قسم الفيـــــــزياء

Department of Physics

Handbook for the program of Master of Science in Physics

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Contents

A welcome from the Head of the Department of Physics

أعزائي طلاب وطالبات الدراسات العليا بقسم الفيزياء بجامعة الملك عبدالعزيز

السلام عليكم ورحمة الله وبركاته

يسرني أن أرحب بكم في قسمكم العريق والذي يتميز ببيئة تعليمية تزخر بنخبة من أعضاء هيئة التدريس الضالعين في علوم الفيزياء بجميع تخصصاتها وببنية تحتية معملية ضخمة تحفز على الإبداع والابتكار في البحث العلمي.

إن دراستكم في هذا القسم ستكون رحلة تجمع بين المعرفة العلمية والتحديات الأكاديمية الشيقة التي تتبعون خلالها شغفكم العلمي لخدمة وطننا الغالي وخدمة البشرية جمعاء بدفع عجلة المعرفة الانسانية فتبدؤون من حيث انتهى الاخرون وتقفون على اكتاف العمالقة من العلماء والعالمات الذين سبقونا بإسهاماتهم العظيمة.

أرجو لكم تجربة دراسية ملهمة وناجحة، وأثق بأنكم ستسهمون بإثراء المعرفة العلمية وتحقيق الإنجازات في مجال الفيزياء. معاً، سنبني مستقبلًا واعدًا يليق بوطننا الحبيب.

رئيس قسم الفيزياء

د. أحمد بن عبيد الزهراني

Purpose of the Handbook

The design of this manual is to provide enough information to both current and prospective students as well as faculty members about King AbdulAziz University's academic degree program in Master of Science in physics, program structure, provided courses, admissions, thesis, defense, and graduation requirements.

The department reserves the right to review and revise the manual content at any time it is deemed necessary. Such amendments remain in line with promoting the best interests of our students, staff, and faculty members. The department informs all students, faculty members, and other academic units, should these changes occur.

King Abdulaziz University (KAU), its history, and cases of distinction

In 1973, KAU joined the Saudi public universities' system. Since then, KAU has gained successful experience and pioneered many academic systems and traditions in the development of higher education in the Kingdom. In less than 50 years, King Abdulaziz University has grown to being the highest ranked university locally and in the Arab region, according to the World University Rankings, with a growing reputation for innovative scientific research. It also ranked 101 globally.

The physics Department, its history, and cases of distinction

The Department of Physics was founded with the Faculty of Science establishment in 1973 (1393AH), including the Astronomy Division until 1978 (1399 AH), and then the Astronomy Division became an independent department and entirely separated from the Department of Physics. The department grants a Bachelor of Science degree (B.Sc.) and Master of Science degree (M.Sc.) from its establishment. In 2010, the department beginning to award a Doctor of Philosophy degree (Ph.D.).

It is equipped with sophisticated equipment and research labs. Furthermore, the departmental staff published more than 400 papers in highly reputed ISI journals and scored more than 8000 citations every year. The department obtained several US patents. Interestingly, the winner of the Best Researcher Award at King Abdulaziz University in Basic and Life Sciences in 2020 and the winner of the Best Postgraduates Supervisor Award in Basic and Life Sciences at King Abdulaziz University for the year 2022 is also from the Physics Department. In the last two years, five faculty members were included in the list of the American Stanford University for the top 2% of the world's most cited scientists in the statistics published by Elsevier for the years 2022 & 2023 AD. Also, many faculty members have obtained PhD degrees from prestigious Universities around the world and have taught there.

1. Introduction

Program design

Level: Post Graduate Program

Duration: 3 Years.

Language : English.

1.1 Overview of the master's program

The Master's Program in Physics is designed to offer a comprehensive educational experience within a flexible timeframe. The program duration spans a minimum of four academic semesters to a maximum of eight semesters, excluding summer semesters. This timeline is calculated from the initial registration in postgraduate courses and continues until the student's supervisor submits a comprehensive report to the department head, encompassing essential elements such as the thesis and program-specific requirements.

Students in the Master's Program are granted an exceptional opportunity for an extension, not exceeding two academic terms, under specific conditions. This extension is contingent upon a detailed report from the supervisor, a positive recommendation from the Council of the Department and College, and subsequent approval by the Council of the Deanship of Graduate Studies.

The prospective target group for the Master's in Physics program includes graduates in Physics who seek to deepen their understanding within the field after completing their undergraduate degree. These individuals possess a solid foundation in the fundamental principles of physics, mathematics, and related sciences. Additionally, the program caters to graduate teachers (BT Assistants), individuals who are either currently employed as graduate teachers or aspire to teaching careers in the field of physics. This group, already equipped with teaching experience, aims to enhance their knowledge base, pedagogical skills, and expertise in specific areas of physics. The Master's Program in Physics is thus structured to accommodate both recent graduates and working professionals, offering a tailored educational experience that aligns with their career goals and aspirations.

1.2 Program's mission

Preparing highly qualified graduates in physics equipped with international academic standards and scientific research and innovation skills, who contribute efficiently to the labor market and community service.

1.3 Program Goals

1. Provide postgraduate students with an advanced understanding of fundamental and modern physics with strong analytical and experimental skills.
2. Empower postgraduate students with robust scientific research and communication skills.
3. Promote highly qualified postgraduate students for a wide range of career paths, to engage in the labor market and service the community in accordance with Saudi Vision 2030.
4. Establish a motivating academic environment for teaching, learning, research, and innovation.

1.4 Graduate attributes

By the completion of the Master's degree requirements, our students are expected to :

5. Have deep knowledge of key principles and concepts of the core curriculum of a physics Graduate degree and the field of specialty.
6. Demonstrate the ability to critically evaluate and interpret scientific literature, understanding the current and future directions of physics research.
7. Conduct research in a specialized physics field using the essential theoretical, computational, and/or experimental skills and appropriately communicate the results.
8. Effectively collaborate and participate in research activities or groups and undertake leadership roles when needed.
9. Show social responsibility by contributing to the improvement of community life.
10. Demonstrate integrity, professional and academic values when dealing with various issues.

1.5 Professions/jobs for which students are qualified.

The Msc holder can easily be qualified to be offered jobs into the followings:

1. Physics Teacher
2. Water distillation specialist
3. Core analysis specialist
4. Metrology Specialist
5. Science Specialist
6. Communication specialist
7. Sustainability scientist
8. Laser technology specialist
9. Environmental consultant
10. Electronics and technology specialist
11. Laboratory specialist/ technician
12. Solar Energy technician
13. Electronics specialist
14. Radiotherapy
15. Medical imaging
16. Nuclear medicine
17. Radiation protection
18. Mining and mineral processing
19. Government regulatory agencies
20. Private consulting, product development and training

21. Associated research activities of non-hospital institutions
22. Developing industries such as nuclear energy and space science
23. Forensic investigation laboratories
24. Teachings at medical polytechniques

1.6 Program Learning Outcomes

Knowledge and Understanding:	
K1	Demonstrate a deep understanding of the fundamental principles and theories of core and specialized physics topics.
Skills:	
S1	Apply advanced theories and models to solve problems in complex and advanced contexts.
S2	Conduct scientific research projects using appropriate experimental setups, computational methods, and data analysis.
S3	Communicate scientific findings clearly and effectively in various forms to professional and non-professional audiences.
Values, Autonomy, and Responsibility	
V1	Show integrity, professional and academic values when performing experiments and interacting with peers.
V2	Participate effectively in scientific discussions, research projects and community service demonstrating leadership skills and responsibility of the work.
V3	Manage specialized tasks and activities in the field of physics effectively, with high autonomy.

2. Program Structure

2.1. Description of the program curriculum

The Department of Physics granted a Master of Science degree in physics-based on courses and thesis, and this requires the completion of (36) credits are distributed to mandatory courses of (17) credits, and elective courses of (9) credits and (10) credits for thesis.

Upon admission, during the first year, students are required to take 3 mandatory courses per semester, establishing a solid understanding of key principles and techniques. In the second year, students take 3 more mandatory courses in the first semester, further refining their skills. In the second semester of the second year, students are granted the flexibility to tailor their education to their specific interests by selecting three elective courses based on their research field that they would like to proceed within their thesis topic. These elective courses are systematically categorized across diverse research field subjects, ensuring students have a spectrum of options to delve into based on their academic and professional aspirations.

1. Theoretical physics.
2. Nuclear physics.
3. Solid state physics.
4. Laser physics.
5. Semiconductor physics and electronics.
6. Radiation Biophysics.

Once students acquire 26 credits of all required and elective courses, they register for their chosen thesis under the guidance of a supervisor. Simultaneously, students enroll in a seminar that serves as a platform for collaborative discussion and feedback.

Following this stage of the program, students immerse themselves in the research work lab, starting the 4^{th} semester since their enrolment, where they actively apply theoretical knowledge to real-world scenarios.

This comprehensive structure ensures that graduates emerge from the program equipped not only with a theoretical foundation but also with the practical skills and research acumen necessary to excel in the ever-evolving field of design.

The following two tables depict the program structure over a three-year span, outlining the sequence of six required courses.

	Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
	Course	Required	7	17	50%
		Elective	3	9	24%
	Thesis		-	10	26%
	Total		-	38	100%

Year	Level	Course Code	Course Title	Required or Elective	Credit Hours	Type of requirements
Year 1	**Level 1**	PHYS 600	Experimental Measurements and Data Analysis	Required	3	Program
		PHYS 613	Mathematical Physics	Required	3	Program
		PHYS 614	Advanced Analytical Mechanics	Required	2	Program
	Level 2	PHYS 615	Electromagnetism Theory (1)	Required	3	Program
		PHYS 616	Advanced Quantum Mechanics (1)	Required	3	Program
		PHYS 617	Statistical Mechanics	Required	2	Program
Year 2	**Level 3**	PHYS xxx *	Elective course 1	Elective	3	Program
		PHYS xxx *	Elective course 2	Elective	3	Program
	Level 4	PHYS xxx *	Elective course 3	Elective	3	Program
		PHYS 699	Thesis	Required	10	College
		PHYS 695	seminar	Required	1	
Year 3		PHYS 699	Thesis	Required		
		PHYS 699	Thesis	Required		

***Please see below of available elective courses (new courses may be added, please ask for availability)**

2.1 List of Required Courses

Course Number	Course name	Credit hours		Pre-quasits course
		Theory	Practical work	
PHYS 600	Experimental Measurements and Data Analysis	1	2	
PHYS 613	Mathematical Physics	3	-	
PHYS 614	Advanced Analytical Mechanics	2	-	
PHYS 615	Electromagnetism Theory (1)	3	-	PHYS 613
PHYS 616	Advanced Quantum Mechanics (1)	3	-	PHYS 614
PHYS 617	Statistical Mechanics	2	-	PHYS 613
PHYS 695	Seminar	1	-	
PHYD 699	Thesis	10	-	

2.2 List of Elective Courses for each research field

1. Theoretical physics

Course Number	**Course name**	**Credit hours**		**Pre-quasits course**
		Theory	Practical work	
PHYS 623	General Relativity	3	-	-
PHYS 624	The Quantum Theory of Scattering	3	-	-
PHYS 625	Atomic and Molecular Physics	3	-	-
PHYS 626	Electromagnetism Theory (2)	3	-	PHYS 615
PHYS 627	Advanced Quantum Mechanics (2)	3	-	PHYS 616
PHYS 628	Aspects of Symmetry	3		
PHYS 629	Quantum Field Theory	3		

2. Nuclear Physics

Course Number	**Course name**	**Credit hours**		**Pre-quasits course**
		Theory	Practical work	
PHYS 630	Advanced Nuclear Reactions	3	-	-
PHYS 631	Advanced Nuclear Physics	3	-	PHYS 615
PHYS 632	Instrumentation and Methods of Experimental Nuclear Physics	1	3	PHYS 600
PHYS633	Nuclear Power			
PHYS 634	Elementary Particles	3	-	PHYS 616
PHYS 635	Radiobiology	3		
PHYS 636	Introduction to Accelerators Physics	3		

3. Solid state physics

Course Number	Course name	Credit hours		Pre-quasits course
		Theory	Practical work	
PHYS 640	Solid State Theory and Optical Properties	3	-	-
PHYS 641	Diffraction and Structural Analysis	2	-	-
PHYS 642	Characteristics of Insulators	2	-	Department approval
PHYS 643	Defects in Solids	2	-	-
PHYS 644	Fabrication and Characterization of Polymers	3	-	-
PHYS 645	Condensed Matter Physics	3	-	-
PHYS 646	Growth and Imperfection in Materials	3		

4. Laser physics.

Course Number	Course name	Credit hours		Pre-quasits course
		Theory	Practical work	
PHYS 650	Laser Fundamentals and Applications	3	-	-
PHYS 651	Atomic Spectroscopy Fundamentals & Applications	3	-	-
PHYS 652	Molecular Spectroscopy Fundamentals & Applications	3	-	-
PHYS 653	Modern Optics and Applications	1	2	-
PHYS 654	Laser Spectroscopy and Applications	3	-	-
PHY 655	Experimental System and Laboratory Work	3		
PHYS 656	Advanced Spectroscopic Measurements	3		

5. Semiconductor physics and electronics.

Course Number	Course name	Credit hours		Pre-quasits course
		Theory	Practical work	
PHYS 660	Physics of Semiconductors	3	-	-
PHYS 661	Electrical Conduction in Semiconductors	3	-	-
PHYS 662	Physics of Semiconductor Devices	1	2	-
PHYS 663	Electronic Circuits	3	-	-
PHYS 664	Polymer Semiconductor Devices	1	2	-
PHYS 665	Optoelectronics	3	-	-
PHYS 666	Microwaves Physics	3		
PHYS 667	Physics of Superconductors	3		
PHYS 668	Physics of Thin Films	3		

6. Radiation Biophysics physics.

Course Number	Course name	Credit hours		Pre-quasits course
		Theory	Practical work	
PHYS 670	Introduction to Biophysics	3	-	
PHYS 671	Biophysics Techniques	2	1	
PHYS 672	Neurophysics	3	-	
PHYS 673	Medical Physics and its Instrumentation	2	1	
PHYS 674	Radiation Dosimetry and Protection	1	1	
PHYS 675	Introduction to Biostatistics	3		
PHYS 676	Radiotherapy	3		

2.3 Brief introduction for Required Course

PHYS 600 **Experimental Measurements and Data Analysis**

This is an applied course which depends on the theoretical study of the basis and mathematical and statistical relations concerning computer measurements and error determination. It includes physical quantities and experimental measurement errors – error correction and analysis. Laboratory experiment (goals, logistics, and instruments), verification of the experimental results. Uses of the computer in the laboratory and programming, finishing three experiments in three different laboratories (programming, solid state, nuclear, laser).

PHYS 613 **Mathematical Physics**

This course delves into essential mathematical concepts for solving physics problems, covering complex variables, conformal mappings, tensor algebra, and more. Emphasizing topics like the Cauchy–Riemann equations and Cartesian tensors, it equips students with tools for tackling complex theoretical physics challenges. The curriculum fosters a deep understanding of mathematical foundations crucial for advanced physics studies.

PHYS 614 **Advanced Analytical Mechanics**

This course provides a comprehensive examination of various methods established by scientists for analyzing the motion of dynamic objects in classical mechanics. Focusing on scalar and vector quantities, students will explore diverse approaches, gaining a deep understanding of analytical techniques used to study complex motion in classical mechanics.

PHYS 615 **Electromagnetism Theory (1)**

This course covers advanced topics in electromagnetic theory including boundary-values problems in electrostatics and magnetostatics, time dependent electric and magnetic fields, Maxwell equations and wave equations of electromagnetic field, plane propagation of electromagnetic waves in lossless and lossy dielectrics.

PHYS 616	**Advanced Quantum Mechanics (1)**
	This course aims to empower students with the ability to apply quantum mechanics to solve physics problems. Topics include the solution of the Schrödinger Equation, Matrix Mechanics, an introduction to angular momentum, addition of angular momentum and Clebsch-Gordan coefficients, symmetry and conservation laws, perturbation theory, variational method, semi-classical treatment (WKB approximation), and the study of identical particles. Through this course, students will develop a robust understanding of advanced quantum mechanical principles and their practical applications in physics problem-solving.
PHYS 617	**Statistical Mechanics**
	This course introduces students to ensemble theory and its applications, covering topics such as thermodynamics, phase space, and ensemble averages. Specific areas of focus include the micro-canonical ensemble for the classical ideal gas, canonical ensemble with energy fluctuations, and applications to the ideal gas and harmonic oscillator. The course also explores the grand canonical ensemble in the context of phase transitions, as well as thermodynamics and occupation number fluctuations in the ideal Bose and Fermi gases. Additionally, statistical mechanics of interacting systems, including the Virial expansion, is discussed. Students will develop a solid understanding of statistical mechanics principles and their practical implications.
PHYS 695	**Seminar**
	Students are mandated to deliver a seminar within the department, focusing on their designated project or dissertation. The primary aim of the seminar course is to afford graduate students a platform to present their preliminary research findings, advancements, and insights related to their assigned projects or dissertations. Structured to foster proficiency in public speaking, presentation design, and academic communication, this course plays a crucial role in honing essential skills. It serves not only as a pivotal opportunity for students to receive constructive feedback and guidance but also as a means to enhance community service by fostering a collaborative and intellectually vibrant academic atmosphere within the physics department.
PHYS 699	**Thesis**
	The dissertation's title and the research scope will be suggested by the dissertation supervisor(s) and subject to approval by the department's committee. This involves engaging in scientific research, which may be theoretical, experimental, or a combination of both. The culmination of this research is expected to result in a paper published in a peer-reviewed journal or presented at a recognized conference.

2.4 Brief introduction for Elective Course

PHYS 623	**General Relativity**
	Objective: To understand the basics of general theory of relativity and cosmology. Course Description: Introduction to general relativity and relativistic cosmology. The basics of Einstein's theory of gravity. Black holes, neutron stars and Big Bang cosmology.
PHYS 624	**The Quantum Theory of Scattering**
	Objective: The objective is to teach the student the underlying quantum mechanical concepts in scattering processes. Course Description:One-dimensional square potential barrier, Collision in three dimensions. Student will study Scattering by spherically symmetric potentials, Scattering by complex potentials, Scattering by Coulomb potentials, The scattering matrix, Stationary collision theory, Born approximation, Distorted wave Born approximation, Partial wave analysis, Phase shift, Cross sections, Second order perturbation theory, Eikonal approximation.
PHYS 625	**Atomic and Molecular Physics**
	Objective: This course develops the basic concepts, techniques and methods of analysis of atomic and molecular physics. Course Description: Basic concepts in atomic and molecular physics and knowledge about experimental techniques and methods of analyses. The structure, dynamics and symmetry character of atoms and molecules are discussed. Experimental devices such as light sources, optical materials, detectors and other essential topics in the course. Training in the classification of atomic and molecular energy states will also take place. Different types of spectra will be studied, such as atomic, molecular and Raman spectra. In connection with these spectra, covalent and ion binding as well as the Stark and Zeman effects.
PHYS 626	**Electromagnetism Theory (2)**
	Objective: The objective of this course is to enhance the concepts of electrodynamics related to Maxwell's equations, electromagnetic waves. Course Description: Time dependent fields, Maxwell Equations, Plane propagation of electromagnetic waves, optical wave guides, simple relative system, diffraction and scattering.
PHYS 627	**Advanced Quantum Mechanics (2)**
	Objective: The objective of the course is to introduce the basic concepts of Relativistic Quantum mechanics. Course Description: Student will study Angular momentum – addition

of angular momentum – Clebsch-Gordon coefficients – quantum theory of radiation – relativistic mechanics of the spin- ½ particles : Dirac principles for relativistic symmetry variation – Hilbert Space theory. Scattering matrix – Mott scattering.

PHYS 628	**Aspects of Symmetry**

Course Objectives:

It is desired to introduce the idea of symmetry in physics and the concepts of symmetry breaking. Course Description: Abstract group theory, Theory of representations, Physical Applications, Rotation group, Unitary symmetry groups, Basic concepts of Lie groups and lie algebra and particles, Symmetry breaking and perturbations.

PHYS 629	**Quantum Field Theory**

Course Objectives: Quantum Field Theory is a set of three ideas and tools that combines quantum mechanics, relativity and field concepts. This course is designed to introduce this combination. Course Description: The Klein Gordon field, The Dirac field, Interacting fields and Feynman diagrams, Elementary processes, Relativistic corrections, Systematic of renormalization, Renormalization and symmetry.

PHYS 630	**Advanced Nuclear Reactions**

Objective: The purpose of this course is to provide an advanced treatment of nuclear reactions. Course Description: This course provides an advanced treatment of nuclear reaction and their applications. Advanced nuclear reactions and theories – direct and indirect nuclear reactions – reactions of heavy and light ions – thermal and optical reactions – elastic and inelastic reactions – high energy reactions – scattering – resonance – polarized nuclear reactions – Fission and fusion reactions – charged and uncharged particles reactions – nuclear forces.

PHYS 631	**Advanced Nuclear Physics**

Objective: The objective of this course is to provide essential concepts of various nuclear models and structures. Course Description: Student will study Nuclear drop model – shell model – statistical model and Fermi gas model – collective model , moments and nuclear shapes – Two-body nuclear force.

PHYS 632	**Instrumentation and Methods of Experimental Nuclear Physics**

Radiation sources and interaction of radiation with matter – radiation counters – different types of detectors and detection methods with applications – Instruments and methods of pulse analysis – the standard specifications of the instruments – Radiation dosimetry and radiation protection – Identification methods of the outgoing particles of the nuclear reaction (flight time – pulse shape – energy loss) – Angular dependence – Energy, time and

momentum measurement – Position determination. The objective is to teach the student about the theory, methodology and application of Instruments in Nuclear physics.

PHYS 633	**Nuclear Power**

Course Objectives: This course aims to teach the postgraduate students Neutron's characteristics, Nuclear fission, Nuclear power plants, reactor theory, and Reactor Kinetics. Course Description: Characteristics of Neutrons, Types of Nuclear Power Plants, Neutron Fission and Fusion, Reactor theories and Kinetics.

PHY 634	**Elementary Particles**

Students will study elementary particles characteristics – Classification of elementary particles – internal quantum numbers – charges – high energy interactions – Baryon, Lepton and SU groups -Quark theory – weak interactions – electromagnetic properties of elementary particles. The objective of the course is to teach the students physics of elementary particles and its interactions.

PHYS 635	**Radiobiology**

Course Objectives: This course aims to teach the postgraduate students the Effect of Radiation at the Molecular and Sub Cellular Levels, Deterministic Effects, Stochastic Effects and Biological Basis of Radio Therapy. Course Description: Effect of radiation on proteins and acids. Radiation damage to cell membranes, Tissue sensitivity and Modes of death, Effects of radiation on chromosomes, Physical factors affecting cell survival.

PHYS 636	**Introduction to Accelerators Physics**

This course covers the history of particle accelerators, Transverse and longitudinal motion, Accelerating beams, Linear accelerators, Electron storage rings, Non-linear effects, Multi-particle effects, The large Hadron collider. The objective of the course is to teach the students an introduction to the physics of particle beams in linear and circular accelerators.

PHYS 640	**Solid State Theory and Optical**

Objective:To develop basic concepts of solid state physics which are necessary in understanding the interaction of electromagnetic radiation with solids.

Course Description: Student will study electronic band structure – electron dynamics – intrinsic approximation – potential theory in simple metals – bands in semiconductors and semimetals – insulating bands – lattice vibrations – phonon and lattice specific heat – band transition general theoretical analysis – optical parameters construction at critical points – electron-photon interaction – indirect transitions characteristics – various photon transitions.

PHYS 641	**Diffraction and Structural Analysis**

Objective: Different experimental techniques and theoretical concepts are introduced for the understanding of the crystal structure and the determination of crystal parameters.

Course Description: Revision of crystal structure – X-ray diffraction of the crystals – Fourier transformation in diffraction – Diffraction from thin solid films – X-ray small angle scattering – diffraction of non-crystalline solids – electron scattering – geometry of electron diffraction models – diffraction notation of the diffraction pattern from monoatonic crystals.

PHYS 642	**Characteristics of Insulators**

Objective: The purpose of this course is to teach the basic physics of insulators which will help the student to gain a deeper insight into this field. Course Description: Student will study the relation between field, polarization, displacement, permittivity and refractive index – optical absorption coefficient and relaxation time – measurement methods – polarization mechanics – Debye theory – insulating properties of materials – Piezoelectricity – ferroelectricity.

PHYS 643	**Defects in Solids**

Objective: This course is designed to provide the student with the basic concepts of the origin, types, nature and dynamics of the defects in solids. Course Description: Student will study defects types – point defects formation energy – thermodynamics and structure – equilibrium between die compounds and volatile components – defects influence on ionic conduction.

PHYS 644	**Fabrication and Characterization of Polymers**

Objective: The objective of this course is the study of the electrical and optical properties of polymers as a function of their structure. Course Description: Static and Dynamic Mechanical properties; DC and AC properties of ploymers; percolation theory, DC conductivity, conduction mechanisms, dielectric properties and polarization, Cole-Cole relation, and effect of temperature on dielectric properties of polymers. Optical properties; fluorescence, phosphorescence, light emission, refractive index, Urbach's tail and energy band gap, photosensitivity.

PHYS 645	**Condensed Matter Physics**

Objective: The objective of this course is to provide the student with a thorough understanding of the theoretical aspects of solid state physics. Course Description: Crystal Structures and Bonding; Lattice dynamics; specific heat of lattice. Free electron theory of Metals; specific heat capacity of electrons in metals, thermionic emission of electrons in metals. Band theory of solids. Transport Properties: Motion of electrons and holes in bands and the effective mass. Scattering of electrons in bands, electrical conductivity of metals, thermoelectric effects, Wiedmann-Franz law. Magnetism, Neel temperature, Curie Weiss law, spin waves, domain walls, ferrites and garnets. Superconductivity: The fundamental phenomenon, Meissner effect, London equation, type I and II superconductors, Cooper pairing and BCS theory. High Tc superconductors.

PHYS 646	**Growth and Imperfection in Materials**
	Objective: The student will learn about crystal growth, imperfections their dynamics and disordered materials. Course Description: Methods of Crystal Growth. Zone refining technique and refining of materials. Kinetics of Crystal growth, dislocations and polytypism. Experimental verification. Atomic Packing in Crystals. Application of Pauling's rules to actual structures. Representations of close packing polymorphic and polytypic structures and notations. Stacking faults in FCC and HCP structures. Atomic imperfections in crystals. Diffusion and ionic conductivity. Disordered Materials: characteristics of amorphous glasses and polymers. Polymers and composite materials.
PHYS 650	**Laser Fundamentals and Applications**
	Objective: The main objective of this course isto provide a broad understanding of lasers; from their operation to various types of lasers and their areas of applications. Course Description: Basic principle of laser action, pumping schemes, Optical feedback and resonator cavity. Line broadening mechanisms. Homogeneous and inhomogeneous broadening. Laser modes and output control, Q-switching, and mode-locking. Different types of lasers. Special features of laser light and their measurement. Applications of lasers in Physics, industry and medicine.
PHYS 651	**Atomic Spectroscopy Fundamentals & Applications**
	Objective: To introduce the semi-classical and quantum theory of atomic structure and spectra and applications of atomic spectroscopy. Course Description: Introduction to Atomic spectroscopy. Bohr and Sommerfeld atomic models. Energy level diagram and quantum numbers. Schrödinger wave equation. Quantum model for Hydrogen atom. Wavefunctions & general interpretation. The electrons spin. Pauli's exclusion principle. The fine structure. Zeeman and Paschen-Back effect. The Stark effect. Spectra of complex atoms & applications of atomic spectroscopy.
PHYS 652	**Molecular Spectroscopy Fundamentals & Applications**
	Objective: To introduce the theory of molecular structure and spectra and applications of molecular spectroscopy. Course Description: Introduction to Molecular spectroscopy. Rotational and vibrational motion of diatomic and polyatomic molecules. Microwave and Infrared spectroscopy, techniques and basic instrumentation. Raman spectroscopy, polarization of light and Raman effect. Rotational and vibrational spectra of simple molecules. Applications of molecular spectroscopy in chemical identification, pollution monitoring, biochemical applications.
PHYS 653	**Modern Optics and Applications**

Non-linear optics: Susceptibilities, Harmonic generation, Phase matching, Optical Mixing, Parametric generation of light, self-focusing of light, Optical bi-stability, Optical Phase conjugation. Applied Optics; Holography: Fourier transforms Optics, Spatial filtering, Speckle Interferometry, Birefringence, Electro-optics, Magneto optics, Kerr effect. Fiber Optics: the optical fibers, Comparison of optical fiber with other inter connectors, Concept of an optical waveguide. Rays and Modes. Principles of light guidance in optical waveguides. Fiber lasers. Application of fiber optics

PHYS 654 **Laser Spectroscopy and Applications**

Objective: The purpose of this course is to introduce theoretical concepts, experimental techniques and applications of laser spectroscopy . Course Description:

Student will study Spectroscopy Fundamentals: Absorption and emission spectroscopy, Atomic structure, electronic configurations, energy levels, selection rules, transition probabilities, lifetimes, oscillator strengths. Molecular structure, vibrational and rotational spectroscopy, Frank-Condon principle, Raman scattering . Laser Spectroscopic techniques: Advantages of lasers in spectroscopy, Excitation spectroscopy, Laser induced fluorescence. Intra cavity absorption. Photo-acoustic spectroscopy. Opto-galvanic spectroscopy. Ionization spectroscopy, Step wise excitation. Multi-phonon absorption and emission.

Principle of laser Raman spectroscopy. Doppler free technique in spectroscopy. Time resolved and ultra fast spectroscopy . Applications of Laser Spectroscopy: Laser photochemistry, isotope separation, monitoring of atmosphere, material characterization, ultra-trace analysis, laser Raman spectroscopy of biological systems, medical applications.

PHYS 655 **Experimental System and Laboratory Work**

Objective: The objective of the course is to teach the student the physics of various apparatus used in the laboratory and to use them in selected experiments. Course Description: Student will study Optical Instrumentation: Beam steering and focusing optics, polarizer, spectrographs, spectrometers, monochromators, interferometers, optical multichannel analyzers. Electronic signal processing: Amplifiers, filters, phase sensitive detection, lock-in amplifiers, boxcar averagers, photon counters, transient digitizers, digital storage oscilloscopes, Detectors: Photodiodes, photo cells, photomultipliers, electron multipliers, channeltron and CCD arrays Experiments with lasers: Measurement of wavelength and refractive index with Michelson and Fabry-Perot interferometers with He-Ne laser, Laser induced fluorescence of iodine gas and some liquid dye with SHG of Nd: YAG laser, opto-galvanic spectrum of copper with Ti-Sapphire laser, opto-acoustic spectrum of some gaseous sample with CO2 laser.

PHYS 656 **Advanced Spectroscopic Measurements**

Objective: The main objective of this course is to introduce the application of various spectroscopic techniques. Course Description: Introduction; Definition of spectroscopy and

	its types, Atomic Spectroscopy, Ultraviolet-Visible Spectroscopy and applications, Infrared & FTIR Spectroscopy, Rotation and Vibration Spectroscopy, Raman Spectroscopy, NMR Spectroscopy and their applications.
PHYS 660	**PHYS 660 Physics of Semiconductors**
	Objective: This course aims to identify semiconductors and their types and applications Course description: Crystal lattice, band theory of solids, properties of silicon and germanium, intrinsic semiconductor, extrinsic semiconductor, P and N type materials, electrons and holes, P-N junction, Zener diode, Tunnel diode, forward and reverse bias, rectification, amplification, transistors, light emitting diode.
PHYS 661	**Electrical Conduction in Semiconductors**
	Objective: This course aims to identify the mechanism of conduction and carriers mobility in semiconductors Course description: Density of carriers in extrinsic semiconductors, concentration of ionized impurities, neutrality condition for P and N type materials, compensation doping, extrinsic compensated, intrinsic compensated, electrical conduction in semiconductors, diffusion of charge carriers, continuity equation for minority carriers, rate of generation and loss, drift carriers, Hall effect, four point probe method for conductivity, minority carrier life time and mobility.
PHYS 662	**Physics of Semiconductor Devices**
	Objective: The course provides an in depth understanding of semiconductor devices and Integrated circuits. Course Description: PN-Junction: Analysis, Fabrication and Current-Voltage Relationship. Student will study .Metal-Semiconductor Contacts. The Schottky effect, Schottky diodes and characteristics. Bipolar Junction Transistors (BJT), Transistor configurations and equivalent circuit models. Junction Field Effect Transistor (JFET). Metal Oxide Semiconductor Field Effect Transistor (MOSFETs), charge transferred devices, power devices SCRs,DIACs,TRICs,IMPATT and Gun diodes.
PHYS 663	**Electronic Circuits**
	Objective: This course aims to identify the electronic circuit components and their characteristics Course description: Electric circuits, circuit components, functional circuits, diodes, transistors, integrated circuits, transducers, waveform generators, operational amplifiers, audio electronics, digital electronics, microprocessors.
PHYS 664	**Polymer Semiconductor Devices**
	Objective: This course presents the fundamentals of conjugated polymers as semiconductor devices Course description: Definition of polymers, conjugated polymers, polymer Schottky diode, polymer light emitting diode, flexible solar cell, photovoltaic, sensors, smart windows, hybrid organic-inorganic diodes, laser diodes made of polymers. Polymer MOSFETs.
PHYS 665	**Optoelectronics**

Objectives: This course aims to understand the present and future technologies and applications of optical communications. Course description: Optics Review, Doping, Currents (Diffusion and drift), pn Junction, Compound Semiconductors, Photo diode (pn junction reverse bias, photocurrent), Solar Cell, Light Emission, LED, Laser Diode.

Course

PHYS 666	**Microwaves Physics**

Objective: The objective of the course is to Describe the theory, techniques, methods, devices and applications of microwaves. Course Description: Electromagnetic waves theory – free and aided microwaves – microwaves transmission lines and theory of

operation and loss-reduction technologies – Smith maps study and using them in calculations and analysis of transmission lines – microwaves transmission pipes of the rectangular, circular and elliptical cross section – microwave resonance study – resonance holes – analytical study of resonance holes, their feed, their connection with transmission pipes and the theory of operation as a microwave frequency counter – microwaves oscillators and amplifiers – semiconductors-operating microwaves and integrated circuits for treatment and transmitting microwaves.

PHYS 667	**Physics of Superconductors**

Course Objectives: This course introduces the basic philosophy of superconductivity in solids. and concepts of superconductivity in solids. Course Description: Introduction, Occurrence of superconductivity, Magnetic behavior and Meissner effect, Cooper pairs and BCS theory, Coherence length, Persistent currents, Flux quantization, Josephson tunneling, Josephson effect, high temperature superconductivity.

PHY 668	**Physics of Thin Films**

Introduction and overview for basic physics of thin films, such as; Thermodynamics of growth (Kinetics, Diffusion, Nucleation, Growth and Film Formation (, different techniques of films Deposition, and finally diverse techniques of films Characterization. The objective of this course is to provide the student with a comprehensive understanding of all aspects of thin films; from growth mechanism to different fabrication techniques and their characterization by structural, chemical and optical means.

PHYS 670	**Introduction to Biophysics**

Objective: The objective of the course is to familiarize the students with the underlying concepts of physics of living systems. Course Description: Characteristics of life, Characteristics of cell, Cell organelles, Nuclear and cell division, Stages of mitosis, Cell differentiation. Chemical bonds, types of bonds, Subunits of macromolecules, Biological macromolecules, Lipids, Proteins, DNA and RNS chains, Cell energy. Diffusion, random motion, The diffusion equation, membranes, Osmosis, Diffusion across membranes, Membrane potentials, Active transport, Artificial membranes. The radiations, Target theory,

Radiation and its measurements, Description and interpretation of radiation action, Molecular effects of radiation, Radiation effects on biomolecules and molecular structure, Effects on cell and organisms, radiation hazards and protection. Muscle physiology, Muscle mechanics and energetics, Structure of cross striated muscle, The mechanism of shortening, Biophysics of locomotion on land and in water.

PHYS 671	**Biophysics Techniques**

Objective: To teach students theoretical and experimental methodologies to enable them studying of biological systems Course Description: The mechanism of x-ray diffraction, Analysis of diffraction patterns, Physical basis of electron microscopy, Centrifugation and sedimentation, Electrophoresis, Viscosity and biological instrumentation. Photo acoustic spectroscopy, Spectroscopy in biophysics, Applications of Mossbauer effect, Electron spin and magnetic resonance spectra. Primary structures, Particles and bonds, Interactions between structural units, Charge transfer reactions in biomolecules, polar interactions, interactions and conformation in polynucleids. Stationary states of molecules, Classification of optical transitions and of excited states, Photo physical processes, Applications of absorption and fluorescence spectra, Fluorescence quenching. Photosynthesis, Structure and properties of chlorophylls, Energy migration, Electron transfer processes, Phosphorylation.

PHYS 672	**Neurophysics**

Objective: The intention of the course is to provide the basic understanding of the electrodynamics of the brain and the central nervous system. Course Description:
Constitution of central nervous system, Nerve cells and their properties, Synaptic transmission, models of neurons, Action potentials. Statistical mechanics of the brain, Onsager representation, States of the brain, Dynamics and nervous parameters, Operators and brain states. Potentials generated in the brain, Electric fields in biological tissues, temporal and spatial properties of EEG, Theoretical and experimental basis of
brain waves. Spacetime representation of the brain, classical theory, Studies of electromagnetism and gravitational fields as perturbations.

PHYS 673	**Medical Physics and its Instrumentation**

Objective: The purpose of this course is to teach the basics of radiological physics and the instruments used in its application. Course Description: Ionizing radiation photography – study about using radioactive isotopes – ultrasonic photography – vessel and sonic measurements – clinical instrumentation - ionizing radiation treatment – resistance transformers – capacitance transformers – chemical transformers – electro biological potential recording poles.

PHYS 674	**Radiation Dosimetry and Protection**

	Objective: The objective is to introduce the concepts of harmful effects of radiation, maximum dosage limits and methods of protection. Course Description:Protection units – ionizing radiation dosimetry – public and workers radiation dose limits – international basis for radiation protection - external and internal radiation protection methods – medical uses of ionizing radiation – introduction to the biological effects of non ionizing radiations like lasers – high frequencies and microwaves detection and protection methods.
PHYS 675	**Introduction to Biostatistics**
	Course objectives: This course is intended to provide a high-level overview of the concepts, terminology, and strategies needed to design and evaluate projects in biomedical statistics including methodologies drawn from software engineering, qualitative, and quantitative research. Course description: Bio statistics, Distributions, Hypothesis testing, Chi-square, Mann-Whitney, T -tests, analysis of variance (ANOV A) and the statistical models, regression, Critical Appraisal, screening. Patient records, Coding, Hospital Information Systems, Decision support systems.
PHYS 676	**Radiotherapy**
	Course objectives: This course intends to give an overview of planning process from sickness to treatment using simulation packages. Course description: Atomic and Nuclear Structure, Production of Photons and Electrons, Treatment Machines, Generators and Simulators; Radiation Interactions; Radiation Beam Quality and Dose, Radiation Protection and Shielding.
PHYS 696	**Special Topics (1)**
	This is one of the two especially constructed courses to be based on “subjects of interest” that are related to the students’ project/assignment or thesis. Subjects of interest will be recommended by the course supervisor.
PHYS 697	**Special Topics (2)**
	This is the second of the two specially constructed courses to be based on “subjects of interest” that are related to the students’ project/assignment or thesis. Subjects of interest will be recommended by the course supervisor.

3. Admission Requirements and Enrolment

3.1 Student Admission Requirements

- **The University Council determining the number of students:**

The university council shall determine the number of students admitted each year to graduate studies programs based on the recommendation of the Council of the Deanship of Graduate Studies, and the proposal of the concerned departments and colleges.

- **The applicant must fulfill the following requirements for admission:**

1. To be of Saudi nationality or to have an official scholarship if the applicant is non-Saudi.
2. To have a university degree from a Saudi university or another equivalent accredited university.
3. To obtain a written undertaking of approval from the employer if the applicant is an employee.
4. B.Sc. Grade (3.75 or higher)
5. English language proficiency (TOEFL 400, IELTS 3.5).
6. To submit two recommendation letters from staff members who taught him/her.
7. To be medically and morally eligible.

Note:

- The final grade of the applicant in the university must be ‹Very Good› or better, but the Council of the Deanship of Graduate Studies may also accept applicants with a grade ‹Above Average›. The Council of the Deanship of Graduate Studies, based on the Department Council recommendation and College Council approval, may accept applicants with grade ‹Good› in some programs specified by the University Council, provided that the applicant's average grade in the Bachelor’s majoring courses is ‹Very Good› or better. The Council of the Deanship of Graduate Studies, based on the Department Council recommendation and College Council approval may add other requirements deemed necessary for admission.
- A student may be admitted to a master’s program in a field different from her/his major based on the concerned Department and College Councils recommendation, and the approval of the Council of the Deanship of Graduate Studies.
- For admission to the master’s program, the concerned department may specify that the applicant must undertake several complementary courses from an earlier stage, in a period not more than three semesters, taking into consideration the following:

1. The complementary course must be first of a grade of ‘Good’ or better.
2. The cumulative GPA in the complementary courses must be ‘Very Good’ or better.
3. Passing the complementary courses before registering in the graduate studies program.
4. The period of the complementary courses is not included in the period specified for obtaining the degree.
5. The complementary courses are not included in the calculation of the cumulative GPA of graduate studies.

- Deanship of Graduate Studies shall be responsible for the applicants’ admission and registration in coordination with the Deanship of Admission and Registration.
- The student must not enroll in two graduate studies programs simultaneously.

3.1.1. Postponing the admission

Upon the endorsement of the department council and the deans of both the college and graduate studies, suspension of admission is feasible. However, this is subject to the condition that the duration of suspension does not surpass two academic semesters, and such suspension does not count to the maximum graduation period.

3.1.2. Suspension of studies

Subject to approval from the department council and the deans of the college and postgraduate studies, the possibility of deferring the study of a course is extended to the student under the following conditions:

1. The student must have successfully completed one or more semesters or fulfilled an appropriate portion of the thesis.
2. The cumulative duration of deferment should not exceed four academic semesters (equivalent to two academic years).
3. A request for suspension must be submitted no later than two weeks before the commencement of the semester.
4. The period of deferment is not calculated within the maximum time frame allocated for obtaining the degree.
5. Consecutive academic semesters cannot be deferred for more than two semesters.
6. Justifiable reasons must accompany any deferment request.

Additionally, with approval from the relevant department council and the deans of the college and studies, the Higher Education Council may sanction the postponement of a student's studies during the supplementary courses stage based on the following criteria:

1. The student must have completed one or more semesters in the supplementary courses.
2. A student is entitled to defer studies for only one semester during the supplementary courses stage.
3. A deferment request must be submitted no less than two weeks before the semester begins.
4. Postponement is not factored into the maximum period stipulated for completing the supplementary courses.

For Further Information please check “ KAU GRADUATE STUDIES MANUAL” in Appendix B.

4. Academic Policies and Procedures

4.1 Grading system

Every required or elective course concludes with a written exam at its conclusion. A minimum passing grade of 75% is required for all courses.

The grades obtained by the student in each course are calculated as follows:

Percentage	Arabic Grade	English Grade	English Grade Code	Grade Weight (out of 5)
95 - 100	ممتاز مرتفع	Distinction	A +	5
90 < 95	ممتاز	Excellent	A	4
85 < 90	جيد جداً مرتفع	Superior	B +	4
80 < 85	جيد جداً	Very Good	B	4
75 < 80	جيد مرتفع	Above Average	C +	3
70 < 75	جيد	Good	C	3
65 < 70	مقبول مرتفع	High Pass	D +	2
60 < 65	مقبول	Pass	D	2
< 60	راسب	Fail	F	1
-	غير مكتمل	Incomplete	IC	-
-	محروم	Denied	D N	1
60 and above	ناجح دون درجة	Nograde – Pass	N P	-
< 60	راسب دون درجة	Nograde – Fail	N F	-
-	منسحب بعذر	Withdrawn	W	-

For further information please check “Exams and Students evaluation policies in Appendix B”.

The general estimate of the cumulative GPA when the student graduates, based on his cumulative GPA, is as follows:

- (Excellent) if the cumulative average is not less than 4.50 out of 5.00.

- (Very good) if the cumulative average is from 3.75 to less than 4.50 out of 5.00.

- (Good) if the cumulative average is from 2.75 to less than 3.75 out of 5.00.

- (Acceptable) if the cumulative GPA is from 2.00 to less than 2.75 out of 5.00.

Classification of Successful Candidate:

- First Class Honors is awarded to students who graduate with an outstanding academic performance, attaining a grade point average between 4.75 and 5.00.
- Second Class Honors is conferred upon students who achieve a commendable academic standing, with a grade point average ranging from 4.50 to 4.75.

To obtain first or second honors, the following requirements are required:

- The student must not have failed any course he studied.
- The student must have completed the graduation requirements in a maximum period of the average period between the minimum and the maximum period for remaining in the college.
- The student must have studied at the university no less than (60%) of the graduation requirements.

Failure to complete any of the courses:

- In the event of a student failing the initial examination for any of the courses, they will be assigned an incomplete grade in course (L) or (IC) and granted the opportunity to participate in the second-round test. Success in the second round will result in giving the assigned grade, while failure will lead to an (E) or (F) grade, necessitating a re-study of the course. If the student successfully completes the course within a year, the assigned grade will stand.
- If a student is absent from the final exam of a course or any of its components (written, oral, practical, clinical), it is considered a course failure. However, in cases of extreme necessity, the College Council or its delegate may consider a forced excuse for the absent student, resulting in an incomplete grade (L) or (IC). The student is then permitted to take the next test, and in this scenario, the grade received in the subsequent test will be assigned.

4.2 Attendance Policies

All courses at the program require that every student attend a minimum of 80% of schadualed lectures frequently to interact with their professors and fellow students. Each University professor tracks its students' course progress, a factor that can significantly impact the student's final course grade.

Leave of Absence

Leave of absence is granted to students on a request based on:

a) Illness, b) Maternity, c) Funeral, d) Child Care

- A leave of absence may be granted for more than 12 months if necessary.
- Students seeking a leave of absence must submit their document to their professor.

4.3 Policy on Academic Integrity and Plagiarism

The institution places a paramount emphasis on upholding the highest standards of academic integrity and ethical conduct in all scholarly pursuits. The Policy on Academic Integrity and Plagiarism underscores the values of honesty, transparency, and integrity, emphasizing the pivotal role these principles play in maintaining the credibility of academic work. Students are expected to conduct themselves ethically and ensure that their academic endeavors reflect their own intellectual contributions. In adherence to this policy, the submission of theses mandates an originality threshold of no more than 10%, ensuring that the work presented is a genuine representation of the student's efforts. To facilitate this, students are encouraged to utilize tools such as Turnitin to independently check their work for potential plagiarism. Moreover, students have the option to collaborate with their supervisors, employing tools like iThenticate which is provided by the University, to ensure the authenticity and originality of their research contributions. This multifaceted approach underscores the institution's commitment to fostering a culture of academic honesty and research ethics within the academic community.

We demand a high level of scholarly behaviour and academic honesty. Work submitted must be the original of the learner. Demonstration of integrity in all academic efforts is expected. Anyone suspected and discovered to have committed plagiarism or any other form of academic dishonesty will be sanctioned as detailed in this policy and is likely to be subjected to disciplinary action.

All students, staff and faculty members of the University are responsible for adhering to the policy. The positions of authority responsible for the adherence and compliance of this policy are: Programme Advisor, Programme Coordinator, Lecturer, Heads of Department (HOD), Director of Student Affairs, Senior Director, Deanship of Graduate Studies and Scientific Research, Deanship of Scientific Research, Dean of the Faculty, , and the Vice President of the University.

4.4 Procedures for academic appeals

Academic Appeal Procedure for Issues Involving Personal Relationships with Students and Supervisors or Academic Process Concerns:

- **Internal Resolution:**

If a student encounters issues related to personal relationships with their supervisor or experiences concerns about the academic process, the initial step involves addressing the matter internally. The student is encouraged to have an open and constructive discussion with their supervisor to resolve the issue amicably. If the resolution is not achieved at this stage, the student should elevate the matter to the Graduate Committee within the department.

- **Graduate Committee Intervention:**

Upon receiving the appeal, the Graduate Committee initiates an internal review of the situation. The committee may choose to form a subcommittee or establish a temporary committee specifically designated to address the concerns raised by the student. This committee, consisting of impartial faculty members, works towards mediating the issue, considering both the student's and supervisor's perspectives. The objective is to find a fair and equitable resolution that aligns with academic standards and maintains a conducive learning environment.

- **Department Head Involvement:**

If the resolution is not achieved through the Graduate Committee's intervention, the matter may be escalated to the Head of the Department. The Head of the Department conducts a thorough review of the case, taking into consideration the recommendations and findings of the Graduate Committee. The Head of the Department works towards a fair resolution and may implement corrective measures as needed.

- **Involvement of the Dean of Scientific Research:**

If the resolution is still elusive, or the matter is of significant concern, the department may seek advice and intervention from the Dean of Scientific Research. The Dean plays a pivotal role in providing guidance and facilitating a resolution that aligns with academic integrity and institutional policies.

This structured academic appeal procedure ensures that issues involving personal relationships with students and supervisors, or academic process concerns are addressed through a systematic and transparent process. Each level of intervention is designed to uphold fairness, objectivity, and adherence to academic standards, thereby fostering a supportive and conducive learning environment.

5. Thesis Guidelines

5.1 Registration of Thesis

1. **Passing 50% of courses:** After the student passes at least 50% of the courses with a cumulative GPS of 'Very Good' or better, she/he is allowed to submit her/his thesis proposal to the Department.
2. **Topic Selection** Students often need to choose a topic that aligns with their interests. Then, the department suggests a qualified faculty member to serve as the thesis supervisor.
3. **Initial Meeting** a meeting between the student and the faculty member is conducted to discuss the research plan, objectives, methodology, and expected outcomes.
4. **Supervisor Confirmation** After meeting with the potential supervisor, students must identify and confirm a faculty member who specializes in the relevant area and is willing to provide guidance.
5. **Proposal Preparation** Upon agreement, the faculty member prepares a comprehensive proposal (according to a proposal form template) that includes the research question, literature review, methodology, and expected outcomes.
6. **Postgraduate Committee Review** The proposal is then submitted to the postgraduate committee to review it. Upon approval, the postgraduate committee will distribute the proposal with a survey to collect the staff member's opinions and comments about the proposal.
7. **Feedback and Revision** The comments are sent back to the faculty member for consideration.
8. **Department Council Approval** the proposal will be discussed and approved by the department council.
9. **Registration form:** Upon approval, supervisor will typically complete the formal registration process, including any required paperwork or administrative steps (electronically) till the registration is completed. Form in appendix.

For thesis writing guidelines provided by the Deanship of Graduate Studies please see Appendix B

5.2 Selection of Topic and Supervisor

Here, students have the autonomy to propose a thesis topic they are passionate about and would like to explore in collaboration with a supervisor. Alternatively, supervisors may also provide students with topic suggestions based on their expertise and ongoing research.

According to the Ministry of Education's postgraduate regulations, the supervision of thesis is subject to the following regulations:

a) Professors and Associate Professors among the University staff members.

b) Assistant Professors can supervise a master's degree if two years have passed since being appointed in her/his rank and have written at least two refereed papers in her/his major, whether published or accepted for publication.

c) Qualified and distinguished staff members from outside the University may supervise dissertations through resolution by the University Council based on recommendations by the Department and the Deanship of Graduate Studies Councils.

d) A staff member from other departments may co-supervise a dissertation depending on the nature of the work, provided that the main supervisor is from the department in which the student is studying.

e) A supervisor, whether solely or in collaboration with others, can concurrently supervise a maximum of seven thesis.

f) Each thesis supervision is equivalent to 1 hour in the staff member's teaching load if s/he is the only supervisor or the main one.

Research groups:

Within the Physics Department, students have the unique opportunity to engage with diverse and specialized research groups tailored to their individual interests and majors. These research groups serve as dynamic hubs, each focusing on a distinct realm of scientific inquiry. Students can choose supervisors from an array of cutting-edge fields, including:

1. **Theoretical and Computational Physics:**

Focus: Exploration of complex theoretical concepts and the application of computational models in physics.

2. **Energy and Sustainability:**

Focus: Investigates sustainable solutions and advancements in energy-related studies, addressing challenges in energy sustainability.

3. **Nuclear Physics**

Focus: Examines the intricacies of atomic nuclei, nuclear reactions, and their applications in various scientific and industrial contexts.

4. **Photonic and Spectroscopy:**

Focus: Explores the properties and applications of light, utilizing spectroscopic techniques to analyze materials and phenomena.

5. **Functional Materials and Nanotechnology:**

Focus: Researches the development and application of advanced materials on a nanoscale, with an emphasis on functionality and innovation.

6. **Biomedical Nanotechnology:**

Focus: Explores the intersection of nanotechnology and medicine, investigating applications in diagnostics, drug delivery, and therapeutic interventions.

7. **Medical Physics:**

Focus: Applies principles of physics to the field of medicine, encompassing medical imaging, radiation therapy, and other medical technologies.

This diverse array of research groups within the Physics Department offers students a range of opportunities to engage in cutting-edge research aligned with their specific interests and career aspirations.

Note: for potential supervisors, please check the staff list in Appendix A.

The supervisor's responsibilities

8. **Guidance:** Provide regular and timely guidance on the research topic, methodology, conducting experiments, analyzing results, and writing.
9. **Feedback:** Offer constructive feedback on drafts and suggest improvements.
10. **Ethical Oversight**: Ensure that the research is conducted ethically and responsibly.
11. **Progress Monitoring:** Keep track of the student's progress and help them stay on schedule.
12. **Regular Check-Ins**: Scheduled meetings to discuss progress, review drafts, and address any issues.
13. **Defense Preparation**: helps students with any required defense or presentation.
14. **In case the main supervisor is unable to continue supervising the student's thesis**, such as leaving the university or any other valid reason, then the Department proposes a substitute supervisor to continue supervising the student's thesis.
15. **If it is proven that the student is not serious in their studies**, or in case of any breach of research duties based on a report from the supervisor, the department must send a warning letter after recording a FN grade. If a FN grade is recorded for two consecutive semesters, the student's registration will be canceled. The student has the right to object to the evaluation.
16. **If the student does not correct the warning causes,** her/his registration shall be cancelled by the Council of the Deanship of Graduate Studies based on the Department Council recommendation.

Follow-up procedures

The program adopts the following procedure to follow-up on scientific thesis supervision:

1. By the end of each semester: the supervisor submits to the department head and the Graduate Studies Dean a follow-up report including the summary of progress against the proposed timeline, challenges, and recommendation, signed by both the supervisor and the student.
2. By the end of each year: The program assigns a mentor to each student, the mentor meets with the student and writes a report and submits it to the program.
3. By the end of each year: the program coordinator writes a report to be discussed and approved by the department council.
4. Seminar: Every student must give a seminar about his/her thesis during the department weekly seminar before submitting their thesis for defines. The seminar is evaluated by three faculty members (including the supervisor) that are specialized in the field student's thesis.
5. Poster: students must present their research results in a poster day that is arranged by the Faculty every semester.
6. Publication: : Students before applying for forming the VIVA committee must publish their research results in a journal or a conference.

5.3. Thesis Defence procedures

1. Before the formation of the thesis committee for the viva, the student should submit his/her thesis to the Deanship of Graduate Studies for approval.
2. Upon approval, the thesis committee is formed consisting of:
    a) The supervisor who chairs the committee.
    b) Two additional members: one from the department (internal examiner) and the other outside the department (external examiner).
3. The committee should fulfill the following requirements (according to the Postgraduates by laws):
    a) An odd number of examiners shall be selected, provided the supervisor is the secretariat.
    b) The minimum number of examiners is three provided that the supervisor and the co-supervisor, if any, do not constitute a majority.
    c) A professor, or at least an associate professor, should be on the examination board.
4. The thesis committee formation should be approved by the department council and the dean of Graduate studies.
5. Upon approval, the date of the Viva will be announced to the whole department.
6. The head of the department, or a member of the postgraduate committee delegated by the head of the department, must attend the Viva for monitoring and write a report to the Dean of Graduate studies.
7. After the Viva, A report signed by all examiners shall be submitted to the Department Chairperson within one week of the examination with one of the following recommendations:

a) Accepting the dissertation and recommending the degree award.

b) Accepting the dissertation and suggesting some changes without being re-examined. One of the examination board members shall be assigned to award the degree provided that the corrections are made within a maximum period of three months from the examination date; the University Council is entitled to make exceptions.

c) Re-examining the dissertation after the corrections are made within a period specified by the Council of the Deanship of Graduate Studies based on the Department Council recommendation. The maximum period is one year from the examination date.

8. Recommendation of degree award shall be submitted by the Dean of to the University Council to decide on the matter.

For Further Information please check Appendix B.

6. Research resources

6.1. Library

The university has several libraries to support its academic programs and research initiatives:

- Central library: is typically a focal point with contained 10,228 volumes and works from 8am-9pm
- Female library: located in the female campus and works from 8am-4pm and offers many books and references.
- Faculty of science library: one is located at the male campus and the other at the female campus inside the faculty of science buildings.

6.2. Classrooms

Faculty of science building in both male and female campus has enough classrooms that are equipped with projector, data show, computers connected to the internet and all necessary technology for teaching and learning activities. Technical support is provided on the spot whenever it is needed in classrooms.

6.3. Research Laboratories

This list includes research and graduate laboratories located in **building (115).**

Lab	**Name Room #**	**Note**
Innovations Exhibition 127	127	Innovations Exhibition 127
Physical Vapor Deposition	122	Sputtering and Electron-beam
Chemica Vapor Deposition	118	Carbon Nanotube CVD
Laser Optics Lab	217	CW Diode Lasers 405, 375 nm…etc
Semiconductor devices Lab	215	Keithley 4200-SCS..etc.
Material Science Lab	213	DSC-TGA and FT-IR instrument
Optoelectronics Lab	207	LED and photosensors…etc
Advanced Nuclear Lab	294	Radiation Sources
X-Ray Diffraction Lab	285	XRD Characterization
Sample preparation Lab	286	Fume hood, scales and furnaces..etc.
Low Temperature Lab	287	He-Cryostat and Cryogenics
Thermal Evaporation Deposition	288	Thermal Evaporation system
Ellipsometry Lab	289	Ellipsometry instrument

*Please note that equipment may be replaced or new maybe added. Please ask the person in charge for an update.

The below list includes research and graduate laboratories located in **building (7) of the female campus.**

Lab Name	**Room #**	**Note**
Laser and optics	24	
Nanoparticle preparation	36	Fume hood, furnace ….
Thin films and electrical measurements	31	Sputtering, Furnace, ultrasonic bath, Ozon etching….

*Please note that equipment may be replaced or new maybe added. Please ask the person in charge for an update.

6.4. Research Centers

There are many research centers in the university that the staff and postgraduate students can get access to them and conduct their research:

1. Center of Excellence In Genomic Medicine Research.
2. Research and Development Center.
3. Water Research Center.
4. King Fahd Medical Research Center.
5. Center of Nanotechnology.
6. Center of Research Excellence in Renewable Energy and Power Systems
7. Center of Excellence in High Performance Computing Center.
8. Center of Excellence for Advanced Materials Research.

7. Student Support Services

7.1. Counseling procedure

- The Student Academic Counseling Committee oversees student counseling.
- Each Faculty is assigned a group of students for counseling.
- The faculty will be available for student counseling at specific office hours daily.
- Faculty should make a file for each student in his counseling group where student contact information, a copy of student timetable, a copy of student academic record are kept and updated every semester.

7.2. Special Support

Disable:

There are many services offered to special needs students at the University level, the college and the program. These includes:

1. **Accessibility Services:**

- Physical Accessibility: campus buildings, classrooms, parking and facilities are accessible to students with mobility challenges.
- Transportation: Providing specially equipped transportation services around the campus for ease of movement.

2. **Academic Support:**

- Assistive Technology: Offering technology-aided learning tools, such as screen readers, voice recognition software, and Braille printers.
- Note-Takers and Sign Language Interpreters: Providing note-takers for classes or sign language interpreters for students with hearing impairments.
- Alternative Formats: Supplying educational materials in accessible formats, including large print, Braille, or audio recordings.
- Extended Time for Exams: Allowing extra time on tests and assignments for students who require it due to their special needs.

3. **Counseling and Health Services:**

- Counseling: Offering psychological counseling and support to help students manage the challenges associated with their disabilities.
- Healthcare Services: Providing medical care and therapy services tailored to the specific needs of students.

4. **Specialized Staff and Resources:**

- Disability Services Office in the university: a dedicated office where students can go to request accommodation and receive advice and support.
- Special needs Committee in the program to provide students with special need tailored services and accommodate them within the program.

5. **Financial support:**

A blind student is eligible to receive an amount of SR 5240 as a Personal Reader Allowance.

A disabled student is eligible for receiving an amount of SR 1500 as a Disability Allowance.

Low achievers:

There is a committee assigned within the program to track and follow-up with low achiever students through the following procedures:

Coordinate with the academic advisory committee for identifying the struggling students.

Communicate with the students and conduct one-to-one meeting to discuss their challenges and needs.

Develop a plan for everyone to help them achieve their needs.

Follow up on the plan.

Gifted and talented students:

They are honored through graduation committees and/or their clubs.

There is a committee assigned within the program to track the gifted students through the following procedures:

- Coordinate with the academic advisory committee for identifying gifted students.
- Communicate with the students and conduct one-to-one meetings to discuss their needs and direct them.
- Develop a plan for everyone to help them achieve their needs.
- Follow up on the plan.

7.3. Learning Resources

Digital library:

The Deanship of Library Affairs provides electronic services that can be accessed on and off campus through Deep Knowledge "https://kau.app.deepknowledge.io/home". These services include:

1- Databases access.

2- Electronic library that can be accessed through https://kau.deepknowledge.io/KAU and offer many resources such as: Saudi Digital Library, ScienceDirect, Web of Science (ISI), IEEE, SpringerLink – Springer, and Wiley.

3- Programs: such as Microsoft office 365, Adobe, ..etc

Deanship of e-learning and distance education

Offers many services to students and faculty staff including :

1- Blackboard System

2- Electronic Exams

3- VitalSource: is an Electronic textbook platform.

4-Tutorials and Your educational bag

5-Training Courses and technical support.

Appendix A: Staff Contacts

Female Branch

الاسم	الدرجة العملية	التخصص	الايميل	المبنى / المكتب
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Appendix B: Summary of Links

Course specification for required courses
Course specification for elective courses
KAU Thesis Formatting Manual
KAU Graduate Studies Manual
Exams and Students evaluation policies at King AbdulAziz University
Manual for Intellectual Property Regulations and Ethical Practices in the Physics Department
Internal Quality Asuurance Mnaual for Pysics Master Porgram

THE END