Course Specifications

Course Title:	Solid State Physics (1)
Course Code:	42031326
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3 credit hours (2 T + 1 P)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course(if any)**:**	**General Physics (2) - (42031219)**
5. Co-requisites for this course(if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	24	40%
2	**Blended**	12	20%
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other (Laboratory)**	24	40%

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**60**
Other Learning Hours*		
1	**Study**	15
2	**Assignments**	15
3	**Library**	15
4	**Projects/Research Essays/Theses**	-
5	**Others**(Lab reports and exam preparation time)	20
	Total	**65**

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

To introduce the students to the basic concepts of solid state physics

2. Course MainObjectives

- Recognize the crystal structure of solids.
- Determine the crystal structure of solids using different characterization techniques such as x-ray diffraction and electron neutron diffraction.
- Describe the mechanical properties of solids.
- State the different kinds of lattice vibration in solids.
- Memorize the electron theory in solids including Fermi-Dirac distribution and free electron gas.

3. Course Learning Outcomes

CLOs		AlignedPLOs
1	**Knowledge:**	
1.1	Recall the fundamental principles of solidstate Physics.	K1
1.2	Describe physical properties of matter according to its crystal structure.	K1, K2
1.3	Recognize the latest development in solid state physics.	K3
2	**Skills :**	
2.1	Explain the physical phenomena related to solid state physics.	S1
2.2	Apply appropriate mathematical concepts and computational techniques to solve problems in crystal structure and physical properties of solids.	S2
2.3	Conduct experiments in basic solid state physics.	S3
2.4	Analyze data using solid state physics principles.	S4
3	**Competence:**	
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in solid state physics.	C1
3.2	Manage a certain topic in the field of solid state physics with his classmates.	C2
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C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	**Bonding in Solids:** Ionic, covalent, metallic, Van der Waals Bonding.	4
2	**Crystal Structures:** Elements of symmetry, crystal structures,crystal structure determination, reciprocal lattice and diffraction (x-ray diffraction, electron and neutron diffraction and analysis of x-ray patterns)	6
3	**Mechanical Properties of Solids:** Hooke's law, elastic properties of solids, Defects in lattice (point defects and dislocations), plastic deformation.	6
4	**Lattice Dynamics:** Lattice Vibrations, Infinite Chain of Atoms, First Brillouin Zone, Finite	8

No	List of Topics	Contact Hours
	Chain of Atoms, Quantized Vibrations, Phonons, Vibrational Frequencies, Elastic Constants, Heat Capacity of the Lattice, Einstein Model, Debye Model, Thermal Conductivity, Thermal Expansion.	
5	**Electron Theory:** Femi-Dirac distribution, Free electron gas, Heat capacity of the electron gas, Electrical conductivity and ohm's law, Motion in magnetic fields (Hall effect).	6
	Total (Lectures)	30
Practical Part		
1	Hall effect in p-germanium	2
2	Hall effect in n-germanium	2
3	Hall effect in metals	2
4	Characteristic X-rays of copper	4
5	Characteristic X-rays of molybdenum	4
6	Diffractometer Debye-Scherrer patterns of powder samples with diamond structure (germanium and silicon)	4
7	Diffractometric Debye-Scherrer patterns of powder samples with the three cubic Bravais lattices	4
8	Examination of the structure of NaCl mono-crystals with different orientations.	4
9	Modulus of elasticity	2
10	Thermal conductivity	2
	Total (practical)	30
	Total (Lectures + practical)	**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recall the fundamental principles of solid state Physics.	Lectures, blended learning, open discussion and brainstorming	Quizzes,homeworkperiodical Exams, midterm and final exam
1.2	Describe physical properties of matter according to its crystal structure.	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
1.3	Recognize the latest development in solid state physics.	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
2.0	**Skills**		
2.1	Explain the physical phenomena related to solid state physics.	Lectures, blended learning, open discussion and brainstorming, Problem based learning, cooperative learning and lab working.	Quizzes, homework periodical Exams,midterm and final exam.

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
2.2	Apply appropriate mathematical concepts and computational techniques to solve problems in crystal structure and physical properties of solids.	Lectures, blended learning, open discussion and brainstorming, problem based learning, Cooperative learning and computer Simulated labs	Quizzes, homework periodical exams, midterm and final exam.
2.3	Conduct experiments in basic solid state physics.	brainstorming, problem based learning, cooperative learning,lab working and computer Simulated labs	Lab report, oral exam, final practical exam
2.4	Analyze data using solid state physics principles.	Lectures, cooperative learning, lab working and computer Simulated labs	Quizzes, lab report, oral exam, final practical exam
3.0	**Competence**		
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in solid state physics.	Group working, cooperative learning	Worksheet, presentations
3.2	Manage a discussion in a certain topic in the field of solid state physics with his classmates.	Group working, cooperative learning	Worksheet, presentations
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	5	5 %
2	Mid- Term exam	9	10 %
3	Periodical exam 2	13	5 %
4	Home works	During the term	10 %
5	Practical (lab reports)	During the term	10 %
6	Final practical	16	10 %
7	Theoretical Exam	17	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including scheduling of faculty office hours, advices on program planning, subjects selection and

career planning are announced and published to the students in the physics department and the faculty website.
- The students are divided into groups, whereas each student has academic counseling.

2. Student Appeals
- The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Introduction To Solid State Physics, Kittel Charles, 8Th Edition, John Wiley& son(2005). - Solid State Physics, Hofmann P., Wiley-VCH, 2008.
Essential References Materials	The physics of solids, Richard Turton, Oxford 2000
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board ,One laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV. - One data show. - One Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching. - The course content. - Satisfaction with the course - Quality of Learning Resources	Students	Questionnaire
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Faculty (staff member)	Observation of lectures, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Program Leader	Observation of lectures, interviews with involved faculty, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty and course participants, analysis of assessment data,

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)

Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	

Course Specifications

Course Title:	Quantum Mechanics (1)
Course Code:	42031306
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3credit hours**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course(if any)**:**	**Classical Mechanics (2) - (42031325)**
5. Co-requisites for this course(if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	36	80%
2	**Blended**	9	20%
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other (course project)**	-	-

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**45**
Other Learning Hours*		
1	**Study**	15
2	**Assignments**	5
3	**Library**	15
4	**Projects/Research Essays/Theses**	5
5	**Others**(Lab reports and exam preparation time)	-
	Total	**40**

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

To introduce the basic mathematical tools related to quantum mechanics.

2. Course MainObjective

On completing this course, the students will be able to:

- Recognize the postulates of Quantum mechanics.
- Explain the one dimensional models including free particles model, potential well , tunnel effect and linear harmonic oscillator.
- Summarize the three dimensional models including free particles harmonic oscillator, central potential, Bohr model and hydrogen like atom.
- State different kinds of operators used in quantum mechanics.

3. Course Learning Outcomes

CLOs		AlignedPLOs
1	**Knowledge:**	
1.1	Outline the postulates of Quantum mechanics (Eigen functions, Eigen values, expectation values)	K1
1.2	Describe the one dimensional free particles model moving in potential well.	K2
1.3	Recognize the importance of hydrogen like atoms in modern physics researches.	K3
2	**Skills :**	
2.1	Derive the time independent Schrödinger equation of the hydrogen atom and solve it.	S1
2.2	Deduce the matrix elements of the Harmonic oscillator.	S2
2.3	Interperate the reflection, transitions and scattering of a particle in step potentials.	S4
3	**Competence:**	
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in Quantum mechanics (1).	C1
3.1	Search in the internet and libraries for quantum confinement and it relation to step potentials.	C3

C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	**Early evidence for quantum behavior:** Photoelectric effect, black body radiation and electron wave function.	6
2	**Postulates of quantum mechanics:** Postulates of quantum mechanics, Dirac notation, operator's , eigen and vectors and functions, eigen values, matrix elements, expectation values.	10
3	**Representations:** of position operators, position functions operators and linear momentum, the Hamiltonian operator and time independent Schrödinger equation, commutators of positions and linear momentum operators.	9

No	List of Topics	Contact Hours
4	**One dimensional models:** Free particle, potential well, step potential, tunnel effect, linear harmonic oscillator, harmonic oscillator.	12
5	**Three dimensional models:** Central potentials, Bohr model and hydrogen like atom.	8
	Total	45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Outline the postulates of Quantum mechanics (Eigen functions, Eigen values, expectation values)	Lectures, Open discussion	Quizzes, homeworkperiodical Exams, midterm and final exam
1.2	Describe the one dimensional free particles model moving in potential well.	Lectures, Open discussion	Quizzes, homework periodical exams, midterm and final exam.
1.3	Describe the one dimensional free particles model moving in potential well .	Lectures, Open discussion	Quizzes, homework periodical exams, midterm and final exam.
2.0	**Skills**		
2.1	Derive the time independent Schrödinger equation of the hydrogen atom and solve it.	Lectures, Open discussion and derivations.	Quizzes, homework periodical exams, midterm and final exam.
2.2	Solve Schrödinger equation using potential well.	Lectures, Open discussion	Quizzes, homework periodical exams, midterm and final exam.
2.3	Construct the Hamiltonian of a harmonic oscillator solve its Schrödinger equation.	Lectures, Open discussion, analytical solutions of DE using computer packages.	Quizzes, homework periodical exams, midterm and final exam.
3.0	**Competence**		
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in Quantum mechanics (1).	Teamwork, Discussions	Worksheet, presentation
3.2	Search in the internet and libraries for quantum condiments and it relation to step potential.	Intertnet and library resources	Worksheet, presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	5	10 %
2	Mid- Term exam	9	20 %
3	Periodical exam 2	13	10 %
4	Home works	During the term	10 %
5	Final theoretical Exam.	17	50 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including scheduling of faculty office hours, advices on program planning, subjects selection and career planning are announced and published to the students in the physics department and the faculty website.
   - The students are divided into groups, whereas each student has academic counseling.
2. Student Appeals
   - The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	"Quantum Mechanics Concepts and Applications" , NouredineZettili, 2nd ed., 2009, by John Wiley and Sons, Ltd.
Essential References Materials	"Introduction to Quantum Mechanics", A. C. PHILLIPS, 2003 by John Wiley & Sons Ltd. "Essential Quantum Mechanics" , GARY E. BOWMAN,2008m by Oxford University Press Inc.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board.
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV. - One data show. - One Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment	-

Item	Resources
is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching. - The course content. - Satisfaction with the course - Quality of Learning Resources	Students	Questionnaire
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Faculty (staff member)	Observation of lectures, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Program Leader	Observation of lectures, interviews with involved faculty, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty and course participants, analysis of assessment data,

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	

Course Specifications

Course Title:	Nuclear Physics (1)
Course Code:	42031324
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3 credit hours (2 T + 1 P)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course(if any)**:**	**Modern Physics (42031313)**
5. Co-requisites for this course(if any)**: None**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	24	40%
2	Blended	12	20%
3	E-learning	-	-
4	Correspondence	-	-
5	Other (Laboratory)	24	40%

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	-
4	Others (specify)	-
	Total	60
Other Learning Hours*		
1	Study	15
2	Assignments	15
3	Library	15
4	Projects/Research Essays/Theses	-
5	Others(Lab reports and exam preparation time)	20
	Total	65

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1.Course description

Student will gain basic knowledge about nuclear physics concepts as well as about different possibilities of nuclear physics applications in technology and medicine.

2. Course MainObjective

Having successfully completed this course, you will be able to :

- Describe properties of the nucleus: Isotopes, nuclear binding energy, angular momentum, nuclear electromagnetic moments, and nuclear forces.
- Demonstrate radioactivity phenomena: Decay law, natural radioactivity, successive decay, artificial radioactivity basic α – decay process, β -decays and γ -transitions.
- Identify interaction of radiation with matter: Interaction of heavy and light charged particles with matter, stopping power, interaction of gamma radiation with matter (Photoelectric, Compton and pair production) and neutrons
- State the different kinds of radiation detectors and accelerators.
- Develop problem solving skills in the above areas.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Recall the fundamental principles, theories and applications which are studied during the course.	**K1**
1.2	Describe natural radioactivity and the differences between various decay modes.	**K2**
1.3	Recognizeknowledge of the interaction of radiations with matter theories, recent advances of radiation detection and accelerators applications in nuclear physics (1) .	**K3**
2	**Skills :**	
2.1	Explain the nuclear processes laws associated with nuclear phenomena arising from the interaction of radiation with matter	**S1**
2.2	Solve basic problems involving the application of the concepts of nuclear process covered in the course.	**S2**
2.3	Explain the physics behind the techniques used in the applications of the concepts of nuclear physics in the practical situations covered in the course unit.	**S3**
2.4	Analyze and interpret the aspect of nuclear physics process covered in the course that are most important to applications in such areas as nuclear structure, radioactivity, biotechnology, radioactive,etc.	**S4**
3	**Competence:**	
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in nuclear physics.	C1
3.2	Explore an application of nuclear physics and sharehis understanding with a group of peers in a presentation appropriate for differing audiences.	C2
....		

C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	**PROPERTIES OF THE NUCLUES:** - **Constituents of nucleus**: - Isotopes, isobars, isotones, and mirror nuclei. - Nuclear charge, mass, radius, and density. - Nuclear force and force carrier. - **Binding energy:** binding energy and mass defect, binding energy per nucleon, binding energy graph. semi-empirical mass formula. **Separation energy:** Separation energy of neutron, proton, alpha particle. **Intrinsic properties of the nucleus:** -Total angular momentum and nuclear spin. - Nuclear magnetic dipole moments. - Nuclear parity.	8
2	**RADIOACTIVE DECAY DYNAMIC:** - **Radioactivity:** (radioactive decay law, decay chains, radiation activity) - **Nuclear decay modes:** (alpha-decay, beta-decay, gamma-decay). - **Radioactive decay reaction:** Q-value of the decay reaction, and the kinetic energy of the alpha particle. - **Radioactive equilibrium:** series decay with short-lived parent, Series decay with long-lived parent). - Radioactive decay scheme and successive radioactive transformations.	8
3	**INTERACTION OF RADIATION WITH MATTER:** - **Radiation types and sources:** alpha, beta, gamma and neutrons. - **Interaction of charged particles** Beth-Bloch Formula, energy loss, mass-stopping power, particle range, and Straggling. - Interaction of accelerated electrons: (the energy loss and the particles range and Radiation loss (Bremsstrahlung). - **Interaction of photons**: photo-electric effect, Compton scattering, pair production, - Attenuation of neutron beams Linear and Mass Attenuation Coefficients. - **Interaction of Neutrons:** elastic scattering, inelastic scattering, and neutron capture.	6
4	**RADIATION DETECTION:** - Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, and Geiger Muller Counter). - Scintillation Detectors (Inorganic and Organic Scintillators). - Solid States Detectors. - Neutron Detectors.	4
5	**PARTICLE ACCELERATORS:** - Motion of charged particles in electric and magnetic fields. - Particle Accelerator Components. - Types of particle accelerators: • Electrostatic Accelerators: Cockcroft-Walton, Van de Graaff, Tandem	4

No	List of Topics	Contact Hours
	Van de Graaff. • Radio-frequency Accelerators: LINAC, RFQ, Cyclotron,	
	Total (Lectures)	**30**

Practical Part		
1	Plotting the characteristic curve of G-M counter (Plateau curve)	3
2	Determination of threshold voltage of G-M counter	3
3	Determination operating voltage of G-M counter	3
4	Determination resolving "dead" time and Background measurements for Geiger tube detector.	3
5	Measurement the absorption coefficient for various absorbing materials	3
6	Verification the Inverse Square Law using radioactive material and Geiger tube.	3
7	Investigate the attenuation of radiation via the absorption of beta particles. Study of absorption of beta particles in Aluminum using GM counter.	3
8	Measurement the half-life time for Ba-137m radioactive material	3
9	Determination the range of an alpha particle in air, and consequently the alpha particle's energy.	3
10	Determination the efficiency of a Geiger-Muller counter for various types of radiation.	3
Total (practical)		**30**
Total (Lectures + practical)		**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recall the fundamental principles, theories and applications which are studied during the course.	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical Exams, midterm and final exam
1.2	Describe natural radioactivity and the differences between various decay modes.	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
1.3	Recognizeknowledge of the interaction of radiations with matter theories, recent advances of radiation detection and accelerators applications in nuclear physics.	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
2.0	**Skills**		
2.1	Explain the nuclear processes laws associated with nuclear phenomena	Lectures, blended learning, open discussion and brainstorming,	Quizzes, homework periodical Exams,midterm and

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
	arising from the interaction of radiation with matter	Problem based learning, cooperative learning and lab working.	final exam.
2.2	Solve basic problems involving the application of the concepts of nuclear process covered in the course.	Lectures, blended learning, open discussion and brainstorming, problem based learning, Cooperative learning and computer Simulated labs	Quizzes, homework periodical exams, midterm and final exam.
2.3	Explain the physics behind the techniques used in the applications of the concepts of nuclear physics in the practical situations covered in the course unit.	brainstorming, problem based learning, cooperative learning,lab working and computer Simulated labs	Lab report, oral exam, final practical exam
2.4	Analyze and interpret the aspect of nuclear physics process covered in the course that are most important to applications in such areas as nuclear structure, radioactivity, biotechnology, radioactive,etc.	Lectures, cooperative learning, lab working and computer Simulated labs	Quizzes, lab report, oral exam, final practical exam
3.0	**Competence**		
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in nuclear physics.	Group working, cooperative learning	Worksheet, presentations
3.2	Explore an application of nuclear physics and sharehis understanding with a group of peers in a presentation appropriate for differing audiences.	Group working, cooperative learning	Worksheet, presentations
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	5	5 %
2	Mid- Term exam	9	10 %
3	Periodical exam 2	13	5 %
4	Home works	During the term	10 %
5	Practical (lab reports)	During the term	10 %
6	Final practical	16	10 %
7	Theoretical Exam	17	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including scheduling of faculty office hours, advices on program planning, subjects selection and career planning are announced and published to the students in the physics department and the faculty website.
   - The students are divided into groups, whereas each student has academic counseling.
2. Student Appeals
   - The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008). - Introduction to Nuclear Physics, by Enge, Publisher: Addison Wisley, 1975.
Essential References Materials	- S.N.Ghoshal, Nuclear Physics, company ltd & S. Chand, New Delhi, 2009.
Electronic Materials	None
Other Learning Materials	http://ie.lbl.gov/toi.html http://www.splung.com http://www.physicstoday.org Websites of CERN, Fermi Lab etc.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board.
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV. - One data show. - One Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching. - The course content. - Satisfaction with the course - Quality of Learning Resources	Students	Questionnaire
- Teaching methods.	Faculty	Observation of lectures, analysis of

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Planned and actual study hours. - Achievement of course learning outcomes.	(staff member)	assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Program Leader	Observation of lectures, interviews with involved faculty, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty and course participants, analysis of assessment data,

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	

Course Specifications

Course Title:	Computational Physics
Course Code:	42031407
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3 credit hours**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course (if any)**:**	**Scientific Programming (42031206)**
5. Co-requisites for this course(if any)**:**	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	42	70%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other(Lab)**	18	30%

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**60**
Other Learning Hours*		
1	**Study**	15
2	**Assignments**	15
3	**Library**	15
4	**Projects/Research Essays/Theses**	-
5	**Others**(Lab reports and exam preparation time)	15
	Total	**60**

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an introduction to computational methods in solving problems in physics. It introduces logarithmic concepts and familiarizes students with the basic computational tools which are essential for graduate students in computational physics and related areas. It teaches programming tactics, numerical methods and their implementation, together with methods of linear algebra. These computational methods are applied to problems in physics, including the modeling of classical physical systems to quantum systems, as well as to data analysis such as linear and nonlinear fits to data sets. In this course, students work toward mastering computational skills, needed to work in classical and quantum physics using the computer.

2. Course MainObjective

To Solve physical problems by the mean of numerical methods with the aid of computer high-level language and packages..

3. Course Learning Outcomes

CLOs		AlignedPLOs
1	**Knowledge:**	
1.1	Recall the methods of numerical (differentiation, integrations, finding roots, errors definitions and estimations).	K1
1.2	Describe some procedures ofsolving mathematical problems with the aid of computer simulations and numerical techniques (ODEs,PDEs, matrix manipulations).	K2
1.3	Recognize the roll of methodologies of computational physics in understanding physical world.	K4
2	**Skills :**	
2.1	Apply principlesof numerical approaches fit some results of an experimental data of physics' experiments.	S1
2.2	Utilize numerical methods for modeling physical systems.	S2
2.3	Analyze and interpret the results of solving ODEs and PDEs of some physics problems.	S3
2.4		S4
3	**Competence:**	
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standard on assigned tasks in computational physics.	C1
3.2	Search in the internet and libraries for certain modern topic in the field of computational physics.	C2

C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	Introduction to numerical analysis	2
2	Error analysis	2
3	Roots finding	2
4	Methods of data fitting	2
5	Methods of numerical differentiations	4
6	Methods of numerical integrations	4
7	Matrix operations	2
8	Numerical solutions of ODEs	4
9	Numerical solutions of PDEs	4
10	Solving physical problems	4
	Total (Lectures)	30

No	List of Topics	Contact Hours
Practical Part None		
1	Practical parts	20
2	Physical problem (project)	10
3		-
4		-
5		-
6		-
7		-
8		-
Total (practical)		30
Total (Lectures + practical)		**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recall the methods of numerical (differentiation, integrations, finding roots, errors definitions and estimations).	- Lecturing, open discussion's	Quizzes, Short exams, final exam,
1.2	Describe some procedures ofsolving mathematical problems with the aid of computer simulations and numerical techniques (ODEs,PDEs, matrix manipulations).	Lectures, Open discussion, Search activities	Quizzes, Short exams, final exam.
1.3	Recognize the roll of methodologies of computational physics in understanding physical world.	Lectures, Open discussion, Search activities	Quizzes, Short exams, final exam,
2.0	**Cognitive Skills**		
2.1	Apply principlesof numerical approaches fit some results of an experimental data of physics' experiments.	- Problem solving - Class discussion, lab working	- Class participation - Graded homework - Midterms - Final Exam, practical exams
2.2	Utilized numerical methods for modeling physical systems.		
2.3	Recognize the roll of methodologies of computational physics in understanding physical world.	Searching the internet and libraries	Dissuasion and home works

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
3.0	**Competence**		
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standard on assigned tasks in computational physics.	-Search activities - working group - Discussion - lab working	Worksheet, presentations
3.2	Search in the internet and libraries for certain modern topic in the field of computational physics.	-Search activities - working group - Discussion	Worksheet, presentations
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	6	5 %
2	Mid- Term exam	9	10 %
3	Periodical exam 2	12	5 %
4	Home works	During the term	10 %
5	Practical (lab reports)	During the term	10 %
6	Final practical	16	10 %
7	Theoretical Exam	17	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including scheduling of faculty office hours, advices on program planning, subjects selection and career planning are announced and published to the students in the physics department and the faculty website.
   - The students are divided into groups, whereas each student has academic counseling.
2. Student Appeals
   - The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Numerical Methods, S. Kalavathy, Thomson Learning (2005)
Essential References Materials	- Introduction to Numerical Analysis , Carl E. Froberg, Addison Wesley Publishing Company; 2nd edition (July

	1969)
Electronic Materials	*None*
Other Learning Materials	*None*

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV - One data show - One Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of Teaching. - The course content. - Satisfaction with the course. - Quality of Learning Resources.	*Students*	Questionnaires
- Teaching Methods. - Planned and actual study hours. - A achievement of course learning outcomes.	Faculty (staff member)	Observation of lectures, analysis of assessment data
- Teaching Methods. - Planned and actual study hours. - A achievement of course learning outcomes.	Program leader	Observation of lectures, interviews with involved faculty, analysis of assessment data
- Teaching Methods. - Planned and actual study hours. - A achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty, and course participants, analysis of assessment data

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	

Course Specifications

Course Title:	Electronics (2)
Course Code:	42031320
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3 credit hours (2 T + 1 P)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course(if any)**:**	**Electronics (1) - (42031311)**
5. Co-requisites for this course(if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	24	40%
2	**Blended**	12	20%
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other (Laboratory)**	24	40%

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**60**
Other Learning Hours*		
1	**Study**	15
2	**Assignments**	15
3	**Library**	15
4	**Projects/Research Essays/Theses**	-
5	**Others**(Lab reports and exam preparation time)	20
	Total	**65**

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

- Perform arithmetic operations within binary numeration system
- Differentiate between logic gates
- Design elementary combinatory/sequential logic functions.
- Gain practical experience in realizing numeric functions by using logic gates.

2. Course MainObjective

To introduce the students to the basic concepts of digital electronicscircuits.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	Explain the principles conversion of Binary arithmetic system	K1
1.2	Recall the basic logic gates and truth tables	K2
1.3	Describe the fundamentals principles of Combination logic Function	K2,K3
2	**Skills :**	
2.1	- Convert a binary number to a decimal number and vice versa - Perform arithmetic operations within the binary base (addition /subtraction/multiplication)	S1
2.2	Simplify the Boolean expression by using (Demorgan Theorem, Karnaugh map technique) and design the correspondent circuit	S2
2.3	Design a Combinational logic Circuits (Encoder,Decoder, Multiplexer, Demultiplexer)	S3
2.4	- Implement and verifythe truth table for various flip-flops - Build up a counter	S4
3	**Competence:**	
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in digital electronicCircuits.	C1
3.2	Manage a certain topic in the field of digital electronics circuits with his classmates.	C2
....	-	

C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	**Numeration Systems** Numbers and symbols, Systems of numeration, Decimal versus binary numeration, Octal and hexadecimal numeration, Octal and hexadecimal to decimal conversion, Conversion from decimal numeration	4
2	**Binary Arithmetic** Numbers versus numeration, Binary addition, Negative binary numbers, Subtraction, Overflow, Bit groupings.	4
3	**Logic Gates** Not, Buffer, AND, NAND, OR, NOR, XOR, XNOR	4
4	**Boolean Algebra** Boolean arithmetic. Boolean algebraic identities. Boolean algebraic properties. Boolean rules for simplification. Circuits simplification examples. De Morgan Theorem	4
5	**Karnaugh Mapping** Venn Diagram. Karnaugh maps. Minterm VS maxterm solution. Sum and product notation	4
6	**Combinational Logic Functions** Half adder. Full adder. Decoder. Encoder. Multiplexer	4

No	List of Topics	Contact Hours
7	**Flip-Flops** D flip-flop, RS flip-flop, JK flip-flop, T flip-flop	4
8	**Counters** Binary count sequence. Asynchronous counter. Synchronous counter	2
	Total (Lectures)	30
Practical Part		
1	Study of basic gates and verify their truth tables	4
2	Simplify and modify Boolean logic functions by means of Demorgan's Theorem.	2
3	Simplification of Boolean logic function using K-Map	4
4	Construct and test Half/Full adder circuits	4
5	Design and implement a Multiplexer/Demultiplexer	4
6	Design and implement encoder/decoder	4
7	Study of Flip Flops	4
8	Study of Synchronous/Asynchronous Counters	4
	Total (practical)	30
	Total (Lectures + practical)	**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Explain the principles conversion of Binary arithmetic system	Lectures, blended learning, open discussion and brainstorming	Quizzes,homeworkperiodical Exams, midterm and final exam
1.2	Recall the basic logic gates and their truth tables	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
1.3	- Describe the fundamentals principles of Combination logicFunction - Describe the flip-flop architecture (based on elementary logic gates)	Lectures, blended learning, open discussion and brainstorming	Quizzes, homework periodical exams, midterm and final exam.
2.0	**Skills**		
2.1	- Convert a binary number to a decimal number and vice versa - Perform arithmetic operations within the binary base (addition /subtraction/multiplication)	Lectures, blended learning, open discussion and brainstorming, Problem based learning, cooperative learning and lab working.	Quizzes, homework periodical Exams, midterm and final exam.
2.2	Simplify the Boolean	Lectures, blended learning,	Quizzes, homework

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
	expression by using (Demorgan Theorem, Karnaugh map technique) and design the correspondent circuit	open discussion and brainstorming, problem based learning, Cooperative learning and computer Simulated labs	periodical exams,midterm and final exam.
2.3	Design a Combinational logic Circuits (Encoder,Decoder, Multiplexer, Demultiplexer)	brainstorming, problem based learning, cooperative learning,lab working and computer Simulated labs	Lab report, oral exam, final practical exam
2.4	- Implementation and verification of truth table for various flip-flops - Build up a counter	Lectures, cooperative learning, lab working and computer Simulated labs	Quizzes, lab report, oral exam, final practical exam
3.0	**Competence**		
3.1	Demonstrate interpersonal skills of teamwork, individual responsibility for own learning and ethical standards on assigned tasks in the field of digital electronic Circuits.	Group working, cooperative learning	Worksheet, presentations
3.2	Manage a discussion in a certain topic in the field of digital electronics circuits with his classmates.	Group working, cooperative learning	Worksheet, presentations
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	5	5 %
2	Mid- Term exam	9	10 %
3	Periodical exam 2	13	5 %
4	Home works	During the term	10 %
5	Practical (lab reports)	During the term	10 %
6	Final practical	16	10 %
7	Theoretical Exam	17	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including

scheduling of faculty office hours, advices on program planning, subjects selection and career planning are announced and published to the students in the physics department and the faculty website.

- The students are divided into groups, whereas each student has academic counseling.

2. Student Appeals

- The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Lessons in Electric Circuits (Vol. IV), Tony R. Kuphaldt, Koros press, 2012 - Digital Principles and Applications, A. P. Malvino, D. P. Leach, Mc-Graw HILL, 2016 - Foundations of Analog and Digital Electronic Circuits, A. Agarwal, J. H. Lang, Elsevier,2005
Essential References Materials	None
Electronic Materials	- https://www.coursera.org/; - https://www.edx.org/; - https://player.fmhttps://en.wikipedia.org
Other Learning Materials	Proteus design suite (Or any other environment based on SPICE (Simulation Program with Integrated Circuit Emphasis)e

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board ,One laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV. - One data show. - One Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching. - The course content. - Satisfaction with the course - Quality of Learning Resources	Students	Questionnaire
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Faculty (staff member)	Observation of lectures, analysis of assessment data,

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Program Leader	Observation of lectures, interviews with involved faculty, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty and course participants, analysis of assessment data,

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	

Course Specifications

Course Title:	Electrodynamics
Course Code:	42031322
Program:	BSc in Physics
Department:	Department of Physics
College:	Faculty of Science
Institution:	AlBaha University

Table of Contents

A. Course Identification

1. Credit hours:	**3credit hours**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Sixth Level / Third Year**
4. Pre-requisites for this course(if any)**:**	**Electromagnetism - (42031214)**
5. Co-requisites for this course(if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	36	80%
2	**Blended**	9	20%
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other (course project)**	-	-

7. Actual Learning Hours(based on academic semester)

No	Activity	Learning Hours
	Contact Hours	
1	**Lecture**	45
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**45**
	Other Learning Hours*	
1	**Study**	15
2	**Assignments**	5
3	**Library**	15
4	**Projects/Research Essays/Theses**	5
5	**Others**(Lab reports and exam preparation time)	-
	Total	**40**

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course aims to provide students with an introduction to the principles and behaviors of dynamical electric and magnetic systems, and a theoretical foundation in classical field theory. Topics to be covered include: Maxwell's equations; Electrodynamics potentials; Electromagnetic waves; Radiation and Electrodynamics

2. Course MainObjective

On completing this course, the students will be able to:

- Recognize the basic principles of electrodynamics theory
- Impart knowledge onbasic laws of propagation of electromagnetic waves in free space and matter
- Impart knowledge on the radiation fields and electric dipole radiation
- Estimate the angular distribution of multiple radiations.

-Calculate the field tensor, equation of motion and the relativistic Lorenz Dirac equation.

3. Course Learning Outcomes

CLOs		AlignedPLOs
1	**Knowledge:**	
1.1	Recall the Maxwell's equations in free space and matter	K1
1.2	Outline the laws of wave propagationin free space and matter.	K2
1.3	State the electromagnetic wave propagation lows in free space and matter	K3
2	**Skills :**	
2.1	Deduce formulas of electric dipole and magnetic dipole radiation	S1
2.2	Calculate the reflection, transmission, absorption and dispersion of electromagnetic wave between interfaces in wave guide.	S2
2.3	Estimate the electromagnetic waves energy using Poynting's theorem	S2
2.4	Analyze the equations of motions and radiation damping using vector potential and field tenser.	S4
3	**Competence:**	
3.1	Dealing with others and collaborative work	C1
3.2	Respect the opinion of others and accepts the criticism.	C2

C. Course Content

No	List of Topics	Contact Hours
	Lectures	
1	**Maxwell's equations:** Generalized of Ampere's law, Maxwell's equations in space and matter.	9
2	**Electrodynamics potentials:** Scalar and vector potential equations, Poynting's theorem, momentum, potentials formulation, Gauge transformations.	9
3	**Electromagnetic waves:** Electromagnetic waves in space and matter, reflection, transmission, absorption, dispersion, waves guide.	9
4	**Radiation:** Radiation fields, electric dipole and magnetic dipole radiation, Center-Fed linear Antenna, angular distribution of multipole radiation.	9
5	**Electrodynamics and relativity:** Four vector potential, field tenser, equations of the motion, radiation	9

No	List of Topics	Contact Hours
	damping and relativistic Lorentz-Dirac equation.	
	Total	45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recall the Maxwell's equations in free space and matter	Lectures, Open discussion.	Quizzes, homeworkperiodical Exams, midterm and final exam
1.2	Outline the laws of wave propagationin free space and matter.	Lectures, Open discussion.	Quizzes, homework periodical exams, midterm and final exam.
1.3	State the electromagnetic wave propagation laws in free space and matter	Lectures, Open discussion. Cooperative learning	Quizzes, homework periodical exams, midterm and final exam.
2.0	**Skills**		
2.1	Deduce formulas of electric dipole and magnetic dipole radiation	Lectures, Open discussion Brainstorming.	Quizzes, homework periodical exams, midterm and final exam.
2.2	Calculate the reflection, transmission, absorption and dispersion of electromagnetic wave between interfaces in wave guide.	Using some computer packages	Quizzes, homework periodical exams, midterm and final exam.
2.3	Estimate the electromagnetic waves energy using Poynting's theorem	Using library, lectures	Quizzes, homework periodical exams, midterm and final exam.
1.4	Analyze the equations of motions and radiation damping using vector potential and field tenser.	Using library, lectures and internet.	Quizzes, homework midterm and final exam.
3.0	**Competence**		
3.1	Dealing with others and collaborative work	Group working Cooperative learning	Worksheet, presentations
3.2	Respect the opinion of others and accepts the criticism.	Group working Cooperative learning	Worksheet, presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodical exam 1	5	10 %
2	Mid- Term exam	9	20 %
3	Periodical exam 2	13	10 %
4	Home works	During the term	10 %
5	Final theoretical Exam.	17	50 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Student Academic Counseling
   - The arrangements for academic counseling and advices for the students, including scheduling of faculty office hours, advices on program planning, subjects selection and career planning are announced and published to the students in the physics department and the faculty website.
   - The students are divided into groups, whereas each student has academic counseling.
2. Student Appeals
   - The regulations for student appeals on academic matters are announced and published in the physics department and the faculty website.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	"Introduction to Electrodynamics", David J. Griffiths, 3rd, 1999, by Prentice-Hall, Inc.
Essential References Materials	List Essential References Materials (Journals, Reports, etc.) Classical Electrodynamics", John David Jackson, 3rd, 1999, John Wiley & Sons, Inc..
Electronic Materials	Youtube web site
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- One classroom containing computer access, and white board.
Technology Resources (AV, data show, Smart Board, software, etc.)	- One AV. - One data show. - One Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching. - The course content. - Satisfaction with the course - Quality of Learning Resources	Students	Questionnaire
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Faculty (staff member)	Observation of lectures, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Program Leader	Observation of lectures, interviews with involved faculty, analysis of assessment data,
- Teaching methods. - Planned and actual study hours. - Achievement of course learning outcomes.	Peer Reviewer	interviews with involved faculty and course participants, analysis of assessment data,

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Curriculum Committee
Reference No.	
Date	