Unit Description Form

Course Description Form

Faculty of Engineering / Department of Biomedicine

Unit Information				
Course Information				
Unit Type	**Electromagnetics**			نظريه ☒ حاضر ☒ المختبر ☒ تعليمي ☐ عملي ☐ ☐ **Seminar**
Unit Code	**BME-312**			
ECTS Credits	**3**			
SWL (ساعة / SEM)	**150**			
Unit level	3	**Delivery Semester**	1	
	Biomedical Engineering	**College**	College of Engineering	
Unit Commander	Saad M. Sarhan	**E-mail Address**	saad.mah@uowa.edu.iq	
Title of Unit Commander	Assistant Doctor	**Unit Commander Qualifications**	Doctor	
Unit Teacher		**E-mail Address**		
Peer Reviewer Name		**E-mail Address**		
Date of accreditation of the Scientific Committee	26/9/2025	**Version number**	1.0	

Unit objectives, learning outcomes and how-to contents	
Course objectives, learning outcomes and instructional contents	
Objectives of the Unit	

Course Objectives	□ Understand the fundamental concepts of scalars, vectors, vector algebra, and different coordinate systems. □ Apply Coulomb's Law and compute electric field intensity for different charge distributions (line, surface, and volume). □ Understand electric flux density, Gauss's Law, and the concept of divergence. □ Use the **Del operator** and apply the Divergence Theorem in field analysis. □ Analyze the relationship between electric potential and energy in electrostatic fields.
Unit Learning Outcomes Learning outcomes of the course	By the end of this unit, students will be able to: 1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. 2. An ability to apply engineering design process to produce solutions that meet specified needs with consideration of public health, safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline. 3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw a conclusion. 4. An ability to recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge

Indicative Contents
Indicative Contents
	1. Overview of Scalars, Vectors, Vector Algebra, and Coordinate Systems
	• Definitions of scalar and vector quantities.
	• Vector operations: addition, subtraction, dot product, and cross product.
	• Coordinate systems:
	  ○ Cartesian
	  ○ Cylindrical
	  ○ Spherical
	• Coordinate transformations.
	
	2. Coulomb's Law and Electric Field Intensity + Charge Distributions
	• Coulomb's Law for electric force.
	• Electric field intensity due to point charges.
	• Electric field for:
	  ○ Line charge distributions
	  ○ Surface charge distributions
	  ○ Volume charge distributions

	• Examples and tutorial problems.
	3. Electric Flux Density, Gauss's Law, and Divergence • Definition of electric flux density **D** and its relation to **E**. • Gauss's Law and its mathematical forms. • Applying Gauss's Law to symmetric field problems. • Divergence and its physical interpretation in electrostatics.
	4. Del Operator and Divergence Theorem • Definition and components of the **Del (∇) operator**. • The divergence operation (**∇·A**). • Divergence Theorem and applications in field analysis.
	5. Energy and Potential • Electric potential and its relation to the electric field. • Calculating potential for different charge distributions. • Energy stored in the electric field. • Relationship among work, potential, and electric field.

Learning and Teaching Strategies Learning and Teaching Strategies	
Strategies	□ The instructor delivers detailed theoretical lectures. □ The instructor assigns periodic reports on the fundamental topics of the course. □ Continuous assessment: conducting short quizzes and regular exercises to monitor students' progress and identify areas that need reinforcement. □ Explanation and discussion: encouraging students to explain their solutions and reasoning to promote deep understanding and improve communication skills

Student Workload (SWL) The student's academic load is calculated for 15 weeks			
SWL منظم (h / sem) Regular academic load of the student during the semester	78	**SWL regulator(h/s)** Regular student load per week	4
SWL غير منظم (h / sem) Irregular academic load of the student during the semester	72	**Unregulated SWL (h/s)** Irregular student academic load per week	4

إجمالي SWL (h / sem) The student's total academic load during the semester	125

Unit Evaluation
Course Evaluation

As		Time/Number	Weight (tags)	Week due	Related learning outcomes
Formative Assessment	Contests	2	10% (10)	5, 10	LO #1 , 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO #3 , 4, 6 and 7
	Projects /Laboratory.	1	10% (10)	continuous	every
	report	1	10% (10)	13	LO #5 , 8 and 10
Final Assessment	Midterm Exam	2 hr	10% (10)	7	LO #1-7
	Final Exam	2 hours	50% (50)	16	every
	Overall Rating		100% (100 degree)		

Delivery Plan (Weekly Curriculum)
Theoretical Weekly Curriculum

week	Covered Material
Week 3+2+1	Overview about scaler, vector, vector algebra, and types of coordinate systems.
Week 4+5	Coulomb's Law and Electric Field Intensity, line charge, surface charge, and volume charge, Tutorial
Week 6+7+8+9	Electric Flux Density, Gauss's Law, and Divergence
Week 10+11+12	Del operator and Divergence Theorem
Week 13+14	Energy and Potential
Week 15	Maxwel Equatiions

Learning and Teaching Resources

Learning and Teaching Resources

	text	Available in the library?
Required texts	Electricity and Magnetism by Purcell	Yes
Recommended texts		Yes
Websites		

Grading chart

Grading chart

group	degree	Appreciation	Tags (%)	definition
An-Najah Group (50 - 100)	**A -** Excellent	privilege	90 - 100	Outstanding Performance
	B - Very Good	Very good	80 - 89	Above average with some errors
	C - Good	Good	70 - 79	Proper work with noticeable errors
	D - Satisfactory	medium	60 - 69	Fair but with significant shortcomings
	E - sufficient	Acceptable	50 - 59	The work meets the minimum standards
Group failure (0 – 49)	**FX -** Failed	Deposit (in processing)	(45-49)	More work required but credit granted
	F - Failed	Failure	(0-44)	Large amount of work required

Note: Signs that are more than 0.5 decimal places greater than or below the full mark will be rounded higher or lower (for example, a score of 54.5 will be rounded to 55, while a mark of 54.4 will be rounded to 54. The university has a policy of not tolerating "imminent traffic failure", so the only modification to the marks granted by the original mark(s) will be the automatic rounding described above.