Course Specification
(Bachelor)

Course Title:	Introduction to Plasma Physics
Course Code:	2034215-2
Program:	Bachelor in Physics
Department:	Physics
College:	Science
Institution:	Taif University
Version:	2nd
Last Revision Date:	10/10/2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (2)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (8th / 4th Year)					
4. Course general Description:					
Plasma is the fourth state of matter and it is really important in basics sciences and technology. This course is an introductory course to plasma physics in which the plasma state and the basics plasma parameters and conditions are defined. Also, the plasma models, the plasma oscillation, and waves phenomena in plasma are explained. In addition, applications of Plasma physics are illustrated.					
5. Pre-requirements for this course (if any):					
None					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
The definition of plasma state and its main behavior and characteristics. **- The definition of basic plasma parameters and conditions with some examples of plasma state in nature.** **- The single particle model and the motion of the charged particle in uniform electric and magnetic field.** **- The fluid plasma model, the plasma frequency, and waves in plasma.** **- Applications of Plasma physics.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	E-learning	--	--
3	Hybrid • Traditional classroom • E-learning	--	--
4	Distance learning	--	--

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Identify the basic concept of Plasma phenomena, Plasma parameters and conditions.	K1	Lecture	Written Exam
1.2	Recognize the Plasma behavior in different fields (B, E and Gravitational fields)	K2	Lecture	Written Exam
2.0	Skills			
2.1	Justify how Plasma physics is essential for technology advances.	S3	Problem solving	Written exam Activities
2.2	Explain the phenomena of Plasma as fluids.	S3	Problem solving	Written exam Activities
3.0	Values, autonomy, and responsibility			
3.1	Show responsibility in working independently with continuous improvement of personal capacities.	V1	Group discussion	Project

C. Course Content

No	List of Topics	Contact Hours
1	**1. Introduction** 1.1 Occurrence of Plasmas in Nature 1.2 Definition of Plasma	6

	1.3 Concept of Temperature 1.4 Debye Shielding 1.5 The Plasma Parameter 1.6 Criteria for Plasmas	
2	**2. Single-Particle Motions** 2.1 Uniform E and B Fields 2.1.1 E=0 2.1.2 Finite E 2.2 Gravitational Field	4
3	**3.Plasmas as Fluids** 3.1 Relation of Plasma Physics to Ordinary Electromagnetics 3.1.1 Maxwell's Equations 3.1.2 Classical Treatment of Magnetic Materials 3.1.3 Classical Treatment of Dielectrics 3.1.4 The Dielectric Constant of a Plasma 3.2 Fluid Drifts Perpendicular to B 3.3Fluid Drifts Parallel to B	6
4	**4.Waves in Plasmas** 4.1 Representation of Waves 4.2 Group Velocity 4.3 Plasma Oscillations 4.4 Electron Plasma Waves 4.5 Sound Waves 4.6 Ion Waves 4.7 Validity of the Plasma Approximation 4.8 Comparison of Ion and Electron Waves	6
5	**5. Diffusion and Resistivity** 5.1 Diffusion and Mobility in Weakly Ionized Gases 5.1.1 Collision Parameters 5.1.2 Diffusion Parameters 5.2 Decay of a Plasma by Diffusion 5.2.1 Ambipolar Diffusion 5.2.2 Diffusion in a Slab 5.3 Steady State Solutions 5.3.1 Constant Ionization Function 5.3.2 Plane Source 5.3.3 Line Source 5.4 Recombination	5
6	**6. Plasma Application** 6.1 Fusion Energy 6.2 Plasma acceleration 6.3 Semiconductors etching 6.4 Plasmas in everyday life.	3
Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Throughout Semester	20
2.	1st Periodic Exam	7	15
3.	2nd Periodic Exam	12	15
4.	Final Exam	16	50

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	- Fundamentals of Plasma physics; Paul M. Bellan, Cambridge University Press, 2006. - Introduction to Plasma Physics; R.J. Goldston, P.H. Rutherford, Institute of Physics Publishing, London, 1997
Supportive References	Introduction to Plasma Physics and Controlled Fusion; F. F. Chen, 3rd edition, Springer International Publishing Switzerland 2016.
Electronic Materials	https://link.springer.com/content/pdf/10.1007%2F978-3-319-22309-4.pdf
Other Learning Materials	Online multimedia and CD associated with the text books (when available).

2. Required Facilities and equipment

Items	Resources
facilities	A classroom with movable tables and chairs conducive to group discussion and teamwork.
Technology equipment	Data show, smart board
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Student Feedback on Effectiveness of Teaching	Students	Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Evaluation of Teaching	Pear reviewer Program coordinator Departmental council Faculty council	Indirect
Improvement of Teaching	Program coordinator Relevant committee	Direct
Quality of learning resources	Students Instructor Faculty	Indirect
Extent of achievement of course learning outcomes,	Program coordinator Instructor	Direct
Course effectiveness and planning for improvement	Program coordinator Instructor	Indirect

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	PHYSICS DEPARTMENT COUNCIL
REFERENCE NO.	NO. 4-45
DATE	27/09/2023 (12/03/1445)

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Physics Department
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TAIF UNIVERSITY