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1. Aims and Scope
The Materials Science and Engineering Program is designed to equip students with fundamental and applied knowledge of materials. The program goal is to prepare students to tackle grand challenges in sustainability and alternative energy, nanotechnology and Nano electronics, biomaterials, materials characterization and low-power computing. The program also aims to support KAUST's existing research centers, such as the Solar, Membrane, Catalysis, Combustion and Desalination centers.

2. Assessment Test (If applicable)
Students are admitted to KAUST from a wide variety of programs and backgrounds. In order to facilitate the design of an appropriate study plan for each individual student, all admitted students without an MS are required to take a written assessment exam when they arrive on Campus. The purpose of the assessment is to determine whether students have mastered the prerequisites for undertaking graduate-level courses taught in the program. The Academic Advisor works with admitted students to develop a study plan if needed. Students are encouraged to prepare for the assessment by refreshing the general knowledge gained from their undergraduate education before arriving at KAUST. The remedial study plan requirements must be satisfactorily completed, in addition to the University degree requirements.

3. Master's Degree Requirements
It is the sole responsibility of the student to plan her/his graduate program in consultation with her/his advisor. Students are required to meet all deadlines. Students should be aware that most Core Courses are offered only once per year.

The Master's Degree (M.S.) is awarded upon successful completion of a minimum of 36 credit hours. A minimum GPA of 3.0 must be achieved to graduate. Individual courses require a minimum of a 'B-' for course credit. Students are expected to complete the M.S. degree in three semesters and one Summer Session. Satisfactory participation in every KAUST's Summer Session is mandatory. Summer Session courses are credit bearing and apply towards the degree.

The M.S. degree has the following components:
- Core Courses
- Elective Courses
- Research/Capstone Experience
- Graduate Seminar 298 (non-credit). All students are required to register and receive a Satisfactory grade for three semesters of the program they attend.

3.1 M.S. Course Requirements

3.1.1 Core Courses (twelve credits) – choose three MSE and one AMCS course
- MSE 221 - Crystallography and Diffraction
- MSE 225 - Electronic Properties of Materials
- MSE 226 - Thermodynamics and Equilibrium Processes
- MSE 227 - Applied Quantum Mechanics

These Core Courses are designed to provide a student with the background needed to establish a solid foundation in the program area. M.S. students must select three MSE Core Courses from the list above, and either MSE 200 and or any AMCS courses to fulfil the Core Course requirements.

3.1.2 Elective Courses (12 credit hours for thesis option; 18 credit hours for non-thesis option)
- MSE 200 - Engineering Mathematics
- MSE 201 - Fundamentals of Materials Science and Engineering
The elective courses (which exclude research, internship credits, and IED courses) are designed to allow each student to tailor his/her educational experience to meet individual research and educational objectives, with the permission of the student’s academic advisor.

3.1.3 Research/Capstone Experience (twelve credits for thesis option, six credits for non-thesis option)
See sections for thesis and non-thesis options below.

3.1.4 Graduate Seminar (MSE 298)
All students are required to register and receive a Satisfactory grade for three semesters during the MS degree to complete the degree requirement.

3.1.5 Winter Enrichment Program
Students are required to satisfactorily complete at least one full Winter Enrichment Program (WEP).

3.2 M.S. Thesis Option
Students wishing to pursue the thesis option must apply by the ninth week of their second semester for a thesis and must have at least a 3.2 cumulative GPA.

The selected thesis advisor must be a fulltime program-affiliated Assistant, Associate or Full Professor at KAUST. This advisor can only become project affiliated for the specific thesis project upon program level approval. Project affiliation approval must be completed prior to commencing research.

3.2.1 M.S. Thesis Defense Requirements
An oral defense of the M.S. Thesis is required, although it may be waived by the Dean’s Office under exceptional circumstances. A requirement of a public presentation and all other details are left to the discretion of the thesis committee.

A written thesis is required. It is advisable that the student submits a final copy of the thesis to the Thesis Committee Members at least two weeks prior to the defense date.

- Students are required to comply with the university formatting guidelines provided by the library [CLICK HERE](#)
- Students are responsible for scheduling the thesis defense date with his/her thesis committee.
A pass is achieved when the committee agrees with no more than one dissenting vote, otherwise the student fails. The final approval must be submitted at the latest two weeks before the end of the semester.

### 3.2.2 M.S. Thesis Defense Committee

The M.S. Thesis Defense Committee, which must be approved by the student’s Dean, must consist of at least three members and typically includes no more than four members. At least two of the required members must be KAUST Faculty. The Chair, plus one additional Faculty Member must be affiliated with the student’s program. This membership can be summarized as:

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**Notes:**
- Members 1-3 are required. Member 4 is optional.
- Co-Chairs may serve as Members 2, 3, or 4, but may not be a Research Scientist.
- Adjunct Professors and Professors Emeriti may retain their roles on current Committees, but may not serve as Chair on any new Committees.
- Professors of Practice and Research Professors may serve as Members 2, 3 or 4 depending upon their affiliation with the student’s program. They may also serve as Co-Chairs.
- Visiting Professors may serve as Member 4.

View a list of faculty and their affiliations: [CLICK HERE](#)

### 3.3 M.S. Non-Thesis Option

Students wishing to pursue the non-thesis option must complete a minimum of six credits of Directed Research (299). Summer internship credits may be used to fulfill the research requirements provided that the Summer internship is research-based. Summer internships are subject to approval by the student’s academic advisor.

Students must complete the remaining credits through one or a combination of the options listed below:
- Broadening Experience Courses: Courses that broaden a student’s M.S. experience.
- Internship: Research-based Summer Internship (295). Students are only allowed to take one internship.
- PhD Courses: Courses numbered at the 300 level.

### 4. Doctor of Philosophy

The Doctor of Philosophy (Ph.D.) Degree is designed to prepare students for research careers in academia and industry. It is offered exclusively as a fulltime program.

There is a minimum residency requirement at KAUST of three and a half years for students entering with a B.S. Degree and two and a half years for students entering with a M.S. Degree. A minimum GPA of 3.0 must be achieved on all doctoral coursework. Individual courses require a minimum of a ‘B-‘ to earn course credit.
The Ph.D. Degree includes the following steps:

- Securing a Dissertation Advisor.
- Successful completion of Program Coursework.
- Passing the Qualifying Examination.
- Passing the Dissertation Proposal Defense to obtain candidacy status.
- Preparing, submitting and successfully defending a Doctoral Dissertation.

4.1 Ph.D. Course Requirements
The required coursework varies for students entering the Ph.D. Degree with a B.S. Degree or a relevant M.S. Degree. Students holding a B.S. Degree must complete all Program Core/Mandatory Courses and Elective Courses outlined in the M.S. Degree section and are also required to complete the Ph.D. courses below. Students entering with a B.S. Degree may also qualify to earn the M.S. Degree by satisfying the M.S. Degree requirements; however, it is the student's responsibility to declare their intentions to graduate with an M.S.

Students entering the Ph.D. Degree with a relevant M.S. Degree must complete the requirements below, though additional courses may be required by the Dissertation Advisor.

**Ph.D. Courses**
- At least four courses, two of which must be at the 300-level.
- Graduate Seminar 398 (non-credit): All students are required to register and receive a Satisfactory grade for four semesters of the program they attend.
- Winter Enrichment Program: Students are required to satisfactorily complete at least one full Winter Enrichment Program (WEP) as part of the degree requirements. Students who completed WEP requirements while earning the M.S. Degree are not required to enroll in a full WEP for a second time in the Ph.D. Degree.
- Satisfactory participation in every KAUST's Summer Session is mandatory. Summer Session courses are credit bearing and apply towards the degree.

4.2 Ph.D. Designation of Dissertation Advisor
The selected Dissertation Advisor must be a full time program-affiliated Professor at KAUST. The student may also select an advisor from another program at KAUST. This advisor can only become project affiliated for the specific dissertation project with program level approval. Project affiliation approval must be completed prior to commencing research.

View a list of faculty and their affiliations: [CLICK HERE](#)

4.3 Ph.D. Candidacy
In addition to the coursework requirements, the student must successfully complete the required Ph.D. qualification milestones to progress towards Ph.D. candidacy status. These milestones consist of the subject-based qualifying examination and Ph.D. Proposal Defense.

4.3.1 Ph.D. Dissertation Proposal Defense Committee
The Ph.D. Dissertation Proposal Defense Committee, which must be approved by the student's Dean, must consist of at least three members and typically includes no more than six members. The Chair, plus one additional Faculty Member must be affiliated with the student’s program.

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Notes:

- Members 1-3 are required. Member 4 is optional.
- Co-Chairs may serve as Members 2 or 3.
- Adjunct Professors and Professors Emeriti may retain their roles on current Committees, but may not serve as Chair on any new Committees.
- Professors of Practice and Research Professors may serve as Members 2 or 3 depending upon their affiliation with the student’s program. They may also serve as Co-Chairs.

Once constituted, the composition of the Proposal Committee can only be changed with the approval of both the Dissertation Advisor and the Dean.

View a list of faculty and their affiliations: [CLICK HERE](#)

### 4.3.2 Ph.D. Dissertation Proposal Defense

The purpose of the Dissertation Proposal Defense is to demonstrate that the student has the ability and is adequately prepared to undertake Ph.D.-level research in the proposed area. This preparation includes necessary knowledge of the chosen subject, a review of the literature and preparatory theory or experiment as applicable.

The Dissertation Proposal Defense is the second part of the qualification milestones that must be completed to become a Ph.D. Candidate. Ph.D. students are required to complete the Dissertation Proposal Defense within one year after passing the qualifying examination. The Dissertation Proposal Defense includes two aspects: a written Research Proposal and an oral Research Proposal Defense. Ph.D. students must request to present the Dissertation Proposal Defense to the Proposal Dissertation Committee at the beginning of the Semester they will defend their proposal.

There are four possible outcomes from this Dissertation Proposal Defense:

- Pass
- Pass with conditions
- Fail with retake
- Fail without retake

A pass is achieved when the committee agrees with no more than one dissenting vote, otherwise the student fails.

In the instance of a Pass with Conditions, the entire committee must agree on the required conditions and if they cannot, the Dean decides. The deadline to complete the conditions is one month after the defense date, unless the committee unanimously agrees to change it.

In the instance of a Fail without Retake, the decision of the committee must be unanimous. The deadline to complete the retake is six months after the defense date, unless the committee unanimously agrees to reduce it. Students who fail the Dissertation Proposal Defense, or who fail the Retake will be dismissed from the University.

A student who successfully passes the Dissertation Proposal Defense is deemed a Ph.D. Candidate.
4.4 Ph.D. Defense
To graduate, a Ph.D. candidate has to form a Ph.D. Dissertation Defense Committee, finalize the Ph.D. dissertation and successfully defend his/her Ph.D. dissertation.

4.4.1 Ph.D. Dissertation Defense Committee
The Ph.D. Dissertation Defense Committee, which must be approved by the student’s Dean, must consist of at least four members and typically includes no more than six members. At least three of the required members must be KAUST Faculty and one must be an Examiner who is external to KAUST. The Chair, plus one additional Faculty Member must be affiliated with the student’s Program. The External Examiner is not required to attend the Defense, but must write a report on the dissertation and may attend the Dissertation Defense at the discretion of the Program.

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Notes:
- Members 1-4 are required. Members 5 and 6 are optional.
- Co-Chairs may serve as either members 2, 3 or 6.
- Adjunct Professors and Professors Emeriti may retain their roles on current Committees, but may not serve as Chair on any new Committees.
- Professors of Practice and Research Professors may serve as members 2, 3 or 6 depending upon their affiliation with the student’s Program. They may also serve as Co-Chairs.
- Visiting Professors may serve as member 6, but not as the External Examiner.

The only requirement with commonality with the Proposal Committee is the Supervisor, although it is expected that other members will carry forward to this committee.

If the student has a co-supervisor, this person can be considered one of the above four members required, provided they come under the categories listed (i.e. meets the requirements of the position).

4.4.2 Ph.D. Dissertation Defense
The Ph.D. Degree requires the passing of the defense and acceptance of the dissertation. The final defense is a public presentation that consists of an oral defense followed by questions and may last a maximum of three hours.

The student must determine the defense date with agreement of all the members of the Dissertation Committee, meet deadlines for submitting graduation forms and inform the committee of his/her progress. It is the responsibility of the student to submit the required documents to the Graduate Program Coordinator at the beginning of the semester they intend to defend. It is also expected that the student submits their written dissertation to the committee at least two months prior to the defense date in order to receive feedback.
The written dissertation is required to comply with the University Formatting Guidelines which are on the library website: CLICK HERE

There are four possible outcomes from this Dissertation Final Defense:
- Pass
- Pass with conditions
- Fail with retake
- Fail without retake

A pass is achieved when the committee agrees with no more than one dissenting vote, otherwise the student fails. If more than one member casts a negative vote, one retake of the oral defense is permitted if the entire committee agrees. In the instance of a ‘Pass with Conditions’, the entire committee must agree on the required conditions and if they cannot, the Dean decides. The deadline to complete the revisions is up to one month after the defense date, unless the committee unanimously agrees to reduce it. The deadline to complete the retake is as decided by the defense committee with a maximum of six months after the defense date, unless the committee unanimously agrees to reduce it. Students who fail without retake the Dissertation Defense or who fail the retake will be dismissed from the University.

Evaluation of the Ph.D. Dissertation Defense is recorded by submitting the Result of Ph.D. Dissertation Defense Examination form within three days after the Defense to the Registrar’s Office.

5. Program Courses and Descriptions

Course Notation:

Each course is listed prefaced with its unique number and post fixed with (L-C-R) where:

| L   | the lecture hours to count towards fulfilling the student workload during the semester. |
| C   | the recitation or laboratory hours                                             |
| R   | the credit hours towards fulfilling a degree course requirement.              |

E.g. CS220 Data Analytics (3-0-3) has a total of three hours of lectures per week, has no labs and earns three credits for the semester.
100-level courses are preparatory in nature and do not count towards the MS or PhD degrees.

MSE 100 – Basic Principles of Physics (3-0-0)
Prerequisite: None.
This course is a review of physics content normally taught at the senior undergraduate level. The course will cover electric field and potential, DC and AC current circuits, magnetism, magnetic induction, electromagnetic waves and optical phenomena (transmission, reflection, diffraction, interference, etc). Further topics will include Blackbody radiation, photoelectric effect, atomic line spectra, Bohr hydrogen atom, de Broglie waves, Heisenberg Uncertainty Principle, free particle, particle in a box, particle on a ring, simple harmonic oscillation, quantum numbers and angular momentum. Finally, an overview of the first, second, and third laws of Thermodynamics along with heat capacity, enthalpy, thermal conduction is presented.

MSE 199 – Directed Study in Materials Science (3-0-0) (variable credit up to a maximum of 12 credits)
A course of self-study in a particular topic as directed by faculty and approved by the division.

MSE 200 – Engineering Mathematics (3-0-3)
Prerequisite: None.
This course presents basic mathematical methods for engineers including: differentiation and integration, Taylor's expansion, linear systems resolution and matrix formalism, partial differential equations, Laplace, Fourier and Legendre transforms, statistics and probability.

**MSE 201 – Fundamentals of Materials Science and Engineering (3-0-3)**
Prerequisite: None.
This course is intended for students who do not have a materials science and engineering background. The course will cover four major topics including: fundamental concepts, microstructure development and phase equilibria, material properties and fabrication methods and applications. The course will cover atomic structure, atomic bonding, crystal structures, defects and diffusion in materials. It also will cover phase transformations and phase equilibria and how they impact microstructure development. The electrical, magnetic, optical, thermal and mechanical properties of materials will also be reviewed. The course will also highlight modern fabrication technologies and applications of metals, ceramics, semiconductors, and polymers.

**MSE 221 – Crystallography and Diffraction (3-0-3)**
Prerequisite: None.
The objective of this course is to present the basic concepts needed to understand the crystal structure of materials. Fundamental concepts including lattices, symmetries, point groups, and space groups will be discussed and the relationship between crystal symmetries and physical properties will be addressed. The theory of X-ray diffraction by crystalline matter along with the experimental x-ray methods used to determine the crystal structure of materials will be covered. Application of X-ray diffraction to proteins, electron diffraction and neutron diffraction will be briefly discussed.

**MSE 225 – Electronic Properties of Materials (3-0-3)**
Prerequisite: Basic knowledge of quantum mechanics, electromagnetism and solid state physics.
The objective of this course is to present the fundamental concepts of structural, electrical and optical properties needed to understand the behavior of the materials. The course includes a brief description of crystal structure of solids and the basics of x-ray diffraction theory; free electron theory in metal and band theory will be addressed. A brief review of thermal and lattice vibration properties will be presented. A brief introduction on key electronic devices based on homo p-n junctions and hetero-junctions. A brief description of dielectric materials.

**MSE 226 – Thermodynamics & Equilibrium Processes (3-0-3)**
Prerequisite or Co-Requisite: MSE 200 or any AMCS Course
The course offers a modern fundamental understanding of the main concepts and practical applications of thermodynamics in materials science. The following major topics are discussed: review of the laws of classical thermodynamics, introduction to statistical thermodynamics phase equilibria, including phase diagrams, theory of solutions, chemical reactions involving gasses and condensed matter, Elligham diagrams, surface and interfacial phenomena and thermodynamics at the nanoscale.

**MSE 227 – Applied Quantum Mechanics (3-0-3)**
Prerequisite or Co-Requisite: MSE 200 or any AMCS Course

**MSE 228 – Biomaterials (3-0-3)**
Prerequisite: None.
This course offers a basic understanding of the concepts underlying the design and selection of materials for use in biological applications. It focuses on both hard and soft tissue materials. The class addresses modern topics including biosensors, surface and interface functionalization. Further topics include: A brief introduction to relevant tissue types: anatomy, biochemistry and physiology; concepts of biocompatibility,
host response, material degradation, testing and selection criteria; an overview of current research on biomechanics and its relevance to prosthesis design and tissue engineering; basic concepts of drug delivery and molecular biomechanics.

**MSE 229 – Polymeric Materials (3-0-3)**
Prerequisite: None.
This course describes polymerization processes; polymer solutions (Flory-Huggins model and application to polymer blends); polymer chain conformations; calculation of end-to-end distribution function $W(r)$ for short range interacting chains; rotational isomeric state scheme and temperature dependence; chain with long range interactions (excluded volume effect); radius of gyration; the crystalline and amorphous states of polymers; the glass transition (configurational entropy model); mechanical, electrical and optical properties and characterization of polymers.

**MSE 230 – Materials for Energy (3-0-3)**
Prerequisite: None.
This course is intended as a review of the challenges facing materials scientists working in renewable energy and sustainability science and technology. It aims to give the student a birds-eye view of the current topics in energy harvesting and storage materials. The potential of various energy harvesting approaches will be discussed in the context of energy needs facing the world. This will be done with particular focus on materials innovations required to improve the state of the art. After this thorough introduction, the course will discuss solar power and electrochemical energy storage in more depth.

**MSE 294 – Contemporary Topics in Materials Science (3-0-0)**
A course of current interest. Topics are not permanent and the content of the course will change to reflect recurring themes and topical interest. The content will be approved by the division.

**MSE 295 – Internship (6 credits)**
Prerequisite: Approval of Academic Advisor.
Master's-level summer internship.

**MSE 297 – Thesis Research (variable credits)**
Prerequisite: Approval of Thesis Advisor.
Master's-level thesis research.

**MSE 298 – Graduate Seminar (non-credit)**
All students are required to register and receive a Satisfactory (S) grades for three semesters to meet degree requirements.

**MSE 299 – Directed Research (variable credits)**
Prerequisite: Approval of Academic Advisor.
Master's-level supervised research.

**MSE 305 – Kinetics and Phase Transformations (3-0-3)**
Prerequisite: MSE 226
The course offers a modern and fundamental understanding to the main concepts and practical applications of Kinetics and Phase Transformations in materials science. The following major topics are discussed within the frame of this course: kinetics of homogenous chemical reactions, thermodynamics of irreversible processes including an introduction to the Onsager postulates, mathematical description of Diffusion in Materials (Fick's Laws and an atomistic description via random-walk process). Basic concepts of phase transformation theories, including homogeneous and heterogeneous nucleation and growth, spinodal decomposition and Landau theory of phase transformation.

**MSE 307 – Materials Characterization (3-0-3)**
Prerequisite: None.
This course will introduce the basic principles of materials characterization and the common characterization techniques available at KAUST. It will cover the following topics: Diffraction methods: basic principles, interaction of radiation and particle beams with matter, XRD, scattering techniques; Spectroscopic methods; Imaging: optical including confocal microscopy, scanning, transmission electron, scanning tunneling and field ion microscopy; Microanalysis and Tomography: energy dispersive, wavelength dispersive, Auger Processes. Electron, ion and Atom Probe Tomography, SIMS, photoelectron spectroscopy; thermal analysis: DTA, DSC. Lab visits and demonstrations will be scheduled to the class to discuss some case studies.

MSE 311 – Soft Materials (3-0-3)
Prerequisite: None.
This course covers chemical and physical aspects of soft materials such as gels, polymers, lipids, surfactants and colloids; physical chemistry of soft materials; phase transformations and self-assembly; the role of intermolecular and surface forces in determining morphology and hierarchy. Membranes, catalysis, drug delivery, flexible and stretchable materials and devices.

MSE 313 – Functional Oxides (3-0-3)
Prerequisite: MSE 227
Fundamental concepts relevant to functional oxides will be reviewed, including common structures, defect chemistry and reactions, Brouwer diagrams, Ellingham diagrams, Heckman diagrams, ionic and electronic transport and tensor notation. The physics, materials, and applications for the following classes of functional oxides will be covered: linear dielectrics, ferroelectrics, multiferroics, piezoelectric, pyroelectrics, electro optics, thermoelectrics and semiconducting oxides. Selected technological applications will be reviewed including sensing, actuation, energy harvesting, and oxide electronics.

MSE 314 – Ab-Initio Computational Methods (3-0-3)
Prerequisite: MSE 227

MSE 315 – Thin Film Science & Engineering (3-0-3)
Prerequisite: None.
Thin films and coatings are the material building blocks of many modern and pervasive technologies ranging from electronics to optics and photovoltaics and from anti-counterfeiting to glazings and hard coatings. The fundamentals and atomistics of thin film growth are discussed in detail. Deposition techniques for thin films and coatings are presented, including physical and chemical vapor depositions, molecular beam epitaxy, atomic layer deposition and low-pressure plasma processes. Organic thin film deposition. Solution-processing and printing of inorganic and hybrid organic-inorganic thin films. Artificially structured and chemically modulated layered and nanocomposite materials. Ex-situ/in-situ characterization of thin films and coatings.

MSE 316 – Magnetic Materials (3-0-3)
Prerequisite: None.
This course introduces fundamental concepts in modern magnetic materials together with the electronic properties of magnetic hybrid structures. (i) Diamagnetism, para-magnetism, ferromagnetism and anti-ferromagnetism will be introduced and the microscopic origin of magnetism will be addressed (metals, semiconductors, oxides, insulators, etc.). (ii) Experimental techniques to investigate magnetism and magnetic behavior will be mentioned (X-ray dichroism, Magneto-Optical Kerr effect, etc...). (iii) Advanced applications of modern magnetic materials will be presented and the electronic properties as well as magnetization dynamics of magnetic hybrid structures will be covered.
MSE 318 – Nanomaterials (3-0-3)
Prerequisite: None.
This course describes the most recent advances in the synthesis, fabrication and characterization of nanomaterials. Topics to be covered: Zero-dimensional nanomaterials, including nanoparticles, quantum dots and nanocrystals; one dimensional materials including nanowires and nanotubes; two (2)-dimensional materials: including self-assembled monolayers, patterned surfaces and quantum well; three (3)-dimensional nanomaterials: including Nano porosity, nanocomposites, block copolymers and supra-cystals. Emphasis on the fundamental surface and size-related physical and chemical properties of nanomaterials; and their applications in bio sensing, nanomedicine, catalysis, photonics and Nano electronics.

MSE 320 – Solar Cell Materials and Devices (3-0-3)
Prerequisite: None.
This course will provide the students with an up-to-date basic knowledge of the physical and chemical principles of materials used in solar cells of various kinds including but not limited to technologies such as: 1) silicon-based solar cells, 2) CIGS, CIS and other inorganic thin film solar cells, 3) multi-junction solar cells, 4) nanoparticles and quantum dots solar cells, 5) organic and hybrid solar cells and 6) thermal and concentrator solar power generation.

MSE 321 – Optical Properties of Materials (3-0-3)
Prerequisite: Basic knowledge of quantum mechanics, electromagnetism, and solid state physics.
Introduction to optical coefficients and optical materials, classical propagation of light, Interband absorption processes and photodetectors, excitons, light emission including photoluminescence and electroluminescence, quantum confined structures, free electrons and plasmons, optical properties of molecules and polymers, color centers, phonons, polaritons, polarons and inelastic light scattering, introduction to nonlinear optical properties of materials including second and third order nonlinearities.

MSE 322 – Semiconductor Materials (3-0-3)
Prerequisite: None.
The course covers the physico-chemical and electronic properties of advanced semiconductor materials other than Si and GaAs. The materials that will be covered include elemental semiconductors such as Ge and carbon (in the form of carbon nanotubes and graphene), compound semiconductors such as III-V and II-VI compounds, and wide-band gap semiconductors such as carbides and nitrides. Special classes of semiconductors such as oxides, chalcogenides, and polymeric semiconductors will be included. In each material category, the material processing and fabrication of select devices will be discussed including 1-dimensional and 2-dimensional devices. Measurement protocols for the devices will be presented.

MSE 390B – Electronic Processes in Organic Semiconductors (3-0-3)
This course offers an introduction to electronic processes in organic materials including small molecules and polymers, nowadays used in many optoelectronic devices such as light-emitting diodes and organic solar cells. Theoretical basics of electronic transitions and excited state dynamics are discussed, specifically emission spectra of single molecules, molecular aggregates, and bulk samples as well as concepts of energy transfer, charge transport, and photo physical processes in conjugated polymers and organic photovoltaic devices. Furthermore, the course offers an introduction to analysis of experimental data from (ultrafast) transient laser spectroscopy and modeling of excited state dynamics using different tools, for instance multivariate curve resolution analysis of complex spectra consisting of several components.

MSE 392 – Introduction to Spintronics (3-0-3)
This course aims at introducing the field of spin electronics to advanced graduate students. This course will cover fundamentals of magnetism and magnetization dynamics, spin transport in hybrid magnetic structures, magnetoresistance, spin transfer torque and spin pumping, spin-orbit effects such as spin Hall effect, Rashba effect and Dzyaloshinskii-Moriya interaction. The current-driven magnetization dynamics of magnetic textures such as domain walls and skyrmions will also be covered.
MSE 394 – Contemporary Topics in Materials Science (3-0-0)
A course of current interest. Topics are not permanent and the content of the course will change to reflect recurring themes and topical interest. The content will be approved by the division.

MSE 395 – Internship (6 credits)
Prerequisite: Approval of Dissertation Advisor.
Doctoral-level summer internship.

MSE 397 – Dissertation Research (variable credits)
Prerequisite: Approval of Dissertation Advisor.
Doctoral-level dissertation research.

MSE 398 – Graduate Seminar (non-credit)
Prerequisite: Non-Seminar sessions focusing on special topics in the field.

MSE 399 – Directed Research (variable credits)
Prerequisite: Approval of Dissertation Advisor.
Doctoral-level supervised research.

6. University Wide Courses
University wide courses are courses in areas not tied to any specific degree program. They are designed to meet institutional requirements, provide broadening experience or to provide supplemental preparation to support students in their degree.

These are listed below:

6.1 English as a Second Language
These courses are designed to provide English language training for students who do not fully meet the University’s English language entrance requirements. Students will be assigned courses based on their level of English or proficiency.

ESL 101 English as a Second Language I (6-0-0)
ESL 101 is a foundational English skills course for reading, listening, speaking and writing. The course has a strong focus on teaching students the basics of academic writing and grammar structures in preparation for thesis work. Course materials are typically A2 level to help students acquire basic academic English skills required for graduate coursework.

ESL 102 English as a Second Language II (3-0-0)
ESL 102 is a pre-English skills course for reading, listening, speaking and writing. The course continues to focus on building academic writing and grammar skills and also have more emphasis on reading for academic purposes. Course materials are typically B1 level to help students further develop pre-intermediate English skills required for graduate coursework.

ESL 103 English as a Second Language III (3-0-0)
ESL 103 is an upper-intermediate English skills course for reading, listening, speaking and writing. The course helps to further develop academic English skills necessary to successfully complete research and thesis work. Course materials are typically B2 level to help students refine upper-intermediate English skills required for graduate coursework.

6.2 Enrichment Program – WEP Courses
The Winter Enrichment Program (WEP) takes place in January each year and is designed to broaden students’ horizon. WEP is an essential and core requirement of the degree programs at KAUST.
Satisfactory completion of at least one WEP is required of all M.S. students as part of the completion of the degree requirements. Ph.D. students who did not receive their M.S. Degree at KAUST are also required to satisfactorily complete at least one WEP. To satisfy this mandatory requirement, full participation must occur within a single WEP period.

6.3 Innovation and Economic Development
Innovation and Economic Development (IED) courses are meant as a broadening experience and are not technical electives. Students should consult with their program to ensure credits can be applied toward their degree.

6.3.1 IED 210 – Technology Innovation and Entrepreneurship (3-0-3)
This course introduces students to using an entrepreneurial and design thinking view to solving real-world challenges including the pathway to commercializing research. It is about changing methods of thinking and equipping graduate students to be able to understand and manage innovation in the corporate world. This course is open to all M.S. students as an elective and to Ph.D. students with permission of their academic advisors.

6.3.2 IED 220 – New Venture and Product Innovation Challenge (6-0-6)
This intensive 8 week module will give a small select group of students, the opportunity and time to develop a detailed value proposition for a product based on an existing piece of intellectual property. This technology may be from the KAUST IP portfolio or potentially from a corporate partner. As part of the program, students will be provided with an overview of key creative subjects related to new product development including: key aspects of intra/entrepreneurship, innovation management including new product development, Go-to-Market strategies as part of commercialization roadmaps, as well as general knowledge on relevant creativity and design thinking. It will also enable students to develop these skills in a full time, heavily mentor-led and experiential learning environment that includes regular pitches and feedback from a wide range of pre-selected mentors from both inside and outside KAUST including international experts.

7. Grading
The KAUST grading system is a 4.0 scale utilizing letter grades and these are the only grades that will be assigned:

- A - 4.00
- A- - 3.67
- B+ - 3.33
- B - 3.00
- B- - 2.67
- C+ - 2.33
- C - 2.00
- C- - 1.67
- D+ - 1.33
- D - 1.00
- D- - 0.67
- F - 0.00
- I - Incomplete
- IP - In-Progress
- W - Withdrew
- S - Satisfactory
- U - Unsatisfactory
- WF - Withdrew-Failed

7.1 Incomplete Grades
Students who complete the majority of the requirements for a course but are unable to finish the course may receive an Incomplete (I) grade. A grade of Incomplete will be assigned only with the consent of the instructor of the course after the instructor and the student have agreed on the academic work that needs to be completed and the date it is due (but no later than the end of the second week of the following semester or session). When the requirements for the course are completed, the instructor will submit a grade that will replace the Incomplete grade on the student’s academic record. 'Incomplete's
not completed by the end of the second week of the following semester or session will be changed to Failing (F) grades.

**Grades for students that are due to Graduate**

Note that any Incomplete grades (as well as Fail grades) will mean a student will not graduate or receive a diploma during the Commencement Ceremony.

Incomplete grades are granted to individual students on a case-by-case basis. Incomplete grades should not be used as a mechanism to extend the course past the end of the Semester. Students are allowed only one Incomplete grade while in a degree program at KAUST.

### 7.2 In-Progress Grades

Thesis Research (297) or Dissertation Research (397) should be graded as In-Progress (IP) or Unsatisfactory (U) for each semester. These ‘IP’ Grades will be converted by the Registrar’s Office to ‘S’ Grades for all semesters once the office has been notified that the thesis or dissertation has been submitted to the library.

### 7.3 Research and Seminar Courses

- 297 = Thesis Research
- 397 = Dissertation Research
- 295/395 = Summer Internship
- 298/398 = Seminar
- 299/399 = Directed Research

**Either ‘IP’ or ‘U’**

### 8. Academic Standing

A student’s academic standing is based on his/her cumulative performance assessment and a semester performance based on the number of credits earned and GPA during the most recently completed semester.

Academic Standing classifications are divided into four categories of decreasing levels of Academic Performance:

- Good Standing
- Academic Notice
- Academic Probation
- Academic Dismissal

**Cumulative Grade Point Average**

- A minimum GPA of 3.0 must be achieved in all coursework.
- Individual courses require a minimum of a B- for Course credit.

**Cumulative Assessment**

<table>
<thead>
<tr>
<th>GPA</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00-4.00</td>
<td>Good Standing</td>
</tr>
<tr>
<td>2.67-2.99</td>
<td>Academic Notice</td>
</tr>
<tr>
<td>2.33-2.66</td>
<td>Academic Probation</td>
</tr>
<tr>
<td>Below 2.33</td>
<td>Academic Dismissal</td>
</tr>
</tbody>
</table>

**S/U Performance**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>GPA Standing</td>
</tr>
<tr>
<td>3-5</td>
<td>GPA Standing less one category</td>
</tr>
<tr>
<td>6-8</td>
<td>GPA Standing less two categories</td>
</tr>
<tr>
<td>9+</td>
<td>Academic Dismissal</td>
</tr>
</tbody>
</table>
### Semester Assessment (Registered in 12 Credits)

<table>
<thead>
<tr>
<th>Credits Earned</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>12+ Credits</td>
<td>GPA Standing</td>
</tr>
<tr>
<td>9-11 Credits</td>
<td>GPA Standing less one category</td>
</tr>
<tr>
<td>6-8 Credits</td>
<td>GPA Standing less two categories</td>
</tr>
<tr>
<td>0-5 Credits</td>
<td>Academic Dismissal</td>
</tr>
</tbody>
</table>

### Semester Assessment (Registered in 9 Credits)

<table>
<thead>
<tr>
<th>Credits Earned</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>9+ Credits</td>
<td>GPA Standing</td>
</tr>
<tr>
<td>6-8 Credits</td>
<td>GPA Standing less one category</td>
</tr>
<tr>
<td>3-5 Credits</td>
<td>GPA Standing less two categories</td>
</tr>
<tr>
<td>0-2 Credits</td>
<td>Academic Dismissal</td>
</tr>
</tbody>
</table>

### Summer Session Assessment

<table>
<thead>
<tr>
<th>Credits Earned</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Credits</td>
<td>GPA Standing</td>
</tr>
<tr>
<td>3-5 Credits</td>
<td>GPA Standing less one category</td>
</tr>
<tr>
<td>0-2 Credits</td>
<td>GPA Standing less two categories</td>
</tr>
</tbody>
</table>

### Definitions:

**Good Standing**
Student is making satisfactory academic progress towards the degree.

**Academic Notice**
Student is not making satisfactory progress towards the degree. A student placed on Academic Notice will be monitored in subsequent semesters to ensure satisfactory progress towards the degree (see Good Standing). If the student’s performance does not improve in the following semester, the student will be placed on Academic Probation.

**Academic Probation**
Student is not making satisfactory progress towards the degree. A student placed on Academic Probation will be monitored in subsequent semesters to ensure satisfactory progress towards the degree (see Good Standing). If the student’s performance does not improve in the following semester, the student will be academically dismissed.

**Academic Dismissal**
Student is not making satisfactory progress towards the degree and is unlikely to meet degree requirements. Dismissed students will be required to leave the University. If deemed eligible, dismissed students will have one week from receiving Notice of Dismissal to file an Appeal.

**Appeal Process for Students Academically Dismissed**
If the student is eligible to appeal, he/she must submit a written explanation why the dismissal should be rescinded along with any supporting documentation. The Committee on Academic Performance will hear the appeal and make a decision to grant or deny the appeal based on the appeal and documentation, the student’s past performance and the likelihood that the student is capable of successfully completing his/her academic program. If the appeal is denied, the student will be required to leave the University. The decision of the committee is final – no additional appeals are permitted.

**S/U Protection**
Due to the significant impact of Unsatisfactory (U) Grades, a Faculty Member giving a ‘U’ Grade for a course involving six or more credits must obtain concurrency of the Dean prior to submitting the grade. If the grade
is given for only a single class (including Research Credit), the number of credits will be capped at six when using the Academic Standing Table displayed above.

**Returning to Good Standing**
A student not in Good Standing due to a GPA deficiency may return to Good Standing by improving his/her cumulative GPA such that it meets or exceeds 3.0. A student not in Good Standing due to 'U' Grades may return to Good Standing by completing at least twelve credits during the subsequent semester with no 'U' grades and a semester GPA of at least 3.0 in traditionally graded courses.

**9. Transferring Credits**
A student may petition to transfer graduate credits from KAUST or another University upon approval of the Program Director and the Registrar.

Each student’s application will be reviewed on a case-by-case basis.

The following rules apply:
- Students entering the program with an M.S. Degree from KAUST may transfer unused coursework toward the Ph.D. program requirements subject to program level approval.
- Up to three graduate-level courses not to exceed nine credits may be transferred for credit. Courses already used for another degree cannot be used as transferred credits.
- The course grade for any course to be transferred must be a ‘B’ or above.
- Courses transferred for degree credit must have been taken within three years prior to admission to KAUST.
- The student must submit a completed KAUST Transfer of Credit Form and include the Course Syllabus and Course Description.
- The student is responsible for supplying an official transcript:
  - The transcript may be no more than three months old.
  - The transcript must be in English or accompanied by a certified English translation.
  - The Grading Key must be included with the transcript.
  - The Transcript must include the course name, level, grade and credit value.
  - The credit value of the course must be equivalent to a minimum of three KAUST credit hours.

**Course Transfer and Equivalency**
Graduate credit hours taken from any KAUST program may be applied to other KAUST graduate programs under the guidelines of the degree program to which the student is admitted. Graduate courses taken from another University or KAUST program that are equivalent in level and content to the designated courses in a major track may be counted towards meeting the major track requirement if their equivalence is confirmed by the Program Director.

Students transferring from other Ph.D. programs may receive some Dissertation Research and Coursework credit units on a case-by-case basis for related work performed at their original Institution. However, such students must satisfy the written and oral requirements for a research proposal (if the proposal had been submitted and approved at the original Institution, the proposal may be the same, if approved by the research advisor). The minimum residency requirement for enrolment of such students at KAUST is two years.

**10. Policy for Adding and Dropping Courses**
A course may be added during the first week of the semester. Students may add courses after the first week with the permission of the instructor. Instructors have the right to refuse admission to a student if the instructor feels that the student will not have the time to sufficiently master the material due to adding the course late. A course may be dropped without penalty at any time during the first two weeks of the semester. Between the second and ninth week, students can drop a course but the course will appear on the student’s transcript with the grade of Withdraw (W). After the ninth week of a full semester, courses may
be dropped only under exceptional circumstances and with the approval of the Course Instructor, the Program Director and the Registrar.

11. Program Planning
It is the sole responsibility of the student to plan her/his graduate program in consultation with her/his advisor. Students are required to meet all deadlines. Students should be aware that most Core Courses are offered only once per year.