stern, K. R. (2020).** Introductory Plant Biology (15th ed.). McGraw-Hill Education. **Geoghegan, J.L. · Holmes, E.C. (2018).** The phylogenomics of evolving virus virulence Nat. Rev. Genet. 19:756-769
	Electronic Sources (Links must be added)	- Egyptian Journal of Virology b- American Journal of Microbiology Web sites www. sciencedirect.com (Science @ direct) www.eulc.edu.eg
	Learning Platforms (Links must be added)	Thinqi + E book plateform of Benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	markers colors - board- laptop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature
Course Coordinator
Prof. Dr. Sabah Abo Elmaaty

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

Mic 391: Physiology of Microorganism Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	**Physiology of Microorganism**			
Course Code (according to the bylaw)	**Mic 391**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	3	0	3
Course Type	**اجباري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Prof. Dr. Reyad Elsharkawy,			
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 chemical composition of fungal cell, physiological characteristics of fungi, factors affecting fungal growth, fungal nutrition and metabolism as well as economic importance and bioactive materials produced from fungi.

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	Define growth parameters and principles of fungal growth
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles.	a2	Describe effects of different factors on growth curve
1.7	Understand how the chemical nature of biological molecules determines their function, with emphasis on major metabolic pathways and their interactions in microorganisms.		
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	b1	interpret the different stages of fungal growth
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	b2	report the different methods for fungal growth measurements
		b3	Explain the fungal nutrition and metabolism
		b4	Memorize some biological important metabolites
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific	c1	isolate the different fungal isolates

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**
	guidelines.		
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	c2	prepare a specific media for fungal growth
		c3	collect the fungal samples from different areas
		c4	investigate the isolated fungi
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	d1	Think independently, and solve problems on scientific basis use computers and internet
		d2	Acquire self- and life-long learning
		d3	Assess the microbiological safety
		d4	work in a team

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Factors affecting microbial growth, nutritional types, chemo lithographic, heterotrophic, and anaerobic respiration of microorganisms.	**5**	**2**	**3**		
2	Chemical composition of fungal cell. Fungal reproductive forms	**5**	**2**	**3**		
3	Microbial nutrition, Chemical analysis of cell content.	**5**	**2**	**3**		
4	Cultivation and preservation of fungi	**5**	**2**	**3**		
5	Nutrition of fungi. Nutrition requirement.	**5**	**2**	**3**		
6	Carbon sources. Nitrogen sources. Vitamine requirements of microorganisms	**5**	**2**	**3**		
7	Sources of essential nutrient. Fungal nutritional types. Transport, Movement of chemicals across the cell membrane	**5**	**2**	**3**		
8	Mid term exam and revision		**0**	**0**		
9	The diffusion of water. Adaptations of osmotic variations in the environment.	**5**	**2**	**3**		
10	The movement of solutes across membranes. Environmental factors that influence fungi. Ecological associations among microorganisms.	**5**	**2**	**3**		
11	The fungal growth curve. Methods of analyzing population growth. The metabolism of microbes. Enzyme structure. Classification	**5**	**2**	**3**		

	of enzyme function. Metabolic pathways.					
12	Controls on the enzyme. Energy balance and biological cell	**5**	**2**	**3**		
13	The metabolic role of ATP. An overview of microbial metabolism. Aerobic respiration. Glycolysis.	**5**	**2**	**3**		
14	The krebs cycle. The respiration chain. Anaerobic respiration. Fermentation. The krebs cycle. The respiration chain. Anaerobic respiration. Fermentation.	**5**	**2**	**3**		
15	Biosynthesis of macromolecules.	**5**	**2**	**3**		

5-Teaching and Learning Methods

1. Lectures

- Provide essential insights into microbial nutrition requirements, including carbon, nitrogen, minerals and growth factors.
- Incorporate multimedia tools—such as visual aids, animations, and video content—to deepen comprehension and engagement.
- Facilitate dynamic, participatory lectures that promote inquiry and foster meaningful student dialogue.

2. Laboratory Sessions

- Engage in practical training involving sterilization, fungal nutrition requirements, and microbial cultivation, and morphological classification.

- Strengthen core laboratory competencies in determining the chemical and physical factors required for best fungal growth.

3. Fieldwork

- Outdoor excursions for collecting fungi from various environments.
- Identification and documentation of field specimens.

- Practical training in determining the optimal fungal growth based on testing various chemical and environmental factors.

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)	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.
	Other References	- Mycologist: An International Journal of general mycology, A publication of the British Mycological Society, Elsevier. - Mycological Research, An International Journal of general mycology, A publication of the British Mycological Society, Elsevier. -Braun, M., Böhmer, M., Häder, D. P., Hemmersbach, R., & Palme, K. (2018). Gravitational biology I: Gravity sensing and graviorientation in microorganisms and plants (pp. 1-122). Cham, Switzerland: Springer.

	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**	Data show
	Supplies	Markers- board- laptop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature
Course Coordinator
Prof .Dr. Reyad Elsharkawy,

Name and Signature
Program Coordinator
Prof.dr.Mohamed Atef

Mic 395: Soil Microbiology Course Specification (2025)

1.Basic Information

Course Title (according to the bylaw)	**Soil Microbiology**			
Course Code (according to the bylaw)	**Mic 395**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3	0	2
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	Microbiology and Chemistry BSc Program			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**A/Prof. Dr. Ghada Eid Abdelgaid 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)

Explores the diversity and functions of soil microorganisms, including bacteria, fungi, actinomycetes, protozoa, and viruses. Focuses on their roles in nutrient cycling (carbon, nitrogen, phosphorus, sulfur, and iron), soil fertility, and plant-microbe interactions. Covers rhizosphere dynamics, nitrogen fixation, and microbial impacts on soil health and ecosystem stability.

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**
1.6	Acquire knowledge of microbial structure, physiology, reproduction, diversity, and ecological roles	a.1	Describe the major types of organisms found in soils and be familiar with their classification based on physiological and taxonomic criteria.
1.9	Demonstrate understanding of nutrient and energy flow within microbial communities and ecosystems.	a.2	Identify the following processes: ammonification, Nitrification, nitrate reduction, and denitrification
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	b.1	identify benefits and hazards roles of the microorganisms in soil
		b.2	Interprets the C/N ratio and its role in transformation of the organic matter in soil.
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to	c.1	Isolation of different types of soil microorganisms on their specific media.

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**
	established scientific guidelines.		
3.8	Utilize modern information retrieval systems, taxonomic keys, bioassays, molecular biology techniques, and microbial identification tools.	**c.2**	Investigate the plant growth-promoting activities of different isolates.
		c.3	Analyze the decomposition of organic matter in soil by different microorganisms.
		c.2	Investigate the plant growth-promoting activities of different isolates.
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	**d.1**	Use computers and the internet for communication, data handling, and word processing.
		d.2	Help raising public awareness of the benefits of conserving intellectual property rights and scientific patents on individuals and communities.
		d.3	Ethical behavior, community linked thinking.
		d.1	Use computers and the internet for communication, data handling, and word processing.

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	History of soil microbiology	4	1	3		
2	Soil profile, weathering factors affect the soil formation,	4	1	3		
3	The role of soil microorganisms in soil fertility,	4	1	3		
4	Positive and negative roles of the microorganisms in soil.	4	1	3		
5	Soil Macro and microflora: Bacteria, cyanobacteria, fungi, Actinomycetes, protozoa, viruses	4	1	3		
6	Microbial role in the transformation of the organic matter in the soil.	4	1	3		
7	Carbon cycle. Degradation and mineralization of organic substances	4	1	3		
8	Midterm exam and revision	0	0	0		
9	Nitrogen cycle: -Ammonification -Nitrification. -Denitrification -Nitrate reduction	4	1	3		
10	Biological Nitrogen fixation (symbiotic and non-symbiotic). -Factors that affect nitrogen fixation in soil.	4	1	3		

11	C/N ratio and its role in the transformation of the organic matter in soil	4	1	3		
12	Phosphorus, sulfur, and iron cycles and the role of the microorganisms in transformation of mineral elements	4	1	3		
13	Microorganisms in the rhizosphere and plant-microbe interaction	4	1	3		
14	Microbial relationships.	4	1	3		
15	REVISION	4	1	3		

5-Teaching and Learning Methods

1- Self-learning
2. E- learning
3. Cooperative learning strategy.
4. field study strategy

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of Total Course Marks
1	Midterm exam	8	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)	Singh, U. B., Kumar, R., & Singh, H. B. (Eds.). (2023). *Detection, Diagnosis and Management of Soil-borne Phytopathogens* (pp. 41-66). Singapore:: Springer. Paul, E., & Frey, S. (Eds.). (2023). *Soil microbiology, ecology and biochemistry*. Elsevier.
	Other References	• Chen, J., Zhang, Y., Kuzyakov, Y., Wang, D., & Olesen, J. E. (2023). Challenges in upscaling laboratory studies to ecosystems

		in soil microbiology research. *Global Change Biology*, *29*(3), 569-574. • Akter, S., Hulugalle, N. R., Jasonsmith, J., & Strong, C. L. (2023). Changes in soil microbial communities after exposure to neonicotinoids: A systematic review. *Environmental Microbiology Reports*, *15*(6), 431-444. • Garcia-Pichel, F. (2023). The microbiology of biological soil crusts. *Annual review of microbiology*, *77*, 149-171. • Balestrini, R., Bianciotto, V., Ghignone, S., Lumini, E., Mello, A., Sillo, F., & Zampieri, E. (2024). Plant–soil biota interactions. In *Soil microbiology, ecology and biochemistry* (pp. 303-328). Elsevier.
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature
Course Coordinator

Dr. Ghada Eid Dawwam

Name and Signature
Program Coordinator

Dr. Mohamed Atef

MIC397: Microbial Genetics
Course Specification
(2025)

1.Basic Information

Course Title (according to the bylaw)	Microbial Genetics			
Course Code (according to the bylaw)	MIC397			
Department/s participating in delivery of the course	Botany and Microbiology			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	-	0	2
Course Type	اختياري			
Academic level at which the course is taught	الفرقة/المستوي الثالث			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**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)

By Finishing of this course the graduate will able to understand Genetic Information in Microbes- Microbial DNA Cloning- Mutation and Selection- Gene Expression- The genetic code – exons and introns- Exchange of Genetic Information- Conjugation- Gene Transformation- Breaking and reunion of Genetic Recombination in bacteria- Gene regulation – lac operon- Microbial Genetic Applications

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.5	Describe the morphology, physiology, genetics, and evolution of diverse microorganisms including bacteria, viruses, fungi, parasites, and algae	a1	Describe Genetic Information in Microbes.
		a2	Identify Microbial DNA Cloning.
		a3	Explain Gene Expression.
1.7	Understand how the chemical nature of biological molecules determines their function, with emphasis on major metabolic pathways and their interactions in microorganisms	a4	Outline Microbial Genetic Applications.
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	Compare between Conjugation and Gene Transformation
		b2	Interpret the benefits of Microbial Genetic.
		b3	Report Mutation and Selection.

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**
		b4	Confirm Gene regulation – lac operon.
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**d1**	Use computer, internet & communications
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements	**d2**	Management, working in group & life-long learning
4.9	Adapt to new technologies, methodologies, and research trends in the constantly evolving field of microbiology and show a passion for continuous learning.	**d3**	Ethical behavior, community linked thinking.

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction	**2**	**2**	**-**		
2	Genetic Information in Microbes	**2**	**2**	**-**		
3	Mutation and Selection	**2**	**2**	**-**		
4	Mutation and Selection	**2**	**2**	**-**		
5	Gene Expression-	**2**	**2**	**-**		
6	The genetic code – exons and introns	**2**	**2**	**-**		
7	Exchange of Genetic Information	**2**	**2**	**-**		
8	Mid term and revision	**0**	**0**	**-**		
9	Conjugation	**2**	**2**	**-**		
10	Gene Transformation	**2**	**2**	**-**		
11	Breaking and reunion of Genetic Recombination in bacteria	**2**	**2**	**-**		
12	Gene regulation – lac operon	**2**	**2**	**-**		
13	Gene regulation – lac operon	**2**	**2**	**-**		
14	Microbial Genetic Applications	**2**	**2**	**-**		
15	revision	**2**	**2**	**-**		

5-Teaching and Learning Methods

2- Self-learning
5. e learning
6. Cooperative learning strategy.
7. field study strategy

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Midterm exam	8	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)	Das, S., & Dash, H. R. (Eds.). (2018). *Microbial diversity in the genomic era*. Academic Press. Nieto-Caballero, M., Savage, N., Keady, P., & Hernandez, M. (2019). High fidelity recovery of airborne microbial genetic materials by direct condensation capture into genomic preservatives. *Journal of microbiological methods*, *157*, 1-3. Zhou, X., & Li, Y. (Eds.). (2021). *Atlas of oral microbiology: From healthy microflora to disease*. Springer Nature.
	Other References	

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

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

Name and Signature
Course Coordinator
Prof.Dr. Samir Hamdy

Name and Signature
Program Coordinator
Mohamed atef

Chm 311: Chemistry of Pesticides and Toxins

1. Basic Information

Course Title (according to the bylaw)	**Chemistry of Pesticides and Toxins**			
Course Code (according to the bylaw)	**Chm 311**			
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	**3**	**-**	**3**
Course Type	اختياري			**Elective Course**
Academic level at which the course is taught	الفرقة/المستوي الثالث			**Third level**
Academic Program	**Microbiology & Chemistry B.Sc. Program**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Dr. Enas Abdel Aleem** **Dr. Hager Moustafa**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2. Course Overview

This course give definition of pesticide and toxins. Discuss the different types of insecticides based upon nature, chemical composition and applications. Examine the preparation of insecticides by different chemical

methods such organic compounds containing chlorine atoms as well as phosphorus atoms and carbamates compounds. Its effect on different types of insects and the lethal dose of each compound also being studied. Also, Synergists or Activators will be discussed in terms of their definition, their effect on insecticides and preparing some of them.

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**
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics.	a1	Recognize the classification and properties of pesticides.
		a2	Understand mode of action of different insecticides
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	a3	investigate different methods for synthesis of different types of insecticides
		a4	Define different applications of pesticides.
		a5	Recognize insecticides environmental problems related to massive use of insecticide.
		a6	Outline integrated insect control procedures.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b1	Relate and follow up action and potency of insecticide.
		b2	Determine methods of pest control.
		b3	Recommend suitable type of insecticide.
		b4	Investigate which Fungicide is safe and effective

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**
3.4	Handle chemical materials and biological samples safely, considering their physical, chemical, and biological hazards.	c1	Predict relation between structures and toxicity of organic compounds
		c2	Knew how to synthesize Herbicides
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	c3	Compare between the different types of insecticides.
		c4	Be aware of toxicology of Herbicides
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	D1	Work in groups

4. Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments/ Projects/ ...)	**Other** (to be determined)
1	Introduction to the definition of pesticides and toxins chemistry	**5**	**2**	**3**	**-**	**-**
2	Different classifications of insecticides based on nature, chemical composition and applications	**5**	**2**	**3**	**-**	**-**
3	Preparation of natural insecticides by different chemical methods and their properties	**5**	**2**	**3**	**-**	**-**
4	Preparation of organo-chlorine insecticides by different chemical methods and their properties	**5**	**2**	**3**	**-**	**-**
5	Preparation of organo-phosphorous insecticides by different chemical methods and their properties	**5**	**2**	**3**	**-**	**-**
6	Preparation of carbamates insecticides by different chemical methods and their properties	**5**	**2**	**3**	**-**	**-**
7	Introduction to Fungicides	**5**	**2**	**3**	**-**	**-**
8	Mid-term exam					
9	Preparation and properties of Polychlorobenzenes, chloronitrobenzenes	**5**	**2**	**3**	**-**	**-**
10	Preparation and properties of Phenol derivatives	**5**	**2**	**3**	**-**	**-**
11	Preparation and properties of Dinitroalkyl phenols	**5**	**2**	**3**	**-**	**-**
12	Preparation and properties of Quinones	**5**	**2**	**3**	**-**	**-**
13	Herbicides, Preparation and properties of Halogenated-alkanoic acid	**5**	**2**	**3**	**-**	**-**
14	Preparation and properties of Benzoic acids derivatives	**5**	**2**	**3**	**-**	**-**

15	Revision	**5**	**2**	**3**	**-**	**-**

5.Teaching and Learning Methods

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

6- Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fourteenth week	١٥	١٥%
2	Mid-Term Exam	eightth week	٥	٥%
3	Final Written Exam	seventeenth week	٥٠	٥٠%
٤	Final Practical Exam	Sixteenth week	٢٥	٢٥%
٥	Final Oral Exam	Sixteenth week	٥	٥%
Total			١٠٠	١٠٠%

7- Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.**
	Other References	**Pesticides and Environmental Injustice ,** BMC Public Health, 2022. **Pesticide Control in Modern Agriculture ,** Springer , 2022.
	Electronic Sources (Links must be added)	https://www.google.com/ https://www.ekb.eg/en/web/guest/login http://en.wikipedia.org/wiki/Raman_spectroscopy http://en.wikipedia.org/wiki/Nuclear_magnetic_resonance http://en.wikipedia.org/wiki/M%C3%B6ssbauer_spectroscopy
	Other	

	(to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Using a microphone and Data show**
	Supplies	**Using a whiteboard** **Using a microphone in lectures** **Using laptops** **Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	**Praxilabs**
	Other (to be mentioned)	

Course Coordinator
Dr. Enas Abdel Aleem

Program Coordinator
Prof. Dr. Mohamed Atef

Chm 331: Applied Electrochemistry

1.Basic Information

Course Title (according to the bylaw)	**Applied Electrochemistry**			
Course Code (according to the bylaw)	**Chm 331**			
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	إختياري			
Academic level at which the course is taught	**Third level**			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of science**			
University/Academy	**Benha**			
Name of Course Coordinator	**Prof.dr.Sayed Mabrouk**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

- This course aims to enable the students to know the meaning of electroplating, corrosion, thermodynamics of corrosion, kinetics of corrosion and types of corrosion. Also, the different methods used to control corrosion.

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems	a1	Define electroplating, corrosion, galvanic series, cathodic protection, and inhibitors.
		a3	Mention passivity of corrosion
		a4	Describe types of corrosion.
		a5	Discover how to prevent corrosion
		a2	Explain thermodynamics and kinetics of corrosion.
		a5	Discover how to prevent corrosion
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	b1	Apply appropriate safety measures while handling corrosive acids and managing heat-producing reactions during corrosion and inhibitor experiments
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b2	Analyze the obtained practical data to calculate the corrosion rate for some materials in absence and presence of different inhibitors.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	c1	Differentiate between the different types of corrosion.

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**
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in microbiology and chemistry	c2	Point out some techniques used to control corrosion.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	c3	Explain some methods to avoid corrosion of metals

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 on electrochemistry .and its application	**5**	**2**	**-**	**0**	**0**
	.Lab safety and equipments	-	-	**3**	-	-
2	.Electroplating and faraday's law	**5**	**2**	**-**	**0**	**0**
	Determination the inhibtion coefficient for different metal .sheets	-	-	**3**	-	-
3	Definitions and Importance of .corrosion	**5**	**2**	**-**	**0**	**0**
	Study the effect of concentration of inhibitor on the inhibition .coefficient	-	-	**3**	-	-
4	Thermodynamics of corrosion	**5**	**2**	**-**	**0**	**0**
	Study the effect of time on the .inhibition coefficient	-	-	**3**	-	-
5	Kinetics of corrosion	**5**	**2**	**-**	**0**	**0**
	Determination the rate of corrosion by using hydrogen .evolution method part١	-	-	**3**	-	-
6	.Mixed potential theory	**5**	**2**	**-**	**0**	**0**
	Determination the rate of corrosion by using hydrogen .evolution method part٢	-	-	**3**	-	-
7	.Passivity	**5**	**2**	**-**	**0**	**0**
	.Corrosion protection part١	-	-	**3**	-	-
8	**Mid term exam**					
9	Passivity 2	**5**	**2**	**-**	**0**	**0**
	.Corrosion protection part٢	-	-	**3**	-	-
10	.Types of corrosion (part ١(	**5**	**2**	**-**	**0**	**0**
	.Corrosion protection part٢	-	-	**3**	-	-
11	Types of corrosion (part2).	**5**	**2**	**-**	**0**	**0**

	Determination the rate of corrosion by using thermometry .methods part١	-	-	**3**	-	-
12	.Prevention Corrosion (part١(	**5**	**2**	**-**	**0**	**0**
	Determination the rate of corrosion by using thermometry .methods part٢	-	-	**3**	-	-
13	.Prevention Corrosion (part٢(	**5**	**2**	**-**	**0**	**0**
	Making photo-cells by the method of electro-polymerization .for solar cell application	-	-	**3**	-	-
14	Kinetics of inhibition.	**5**	**2**	**3**	**0**	**0**
	Making photo-cells by the method of electro-polymerization .for solar cell application					
15	.Kinetics of inhibition 2	**5**	**2**	**3**	**0**	**0**

5-Teaching and Learning Methods

1. Problem Solving
2. Open Discussion
3. Brain storming

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	eighth week	**5**	**5 %**
3	Oral exam	fifteenth week	**5**	**5%**
4	Practical Exam	Sixteenth week	**25**	**25%**
٤	Written exam	seventeenth week	**50**	**50%**
Total			**100**	**100%**

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	**Lecture notes prepared by the course instructor(s) approved from Chemistry Department.**
	Other References	1) *Pierre R. Roberge, Handbook of Corrosion Engineering, McGraw-Hill2000.* 2) *V. S. BAGOTSKY., FUNDAMENTALS OFELECTROCHEMISTRY , Wiley & Sons, 2006* 3) *CHRISTOPHER M. A. BRETT And ANA MARIA OLIVEIRA BRETT, ELECTROCHEMISTRY Principles, Methods, and Applications, Oxford University Press Inc 1994*
	Electronic Sources (Links must be added)	**https://www.google.com/** **https://www.ekb.eg/en/web/guest/login** **https://www.wikipedia.org/** **http://www.corrosion-doctors.org/** **https://en.wikipedia.org/wiki/Corrosion** **http://www.chem1.com/acad/webtext/elchem/** **http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/electro.php**
	Other (to be mentioned)	1) *Waldfried Plieth, Electrochemistry for Materials Science, Elsevier, 2008*
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Data show**
	Supplies	**Using a whiteboard** **Using a microphone in lectures** **Using laptops** **Markers**
	Electronic Programs	
	Skill Labs/ Simulators	**Group Discussions**
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator **Prof.dr.Sayed Mabrouk**	**Program Coordinator** **Prof. Dr. Mohamed atef**

Geo 361: Water Geochemistry Course Specification

(2024-2025)

1.Basic Information

Course Title (according to the bylaw)	**Water Geochemistry**			
Course Code (according to the bylaw)	**Geo 361**			
Department/s participating in delivery of the course	**Department of Geology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3		2
Course Type	**Elective**			
Academic level at which the course is taught	**Third Year/Third Level**			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Mohamed El-Fakharany**			
Course Specification Approval Date	**7/27/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

This course is aimed to introducing students to principles and processes of Water Geochemistry, and to train students on recognition of the main concepts of physical, chemical, and biological characteristics of groundwater – rocks water interaction, effect of pollution, good quality drinking water and tracing the origins of water.

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**
1.9	Demonstrate understanding of nutrient and energy flow within microbial communities and ecosystems.	a1	explain and master fundamental qualitative and quantitative principles of Water Geochemistry.
		a2	know how to approach and solve basic problems in the field of Water Geochemistry.
		a3	realize how Water Geochemistry is interrelated with other natural and environmental science disciplines,
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics	a4	recognize the methods and techniques used in interpetation of the Water Geochemistry data.
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	b1	identify the ability to imagine and confirm new hypotheses, new water geochemistry problem descriptions, and new water geochemistry methods for analyzing data.
		b2	demonstrate of the motivation to question conventional formulations of problems
		b3	analyze the distribution and propagation of different types of water pollution problems.
3.5	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in microbiology and chemistry	c1	acquire substantial quantities of information, process it effectively, and draw appropriate conclusions,
		c2	make and record accurate observations and measurements,

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**
		c3	analyze the various geological and structrual issues of water geochemistry problems,
3.7	Consider variations in biological materials (sample size, accuracy, precision, calibration) when designing and interpreting experiments.	**C4**	carry out scientific research and evaluate and make use of the material so acquired,
		C5	write and construct scientific documents using appropriate styles, conventions, and terminology.
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	**d1**	work productively with others,
		d2	communicate effectively in writing,
		d3	organise and manage working time, schedule tasks, and meet deadlines,
		d4	manage and manipulate numerical data,
		d5	work safely in the laboratory and the field and to access related safety issues,

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction and course description	**4**	**1**	**3**		
2	The water cycle in nature	**4**	**1**	**3**		
3	Chemical components of water- Origin of water	**4**	**1**	**3**		
4	Physical properties of water	**4**	**1**	**3**		
5	Chemical properties of water	**4**	**1**	**3**		
6	Dissolved gases in the groundwater -	**4**	**1**	**3**		
7	Biological characteristics of groundwater	**4**	**1**	**3**		
8	**Midterm exam**					
9	Radioactive materials in the groundwater	**4**	**1**	**3**		
10	Types of rocks and the quality of the groundwater	**4**	**1**	**3**		
11	Assessment of water for uses in drinking	**4**	**1**	**3**		
12	Assessment of water for uses in agriculture	**4**	**1**	**3**		
13	Assessment of water for uses in industry	**4**	**1**	**3**		
14	The impact of human activities on water pollution	**4**	**1**	**3**		
15	Revision and Feedback	**4**	**1**	**3**		

5.Teaching and Learning Methods

- **Interactive lectures** supported by visual presentations and real-world water chemistry datasets to explain geochemical principles and processes.
- **Laboratory sessions** focusing on water sampling, chemical analysis, and interpretation of hydrochemical parameters (e.g., pH, TDS, major ions).
- **Problem-solving exercises** using real case studies and hydrogeochemical data to interpret water quality and identify controlling geochemical processes.
- **Group discussions and collaborative projects** on topics such as groundwater contamination, water-rock interaction, and geochemical modeling.
- **Fieldwork activities** including collection of water samples, measurement of physicochemical parameters, and on-site observations of hydrogeological settings.

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	8th week	5	5%
3	Practical exam	15th week	25	25%
4	Final Oral exam	15th week	5	5%
5	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	**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

references, etc.) *	**Other References**	• Geochemistry, groundwater and pollution (eBook, 2005) Get this from a library! Geochemistry, groundwater and pollution. [C A J Appelo; Dieke Postma] • Physical and Chemical hydrogeology by Domenico, P.A. and Schwartz, F.W., (1990): " (eds)" Wiley,J. and Sons, inc. New York • Groundwater resource development Hamill, L. and Bell, F.G.,(1986): British Library, ISBN 0-408-01409-1, pages. 253 • Groundwater Geochemistry A Practical Guide to Modeling of Natural and Contaminated quatic Systems by Broder J. Merkel Britta Planer-Friedrich Edited by Darrell Kirk Nordstrom • ISBN 3-540-24195-7 Springer Berlin Heidelberg New York Library of Congress Control Number: 2004117858
	Electronic Sources (Links must be added)	• EKB.com (Egyptian Knowledge Bank) • Thinqi.com
	Learning Platforms (Links must be added)	• University e-learning platform • Virtual microscopy laboratories • Online mineral identification tools
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	• Data show projector • Sound system •
	Supplies	•
	Electronic Programs	•
	Skill Labs/ Simulators	•
	Virtual Labs	
	Other (to be mentioned)	

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

Name and Signature **Course Coordinator** **Prof. Dr. Mohamed El-Fakharany**	**Name and Signature** **Program Coordinator** **Asst. Prof. Dr./ Mohamed atef**

Geo 363: Hydrology Course Specification

(2024-2025)

1.Basic Information

Course Title (according to the bylaw)	**Hydrology**			
Course Code (according to the bylaw)	**Geo 363**			
Department/s participating in delivery of the course	**Geology department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3		2
Course Type	**Elective**			
Academic level at which the course is taught	**Third Year/Third Level**			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof. Dr. Mohamed El-Fakharany**			
Course Specification Approval Date	**7/27/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

This course is aimed to introducing students to principles hydrology, and to define locations of hydrologic data and how to use them in hydrologic investigations. The students should therefore be able to assess how hydrology is interrelated with other natural and environmental science disciplines.

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**
1.9	Demonstrate understanding of nutrient and energy flow within microbial communities and ecosystems	**a1**	approach and solve basic problems in the field of hydrology,
		a2	explore locations of hydrology data and how to use them in hydrologic investigations,
		a3	realize how hydrology is interrelated with other natural and environmental science disciplines,
		a4	identify the methods and techniques used in interpetation of the hydrology data.
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various sources.	**b1**	Investigate the distribution of under-gorundwater.
		b2	analyze hydrologic processes, particularly the processes of precipitation, evaporation, infiltration, and runoff.
		b3	explore methods of hydrologic analysis, including aquifer types, groundwater velocity.
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes.	**b4**	investigate the methods of hydrologic design, including design of groundwater flow maps.
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines.	**c1**	acquire substantial quantities of information, process it effectively, and draw appropriate conclusions,
		c2	report accurate observations and measurements,
3.5		**c3**	analyze the various geological and structrual issues of aquifers,

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**
	Use appropriate statistical and computational tools to analyze, model, and interpret experimental data in microbiology and chemistry	**C4**	carry out scientific research and evaluate and make use of the material so acquired,
4.5	Address community-related problems with sensitivity to ethics, cultural traditions, and societal needs.	D1	work productively with others,
		d2	communicate effectively in writing,
		d3	organise and manage working time, schedule tasks, and meet deadlines,
		d4	Use computer, internet & communications.
		D5	adhre to ethical and community linked thinking

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical/Clinical/ .....)	Self-learning (Tasks/ Assignments / Projects/ ...)	Other (to be determined)
1	Introduction and course description	4	1	3		
2	The hydrologic cycle	4	1	3		
3	Precipitation	4	1	3		
4	Evaporation	4	1	3		
5	Transpiration	4	1	3		
6	Surface water hydrograph	4	1	3		
7	Drainage basins	4	1	3		
8	**Mid term exam**					
9	Vertical distribution of groundwater	4	1	3		
10	Porosity	4	1	3		
11	Permeability.	4	1	3		
12	Aquifer types	4	1	3		
13	Wells and springs	4	1	3		
14	Groundwater velocity	4	1	3		
15	Revision and Feedback	4	1	3		

5.Teaching and Learning Methods

- Interactive lectures supported by visual presentations, maps, and hydrological models to explain hydrological principles and processes.
- Laboratory sessions focusing on the measurement, analysis, and interpretation of hydrological data such as rainfall, runoff, and infiltration.
- Problem-solving exercises using real-world case studies for watershed modeling and water balance estimation.
- Group discussions and collaborative projects addressing issues like flood management, groundwater recharge, and sustainable water use.
- Fieldwork activities involving streamflow measurement, groundwater monitoring, and observation of hydrological systems.

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	8th week	5	5%
3	Practical exam	15th week	25	25%
4	Final Oral exam	15th week	5	5%
5	Final Written Exam	16th week	50	50%
Total			**1**00	**1**00 %

*

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
	Other References	• Basic ground-water hydrology (1987) By RALPH C. HEATH Library of Congress Cataloging in Publication Data Geological Survey water-supply paper; 2220 • Groundwater resource development Hamill, L. and Bell, F.G.,(1986): British Library, ISBN 0-408-01409-1, pages. 253. • Hydrology Principles, Analysis, Design Revised 2nd edition Author: H. M. Raghunath Copyright © 2006 New Age International (P) Ltd., Publishers Published by New Age International (P) Ltd., Publishers pages 463
	Electronic Sources (Links must be added)	• EKB.com (Egyptian Knowledge Bank) • Thinqi.com
	Learning Platforms (Links must be added)	• University e-learning platform • Virtual microscopy laboratories • Online mineral identification tools
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	• Data show projector • Sound system •
	Supplies	•
	Electronic Programs	•
	Skill Labs/ Simulators	•
	Virtual Labs	
	Other (to be mentioned)	

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

Name and Signature **Course Coordinator** **Prof. Dr. Mohamed El-Fakharany**	**Name and Signature** **Program Coordinator** **Asst. Prof. Dr./ Mohamed atef**

Chm 314: Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1)

1.Basic Information

Course Title (according to the bylaw)	**Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1)**			
Course Code (according to the bylaw)	**CHM 314**			
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	**Third level**			الفرقة/المستوي الثالث
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Prof. Dr. Mohamed Salah Omar			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

The student will be able to mention the different classes of carbohydrates including: Nomenclature and classification of sugars; Stereoisomers; Glucose, Mannose and Galactose; Fructose; Reactions of monosaccharides; Glycosides; Amino sugars and deoxy sugars; Pentoses; Disaccharides; Oligosaccharides and polysaccharides. The student will be able to mention the different classes of lipids including: Classification of lipids, Classification of fatty acids: Saturated and unsaturated fatty acids, Neutral fats or triacylglycerols; Phospholipids; Phosphatidyl choline or lecithin; Sphingomyelin and Non-phosphorylated lipids. The student will be able to mention the Classification of amino acids based on structure; Based on side chain character; Based on

metabolic fate; Based on nutritional requirements, Iso electric point; Reactions due to carboxyl group; Reactions due to amino group; Reactions of SH group and Peptide bond formation moreover the peptides and protein biochemistry. The student will be able to answer questions about steroid hormones and fat-soluble vitamins and water-soluble vitamins. The student will be able to answer questions on alkaloids, and terpenes. The student should also be able to carry out simple laboratory tests to identify carbohydrates, lipids, protein, hormones and vitamins.

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry.	**A1**	Describe the carbohydrates nomenclature and classification and their reactions.
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 stereoisomers of carbohydrates
		A3	Describe the monosacharides, disaccharides, oligosaccharids and polysaccharides
1.10	Identify the constitution, properties, and synthetic pathways of chemical compounds and predict their behavior based on structural characteristics	**A4**	Describe the classification of lipids and fatty acids.
		A5	Classify of amino acids and their **r**eactions.
		A6	Describe the levels of protein structures.
		A7	Describe the steroid hormones.
		A8	Describe the fat- and water-soluble vitamins
		A9	Mention the chemical structures and preparations of alkaloids & terpenes and their chemical and physical properties.
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	**C1**	Determine chemical reactions of sugars, amino acids and lipids.

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**
		C2	Apply the given chemical data to differentiate between different types of hormones and vitamins.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols	**C3**	Apply preparation methods of Alkaloids and Terpenes.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks.	**d2**	communicate effectively in writing,

4.Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignments)	Other (to be determined
1	1.Introduction to carbohydrates and its categories.	5	2	-	-	-
	1.2.Separation Technique.		-	3		
2	2.1. Stereo forms (D, L) of Aldoses and Hexoses.	5	2	-	-	-
	2.2. Mixture of Acid – Acid.		-	3		
3	3.1 Reactions of Monosaccharides.	5	2	-	-	-
	3.2. Mixture of Acid - Base.		-	3		
4	4.1. Stereo chemistry of glucose.	5	2	-	-	-
	4.2. Mixture of Acid - Carbohydrates		-	3		
5	5.1. Cyclic structures of Monosaccharides.	5	2	-	-	-
	5.2. Mixture of Phenol - Carbohydrates.		-	3		
6	6.1. Formation of glycosides.	5	2	-	-	-
	6.2. Mixture of Base - Carbohydrates		-	3		
7	9.1. Polysaccharides.	5	2	-	-	-
	9.2. Mixture of Base - Phenol		-	3		
8	8.1. Disaccharides.	5	2	-	-	-
	8.2. Mixture of Neutral - Neutral		-	3		
9	**Mid term exam**					
10	10.1. Alkaloids and Terpenes chemistry.	5	2	-	-	-
	10.2. Mixture of Acid - Phenol		-	3		
11	11.1. Chemical category of Alkaloids.	5	2	-	-	-
	11.2. Mixture of Acid - Salt of acid.		-	3		
12	12.1. Terpenes	5	2	-	-	-
	12.2 Mixture of Phenol - Salt of acid		-	3		
13	13.1.Chemical and physical composition of Alkaloids and Terpenes.	5	2	-	-	-

	13.2. Mixture of Base - Salt of acid.		-	**3**		
14	14.1. Preparation methods of Alkaloids and Terpenes.	**5**	**2**	-	-	-
	14.2. Revision		-	**3**		
15	15.1. Revision	**5**	**2**	-	-	-
	15.2. Revision		-	**3**		

5.Teaching and Learning Methods

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

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	**١٥**	**١٥%**
2	Mid-Term Exam	ninth week	**٥**	**٥%**
3	Final Written Exam	seventeenth week	**٥٠**	**٥٠%**
٤	Final Practical Exam	Sixteenth week	**٢٥**	**٢٥%**
٥	Final Oral Exam	Sixteenth week	**٥**	**٥%**
Total			**١٠٠**	**١٠٠%**

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	3. Lecture notes prepared by the course instructor(s). 4. **Lipids: Biochemistry, Biotechnology, and Health"** by Michael I. Gurr et al., Wiley, 2022. 5. **Advanced Organic Chemistry"** by Francis A. Carey and Richard J. Sundberg, Springer, 6th Edition, 2022. 6. **Biochemistry of Lipid and Carbohydrate Biosynthesis"** by Daniel Brown, Journal of Biochemistry Research, April 2023.
	Other References	*Journal* of *Chemical Education* (ACS); Organic Chemistry (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 https://www.ekb.eg/web/guest/home
	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

Prof. Dr. Mohamed Salah Omar

Program Coordinator

Dr. Mohamed atef

Chm 328: Transition elements and complexes

1-Basic Information

Course Title (according to the bylaw)	**Transition elements and complexes**			
Course Code (according to the bylaw)	**CHM 328**			
Department/s participating in delivery of the course	**Botany and microbiology Department and Chemistry Department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**3**	**-**	**3**
Course Type	**compulsory Course** اجباري			
Academic level at which the course is taught	**Third level** الفرقة/المستوي الثالث			
Academic Program	**B.Sc. Microbiology and Chemistry**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Dr. Sabry Hamed			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2-Course Overview (Brief summary of scientific content)

This course aims to learn Study the general properties of transition elements, such as color, magnetism, isomerism, and variable oxidation states. Learn about transition metal complexes, focusing on their nomenclature and bonding theories. Identify the importance of transition metal complexes in various chemical processes. Learn the application of these properties and complexes in real-world chemical systems. Investigate general properties of each group of the transition elements in the periodic table. Define some chemical concepts in coordination compounds. Name neutral, cationic and anionic complexes. Identify theories of chemical bonding in coordination compounds. This course aims to learn the importance of transition metal complexes in transition metal groups in the periodic table.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry	A1	Investigate general properties of each group of the transition elements in the periodic table.
		A2	Define some chemical concepts in coordination compounds
		A3	Name neutral, cationic and anionic complexes
		A4	Explain the bonding theories of transition metals and complexes
		A5	Investigate the different transition metal complexes
		A6	Investigate general properties of each group of the transition elements in the periodic table
2.5	Break down, synthesize, reconstruct, and reformulate complex information	B1	Compare between different types of coordination compounds
		B2	Interpret the bond lengths, geometries, magnetism, and color of the transition metal complexes
		B3	understand the bonding theories in the transition metal complexes
		B4	Report the given chemical data to identify the chemical structure of transition metal complexes
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines.	C1	Prepare the different types of metal complexes
		C2	analyze the knowledge that the student studied to propose the molecular structures of the transition metal complexes
		C3	Show the number of unpaired electrons in the complex depending on its given magnetism
4.1	Use information and communication technology effectively for data handling, scientific writing, and digital communication.	D1	Solve problems on the scientific basis taught in the preparation of different metal complexes
		D2	Using internet, Report about the transition metal complexes, types and general properties

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures /discussion groups)	Training (Practical)	Self-learning	Other
1	Introduction to the transition metal complexes including Werner theory	**5**	**2**	**3**	**-**	**-**
2	General properties of transition metal complexes	**5**	**2**	**3**	**-**	**-**
3	Nomenclature of coordination compounds.	**5**	**2**	**3**	**-**	**-**
4	Isomerism of coordination compounds.	**5**	**2**	**3**	**-**	**-**
5	Valence bond theory	**5**	**2**	**3**	**-**	**-**
6	Crystal field theory	**5**	**2**	**3**	**-**	**-**
7	Magnetism, color, and Molecular orbital theory	**5**	**2**	**3**	**-**	**-**
8	**Mid-Term**					
9	General properties of groups 3 and 4 elements	**5**	**2**	**3**	**-**	**-**
10	General properties of groups 5 and 6 elements	**5**	**2**	**3**	**-**	**-**
11	General properties of groups 7 and 8 element part (1)	**5**	**2**	**3**	**-**	**-**
12	General properties of groups 7 and 8 element part (2)	**5**	**2**	**3**	**-**	**-**
13	General properties of groups 9 and 10 elements	**5**	**2**	**3**	**-**	**-**
14	General properties of groups 11 and 10 elements part (1)	**5**	**2**	**3**	**-**	**-**
15	General properties of groups 11 and 10 elements part (2)	**5**	**2**	**3**	**-**	**-**

5-Teaching and Learning Methods

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

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-Term Exam	Seventh week	5	5%
2	Semester work	Fifth week	15	15%
3	Final Oral Exam	Sixteenth week	5	5%
٥	Practical Exam	Sixteenth week	25	25 %
6	Final Written Exam	seventeenth week	50	50%
Total			١٠٠	١٠٠%

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)	7. Lecture notes prepared by the course instructor(s). 8. by S. G. Crich, published in *Elsevier*, 2022.Bernhard Schrader, Infrared and Raman Spectroscopy, New York, 1994, pp. 1-200. 9. by R. B. Gupta and G. L. Sharma, published in *Springer Nature*, October 2022. 4 S. F. P. K. Sainz, published in *American Chemical Society (ACS) Publications*, December 2022
	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 & equipment for teaching and learning *	**Devices/Instruments**	Microphone in lectures and Data show
	Supplies	White board
	Electronic Programs	Microsoft office
	Skill Labs/ Simulators	Laboratories with enough chemicals and equipments
	Virtual Labs	Praxilabs
	Other (to be mentioned)	

Course Coordinator	Program Coordinator
Dr. Sabry Hamed	Dr. Mohamed Atef

382 Mic :Microbial Immunology
Course Specification
(2025)

1.Basic Information

Course Title (according to the bylaw)	**Microbial Immunology**			
Course Code (according to the bylaw)	**382 Mic**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	3	0	2
Course Type	**اجباري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	Dr. Prof. Dr. Mohamed Osman			
Course Specification Approval Date	**1/7/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

The course explores the immune system, its structure, and its role in defending the body against infections. It covers innate immunity (non-specific barriers, phagocytosis, and lymphatic system) and acquired immunity (humoral and cell-mediated responses, antigens, and antibodies). Students learn about immune responses to microbes, hypersensitivity reactions, autoimmune diseases, and immunodeficiencies. Overall, the course highlights how immunity protects health and how its imbalance leads to disease.

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry	a1	Identify the immunity and immune system
		a2	characterize the antigens and their prevalence
		a3	describe phases of humoral immune responses
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	b1	- interpret the innate and aquired immunity .
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b2	design diagrammatic representation of tissue and cells involved in immune responses
		B3	interpret the difference between antigen and immunogen

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**
		B4	interpret the difference between antigens classes
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	c1	Draw different classes of immunoglobulins.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols	c2	Investigate antigen antibody reactions .
		c3	Differentiate between agglutination and precipitation.
4.4	Work cooperatively in teams; manage time; collaborate effectively; and communicate with clarity and professionalism.	d1	Think independently, set tasks and solve microbiological problems
		d2	Management, working in group & life-long learning
		d3	Ethical behavior, community linked thinking
		D4	Use computer, internet & communications

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Identify the immunity and immune system	**5**	**2**	**3**		
2	The innate immunity	**5**	**2**	**3**		
3	The acquried immunity	**5**	**2**	**3**		
4	The relationship between microbes and immunity system	**5**	**2**	**3**		
5	The components of innate immunity (non-specific)	**5**	**2**	**3**		
6	The Cellular Factors Cells of the innate immune response	**5**	**2**	**3**		
7	The Phagocytosis, the lymphatic system, the Antigen and Immunogenicity	**5**	**2**	**3**		
٨	Antibodies (immunoglobulin), phases of humoral immune responses,	**5**	**2**	**3**		
9	Midterm exam and revision	**0**	**0**	**0**		
10	Antibodies (immunoglobulin), phases of humoral immune responses,	**5**	**2**	**3**		
11	- The cell- mediated immunity	**5**	**2**	**3**		
12	The immune response to infection	**5**	**2**	**3**		
13	The hypersenstivity reactions and autoimmune diseases,	**5**	**2**	**3**		
14	Properties of Human Immunoglobulins, and the immunodeficiency	**5**	**2**	**3**		
15	Revision	**5**	**2**	**3**		

5.Teaching and Learning Methods

1- Self-learning
2. e learning
3. Cooperative learning strategy.
4. field study strategy

6.Methods of students' assessment

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

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

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Abbas, A. K., Lichtman, A. H., & Pillai, S. (2019). *Basic immunology e-book: functions and disorders of the immune system*. Elsevier Health Sciences
	Other References	Male, D., Male, V., & Peebles, R. S. (2020). *Immunology E-Book*. Elsevier Health Sciences. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2019). *Basic immunology e-book: functions and disorders of the immune system*. Elsevier Health Sciences.

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

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

Name and Signature
Course Coordinator
Prof. Dr. Mohamed Osman,

Name and Signature
Program Coordinator

Dr\ Mohamed atef

Mic 392: Microbial toxins Course Specification (2025)

1.Basic Information

Course Title (according to the bylaw)	Microbial toxins			
Course Code (according to the bylaw)	**Mic 392**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3	0	2
Course Type	**اجباري**			
Academic level at which the course is taught	الفرقة/المستوي الثالث			
Academic Program	**Microbiology and chemistry BSc Program**			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof.dr. Hesham** **Assoc. Prof. Atiya Ahmed** **Dr. Amany Abdel Aziz**			
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 that toxins are important virulence determinants responsible for microbial pathogenicity and/or evasion of the host immune response. Bacterial toxins, algal toxins,and fungal toxins (types, factors affecting production). Effect of microbial toxins on human and animal health

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	define Bacterial toxins, algal toxins, and fungal toxins
		A2	describe types, factors affecting microbial toxin production
		A3	identify the effect of microbial toxins on human and animal health.
2.4	Interpret data related to microorganisms and their impact on health, the environment, and industry	b1	Confirm the microbial toxin structure and mechanism of action
2.9	Evaluate the interrelationships between microorganisms, plants and their ecosystems and predict their responses to environmental changes	b2	develop new methods for assaying bacterial Toxin
		B3	compare between experimental procedure for mycotoxins and bacterial toxins detection

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**
3.4	Handle chemical materials and biological samples safely, considering their physical, chemical, and biological hazards	**c1**	Design microbial techniques for production of microbial toxins
		c2	prepare toxin extracts for industrial purposes using narrow scale fermenters
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	**c3**	recommend some techniques such as the chromatographic applications in extraction of products.
		C4	Extract, separate and identify partially the factors determining the pathogenesis (toxins)
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**d1**	Think independently, and solve problems on scientific basis
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements	**d2**	Acquire self- and life-long learning
		d3	Exhibit the sense of beauty and neatness in nature
		d4	work in a team

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Introduction of microbial toxins and toxin definition	**4**	**1**	**3**		
2	Bacterial toxins and its types	**4**	**1**	**3**		
3	Algal toxins and types	**4**	**1**	**3**		
4	Mycotoxins produced by Aspergillus and penicillium Aflatoxins & ochratoxins	**4**	**1**	**3**		
5	Tremorgenic mycotoxins,Citrinin &Patulin	**4**	**1**	**3**		
6	Some bacterial toxins, such as Botulinum neurotoxins, are the most potent natural toxins known.	**4**	**1**	**3**		
7	Some bacterial toxins, such as Botulinum neurotoxins, are the most potent natural toxins known.	**4**	**1**	**3**		
8	Microbial toxins promote infection and disease by directly damaging host tissues (Pathotoxins, phytotoxins &vivotoxins)	**4**	**1**	**3**		
9	Midterm exam and revision	**0**	**0**	**0**		
10	Fusarium toxins and types of trichothecene	**4**	**1**	**3**		

11	Microbial toxins have important uses in medical science and research.	**4**	**1**	**3**		
12	Strigmatocystein and Roquifortine	**4**	**1**	**3**		
13	Potential applications of toxin research include combating microbial virulence (detoxification) .	**4**	**1**	**3**		
14	Zearalenone, .	**4**	**1**	**3**		
15	Penicillic acid	**4**	**1**	**3**		

5.Teaching and Learning Methods

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

6.Methods of students' assessment

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

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

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Murray, Rosenthal & Pfaller – Medical Microbiology (latest edition).
	Other References	Todar's Online Textbook of Bacteriology Jawetz, Melnick, & Adelberg's Medical Microbiology Salyers & Whitt – *Bacterial Pathogenesis: A Molecular Approach*
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Marker- board- laptop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature
Course Coordinator
Prof.dr. Mohamed Hesham

Name and Signature
Program Coordinator
Dr\ Mohamed atef

MIC 394 Microbial enzymes :Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	Microbial enzymes			
Course Code (according to the bylaw)	MIC 394			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1	3	0	2
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**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, Enzymes definition; General prosperities; Nomenclature of enzymes; Structure of enzymes; Mechanism of enzymes action; Separation and Purification, Inhibitors and activators, Classification of enzymes, Bacterial enzymes, Fungal enzymes, Applications of microbial enzymes, Microbial enzymes and environmental sanitation, Antimicrobial activity of enzymes.

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	Describe the general characteristics of Enzymes.
		a2	Identify the classification of Enzymes.
		a3	Explain the activity and function of Enzymes.
		a4	Outline the economic importance of Enzymes.
2.5	Break down, synthesize, reconstruct, and reformulate complex information such as biosynthetic pathways, macromolecular structures, or microbial life cycles	b1	Compare between different Types of Enzymes.
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare.	b2	Interpret the benefits of Enzymes.
		b3	Report the mechanism of Enzymes action.
		b4	Confirm the production of different secondary metabolites of Enzymes.

3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations	**c1**	Isolation of Microbial Enzymes from different media.
3.10	Conduct chemical analyses, synthetic procedures, and microbial assays according to standard laboratory protocols.	**c2**	Investigate the biochemical and molecular characteristics of Enzymes.
		c3	Analyze the production of secondary metabolites of Enzymes.
		c4	Investigate the biochemical and molecular characteristics of Enzymes.
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**d1**	Think independently, set tasks and solve microbiological problems on scientific basis.
		d2	Management, working in group & life-long learning
		d3	Ethical behavior, community linked thinking.
		d4	Think independently, set tasks and solve microbiological problems

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	Demonstrate knowledge in life representative taxa in different disciplines from a cellular to organisms used in basic and applied branches of microbiology	a1	Describe the general characteristics of Enzymes.
1.11	Demonstrate the complexity and the diversity of microorganisms through the study of genetics, developmental stages and evolution.	a2	Identify the classification of Enzymes.
		a3	Explain the activity and function of Enzymes.
		a4	Outline the economic importance of Enzymes.
2.3	Formulate data and select proper mechanism for their setting within a theoretical framework in microbiology, chemistry and allied branches of basics and biological sciences	b1	Compare between different Types of Enzymes.
2.9	Provides recommendations for the solution of variety of microbiology – related issues	b2	Interpret the benefits of Enzymes.
		b3	Report the mechanism of Enzymes action.
		b4	Confirm the production of different secondary metabolites of Enzymes.
3.3	Collect and analyze microbiological data using appropriate techniques in the field and laboratory.	c1	Isolation of Microbial Enzymes from different media.
3.4	Select representative microbiological samples considering their validity, accuracy and reliability during collection.	c2	Investigate the biochemical and molecular characteristics of Enzymes.
3.5	Assess risk in laboratory work taking into consideration the specific hazards associated with the use of chemical and microbiological materials as well as the safe and proper operation of the laboratory techniques.	c3	Analyze the production of secondary metabolites of Enzymes.
3.9	Apply current knowledge for integrating chemical or biochemical and genetic techniques to microbiology.	c4	Investigate the biochemical and molecular characteristics of Enzymes.
4.3	Think independently, set tasks and solve microbiological problems on scientific basis.	d1	Think independently, set tasks and solve microbiological problems on scientific basis.

4.5	Consider community linked problems, ethics and traditions.	**d2**	Management, working in group & life-long learning
4.7	Apply microbiological models, systems and tools effectively.	**d3**	Ethical behavior, community linked thinking.
4.8	Deal with microbiological patents considering property right.	**d4**	Think independently, set tasks and solve microbiological problems

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments / Projects/ ...)	**Other** (to be determined)
1	Enzymes definition	**4**	**1**	**3**		
2	General prosperities	**4**	**1**	**3**		
3	Nomenclature of enzymes	**4**	**1**	**3**		
4	Structure of enzymes	**4**	**1**	**3**		
5	Mechanism of enzymes action	**4**	**1**	**3**		
6	Separation and purification	**4**	**1**	**3**		
7	Inhibitors and activators	**4**	**1**	**3**		
8	Classification of enzymes	**0**	**0**	**0**		
9	Midterm exam and revision	**4**	**1**	**3**		
10	Bacterial enzymes	**4**	**1**	**3**		
11	Fungal enzymes	**4**	**1**	**3**		
12	Applications of microbial enzymes	**4**	**1**	**3**		
13	Microbial enzymes and environmental sanitation.	**4**	**1**	**3**		
14	Antimicrobial activity of enzymes.	**4**	**1**	**3**		
15	Antimicrobial activity of enzymes .	**4**	**1**	**3**		

5.Teaching and Learning Methods

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

6.Methods of students' assessment

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

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

7.Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	2- Bisswanger, Hans. *Enzyme kinetics: principles and methods*. John Wiley & Sons, 2017. 3- LOPINA, Olga D. Enzyme inhibitors and activators. In: *Enzyme inhibitors and activators*. IntechOpen, 2017. 4- Singh, Ram Sarup, Taranjeet Singh, and Ashok Pandey. "Microbial enzymes—an overview." *Advances in enzyme technology* (2019): 1-40. 5- Tao, Zhiyu, et al. "The classification of enzymes by deep learning." *IEEE Access* 8 (2020): 89802-89811.

		6- El-Gendi, H., Saleh, A. K., Badierah, R., Redwan, E. M., El-Maradny, Y. A., & El-Fakharany, E. M. (2021). A comprehensive insight into fungal enzymes: Structure, classification, and their role in mankind's challenges. *Journal of Fungi*, *8*(1), 23.
	Other References	
	Electronic Sources (Links must be added)	-
	Learning Platforms (Links must be added)	Thinq+ E book plateform of benha university
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show
	Supplies	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature
Course Coordinator

Prof. Dr. Mohamed Osman,

Name and Signature
Program Coordinator

Dr\ Mohamed atef

Chm 310: Advanced organic chemistry

1.Basic Information

Course Title (according to the bylaw)	Advanced organic chemistry			
Course Code (according to the bylaw)	Chm 310			
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
	٢	٠	٠	٢
Course Type	Elective Course			
Academic level at which the course is taught	Third level			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	Faculty of science			
University/Academy	Benha University			
Name of Course Coordinator	Dr. Enas Abdelaleem			
Course Specification Approval Date	٢٠٢٥/٦/١٨			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

This course aims to enable the students to understand the general principles of advanced organic chemistry. Also, describe the synthesis and evaluation of some applied compounds and surface-active elements and show the modern technology for synthesis and reactions of polymers.

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1	Demonstrate comprehensive understanding of theories, concepts, principles, facts, and essential techniques related to microbiology and chemistry	a.1	Recognize the general principles of advanced organic chemistry.
1.12	Gain knowledge of current scientific issues, biotechnological developments, and technological applications relevant to microbiology and chemistry.	a.2	Describe classifications and properties of polymers.
		a.3	Identify mechanisms of polymerization and initiators.
		a.4	Define types of soaps, detergents, surfactants, and builders.
		a.5	Explain the role of bleaching agents and additives.
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry	b.1	Analyze the relation between polymer structure and properties.

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**
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**D3**	Ethical behavior, community linked thinking.

4.Course Schedule

no 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 general principles of advanced organic chemistry and the chemistry of polymers	2	2	-	-	-
2	Different classifications of polymers based on nature, monomer and structure	2	2	-	-	-
3	Different classifications of polymers based on main chain, thermal behavior and the nature of atoms in chain	2	2	-	-	-
4	Different types of polymerization process, their examples and different types of rubber	2	2	-	-	-
5	Mechanism of polymerization process and types of initiators and their properties	2	2	-	-	-
6	Modern technology for synthesis and reactions of polymers	2	2	-	-	-
7	Chemistry of soaps	2	2	-	-	-
8	Soaps and detergents Manufacture	2	2	-	-	-
9	Mid term exam					
10	Detergent industry	2	2	-	-	-
11	Principle groups of synthetic detergents	2	2	-	-	-
12	Surfactants Types	2	2	-	-	-
13	Builders	2	2	-	-	-
14	Bleaching agent and Additives	2	2	-	-	-
15	Revision	2	2	-	-	-

5.Teaching and Learning Methods

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

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1 (Semester work)	Fifth week	١٠	١٠%
2	Midterm exam	Seventh week	١٠	١٠%
٣	Exam 2 (Semester work)	Fourteenth week	١٠	١٠%
٤	Final Oral Exam	Sixteenth week	١٠	١٠%
٥	Final Written Exam	Seventeenth week	٦٠	٦٠%
Total			١٠٠	١٠٠%

7.Learning Resources and Supportive Facilities *

Learning resources	**The main (essential) reference for the course**	Smulders, E., *Laundry Detergents*, Wiley-VCH, Verlag-Germany, 2002.

(books, scientific references, etc.) *	**Other References**	1. Davidsohn, A. S. and B. Milwidsky, *Synthetic Detergents*, Longman Scientific and Technical, Burnt Mill, Harlow-England, 1987. 2. Kirshner, E. M., Soaps & Detergents, *Chemical and Engineering News*, American Chemical Society, January 26, pp. 39-54, 1998.
	Electronic Sources (Links must be added)	https://www.ekb.eg/ https://www.sciencedirect.com/
	Learning Platforms (Links must be added)	https://benhasci.ekb.eg/ http://ebook.bu.edu.eg/
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	- Using a microphone in lectures - Data show
	Supplies	- Using a whiteboard - Laptops
	Electronic Programs	- Microsoft office
	Skill Labs/ Simulators	- Avogadro - ChemSketch
	Virtual Labs	
	Other (to be mentioned)	

Course Coordinator **Dr. Enas Abdelaleem**	**Program Coordinator** **Dr.mohamed atef**

Chm 332: Surface Chemistry

1.Basic Information

Course Title (according to the bylaw)	**Surface Chemistry**			
Course Code (according to the bylaw)	**CHM 332**			
Department/s participating in delivery of the course	**Department of Chemistry**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**-**	**-**	**2**
Course Type	**اختياري**			
Academic level at which the course is taught	**Third level** الفرقة/المستوي الثالث			
Academic Program	**Microbiology and chemistry B.Sc. Program Specification**			
Faculty/Institute	**Faculty of Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Dr. Marwa Sameeh**			
Course Specification Approval Date	**6/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department Council Date: 21/7/2025** **Facility Council meeting number (515):** **9/7/2025** **and Emergency session(516) 28/7/2025**			

2.Course Overview (Brief summary of scientific content)

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

3.Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.11	Understand the principles of thermodynamics, kinetics, catalysis, and quantum chemistry, and their applications in chemical and biological systems	**A1**	Investigate the relation between surface and solid crystal structure on the catalyst behavior and the surface properties of different materials and the colloid state of matter.
		A2	Define the concepts of surface, colloid and catalysis.
2.7	Postulate and deduce mechanisms, models, and procedures to solve scientific problems in modern microbiology and chemistry.	**B1**	Analyze the given chemical data to identify the activity of catalyst.
		B2	Explain the different theories of catalysis, different types of colloid systems.
		B3	Explain the types of catalyst materials.
4.3	Think independently, critically, and creatively to solve scientific and practical problems.	**D1**	Think independently, set tasks and solve problems on scientific basis.

4-Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups)	Training (Practical)	Self-learning (Tasks/ Assignments)	Other (to be determined
1	○ Introduction to surface chemistry, catalysis, colloid state.	**2**	**2**	-	-	-
2	2.1. Surface tension and its relation with curvature and effect of temperature on it.	**2**	**2**	-	-	-
3	3.1. Measurements of surface tension and surface activity	**2**	**2**	-	-	-
4	a. Surface excess and how be measured, solid/liquid interface, spreading coefficient, Liquid/liquid interface and application of thin films	**2**	**2**	-	-	-
5	5.1. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (1).	**2**	**2**	-	-	-
6	6.1. Gas/solid interface, adsorption and adsorption isotherms, hysteresis and surface area, pore volume and pore radius measurements part (2).	**2**	**2**	-	-	-
7	8.1. Introduction to Colloid state, types of colloid systems, preparation of them and purification.	**2**	**2**	-	-	-
8	9.1. The properties of colloid solutions (electrical, optical and kinetic properties, protection of colloid systems).	**2**	**2**	-	-	-
9	**Mid term exam**					
10	10.1. Introduction to catalysis.	**2**	**2**	-	-	-
11	11.1. The components of catalyst part (1).	**2**	**2**	-	-	-
12	12.1. The components of catalyst part (2).	**2**	**2**	-	-	-
13	13.1. Materials used as catalyst (metals, semiconductor, insulators).	**2**	**2**	-	-	-
14	14.1. Preparation of catalyst, function of catalyst.	**2**	**2**	-	-	-
15	15.1. Enzyme Catalysis	**2**	**2**	-	-	-

5.Teaching and Learning Methods

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

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Semester work	Fifth week	**٢٠**	**٢٠%**
2	Mid-Term Exam	ninth week	**١٠**	**١٠%**
3	Final Written Exam	seventeenth week	**٦٠**	**٦٠%**
4	Final Oral Exam	Sixteenth week	**١٠**	**١٠%**
Total			**١٠٠**	**١٠٠%**

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	1. Richard M. Pashley and Marilyn E. Karaman`` Applied Colloid and Surface Chemistry 2. Introduction to Surface Chemistry and Catalysis" by Gabor A. Somorjai and Yimin Li, 2nd Edition, Wiley, 2019.
	Other References	https://pmc.ncbi.nlm.nih.gov/articles/PMC5513586/ https://link.springer.com/journal/10634
	Electronic Sources (Links must be added)	The Egyptian Knowledge Bank https://www.ekb.eg/web/guest/home https://www.sciencedirect.com/topics/materials-science/electron-microscopy
	Learning Platforms (Links must be added)	https://benhasci.ekb.eg/ https://ebook1.bu.edu.eg/

	Other (to be mentioned)	
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. Marwa Sameeh**	**Program Coordinator** **Dr. Mohamed atef**

Mic 302 Applied and Field Training
:Course Specification
(2025)

1.Basic Information

Course Title (according to the bylaw)	**Applied and Field Training**			
Course Code (according to the bylaw)	**Mic 302**			
Department/s participating in delivery of the course	**Botany and Microbiology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	-	3	0	3
Course Type	**اختياري**			
Academic level at which the course is taught	**الفرقة/المستوي الثالث**			
Academic Program	Microbiology and chemistry BSc Program			
Faculty/Institute	**Science**			
University/Academy	**Benha University**			
Name of Course Coordinator	**Prof.dr.sabah abo elmaaty**			
Course Specification Approval Date	**7/21/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council Date: 21/7/2025 Facility Council meeting number (515): 9/7/2025 and Emergency session(516) 28/7/2025			

2.Course Overview (Brief summary of scientific content)

The objective of this course is to obtain intensive practical training in one of the functional areas of field Microbiology. The students will be teached how to report microbioloigcal data and samples. The course is designed to familiarize students with microbiological techniques, and to bridge the gap between theoretical knowledge and practical applications. Through interactive sessions, practical training, experiments and scientific visits. Also to enhance and develop their practical skills and job experience in the respective field of wok.

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	identify the different microbiological methods used in the (medical/industrial/ environmental health/agricultural) fields of work to complete the theoretical knowledge they have acquired during their studies.
		a2	define the different microbiological methods used in the (medical/industrial/ environmental health/agricultural) fields of work to complete the theoretical knowledge they have acquired during their studies.
2.2	Analyze, assess, and interpret quantitative and qualitative scientific data from various sources.	b1	Develop their knowledge and practical skills in the field of specialization
2.10	Suggest scientifically valid solutions to microbiology- and chemistry-related issues in industry, environment, and healthcare	b2	Report practical problems during field work and learn how to solve them

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**
3.1	Plan and conduct investigations using standard scientific methods, prepare structured reports, and present findings according to established scientific guidelines	c1	Collect and prepare samples for isolation and identification of microorganisms
3.2	Use modern laboratory instruments, equipment, and technologies safely and efficiently in chemical and microbiological investigations.	c2	Differentiate available tools to collect data.
3.4	Handle chemical materials and biological samples safely, considering their physical, chemical, and biological hazards	c3	Prepare microbiological data reports
3.12	Assess laboratory risks and implement biosafety and chemical safety procedures effectively		
4.2	Identify roles, responsibilities, task delegation, and performance indicators within team settings	d1	Use computer, internet & communications
4.4	Work cooperatively in teams; manage time; collaborate effectively; and communicate with clarity and professionalism		
4.6	Acquire self-learning and life-long learning skills to remain updated with scientific and technological advancements.	d2	Develop the skills of coordinating group or individual tasks according to the nature of the work.
4.8	Demonstrate neatness, accuracy, organization, and aesthetic sense in scientific and professional tasks	d1	Use computer, internet & communications

4.Course Schedule						
Weeks	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	Botany and Microbiology Department organize Applied and Field Training to one of different Agricultural, industrial, medicinal, and pharmaceutical sector in Egypt including Water, Pharmaceutical, and Food factories in addition to government and private hospitals to train the student on the microbiological field work and sample collecting and the basis of microbiological analysis and the student must introduce	3		3		
2	Determination of waterborne and foodborne pathogens that posed a threat to both human and animal health	3		3		
3	Description of the various microbial environments encountered in the field including soil, water, and the atmosphere	3		3		
4	A discussion of methodologies available for detection, enumeration, and identification of microbes and their activities	3		3		

5	An examination of microbial communication, activities, and interactions with their environment and how these activities affect the cycling of nutrients world detection, enumeration, and identification of microbes and their activities	**3**		**3**		
6	An examination of the wastewater treatment and disinfection processes used to treat our largest (in terms of volume) societal waste problem	**3**		**3**		
7	evaluated as practical paper. Before the training or trip the following topics will be covered within the course comprehensive report about the different activity during the field training	**3**		**3**		
8	Reports writing	**3**		**3**		

5.Teaching and Learning Methods

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

6.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Student report quality	9	40	40%
2	Training manager report	8	40	40%
3	Final Written Exam	9	20	20%

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

7.Learning Resources and Supportive Facilities *

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

Supportive facilities & equipment for teaching and learning *	**Supplies**	Markes- board- labtop
	Electronic Programs	
	Skill Labs/ Simulators	
	Virtual Labs	Visual lap
	Other (to be mentioned)	

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

Name and Signature **Course Coordinator** **Prof.Dr. Sabah Abo Elmaty**	**Name and Signature** **Program Coordinator** **Dr Mohamed atef**