4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Introduction to Magnetohydrodynamics**

Course Code: **4046705-4**

Course Specifications

Institution: Umm Al-Qura University Date : 28 / 10 / 2017
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Introduction to Magnetohydrodynamics (4046705-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: Master of Science (Applied Mathematics)				
4. Name of faculty member responsible for the course: Prof. Abdullah A. Abdullah				
5. Level/year at which this course is offered : Leve 3/ Master				
6. Pre-requisites for this course (if any): Fluid Mechanics				
7. Co-requisites for this course (if any): Continuum Mechanics				
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	✓	What percentage?	85	
b. blended (traditional and online)		What percentage?		
c. e-learning	✓	What percentage?	15	
d. correspondence		What percentage?		
f. other		What percentage?		
Comments:				

B Objectives

1. What is the main purpose for this course? This is a 4 credit postgraduate course introducing advanced topics in Magnetohydrodynamics. The main purpose for this course is to introduce the fundamentals of Magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas. The course covers the fundamental equations in magnetohydrodynamics, waves and oscillations and dynamic instability and convection.
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) 1. Updating references used in teaching process. 2. Using e-learning facilities more efficiently.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: This is a 4 credit postgraduate course at Master/Ph. D. level introducing fundamentals of Magnetohydrodynamics. The course comprises approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – General Principles . Electromagnetic effects. . Mechanical effects. . Parallel flow. . Magnetic rigidity.	2	8
Chapter 2 - Magnetohydrostatics . Magnetohydrostatic states. . Force-free field. . Sunpost Equilibrium. . Filaments and prominences. . Magnetohydrostatic instability. . Spiral arma.	3	12
Chapter 3 – Waves and Oscillations . Allven waves and its properties. . Magnetosonic waves. . Hydromagnetic shock waves. . Stellar rotation.	3	12
Chapter 4 – Dynamic Instability and Convection . Modes of instability. . Stability of shear flow. . Kelvin-Helmholtz instability. . Thermal convection.	3	12
Chapter 5 – Dynamo Theories . The dynamo problem. . Symmetric field. . The general kinematic dynamo. . The mechanics of the dynamo. . Turbulent motion.	2	8

Chapter 6 – Plasma Magnetohydrodynamics . Particle effects. . Two-fluid theory. . Partially-ionized gases. . Collisionless plasmas.	2	8

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	60	--				60
Credit	4	--				4

3. Additional private study/learning hours expected for students per week.
Four hours weekly for homework and revision

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column. **First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Have a knowledge on magnetohydrodynamics, waves and oscillations, dynamic instability and convection.	Use various educational tools during the lecture such as open discussion,	Quiz Homework Midterm exam Final exams
1.2	Have the ability to recall the learned		

	material of the course.	problem solving.	
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
2.2	Be able to integrate related topics from separate parts of the course.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show the ability to work independently and within groups.	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
	Have the ability to prove theorems and develop lemmas using different techniques		
	Be able to describe and analyze models using related equations		
4.0	**Communication, Information Technology, Numerical**		
4.1	Learn how to use computer codes to solve problems in Magnetohydrodynamics.	Use software to solve some problems numerically.	Discussion Home Work.
4.2	Use software such as matlab and maple for their calculations.		
5.0	**Psychomotor**		
	Not applicable		

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) 1. Weekly Office hours. 2. Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - Magnetohydrodynamics, T. G. Cowling, Adam Hilger, Bristol (1976). - An Introduction to Magnetohydrodynamics, P. A. Davidson, Cambridge texts in applied mathematics, Cambridge University Press, 2001.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab and Maple software

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Provide a suitable classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- Overhead projector. - Laboratory equipment for individual students.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development. - Self- assessment of the program - External revisions and assessment. - Course report. - Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning.
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) None
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Student's feedback. - Course report. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Prof. Abdullah A. Abdullah

Signature:_____Date Report Completed: 28 / 10 / 2017

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____