The Computer Science Program

Contents

The Computer Science Program
2014-2015 Academic Year

1. Aims and Scope

The Computer Science program trains students to become world-class researchers and thought leaders in the field of computer science. The program is designed to prepare the student for a career in academia, industrial research or advanced positions in industry. The program offers two degrees: the Doctor of Philosophy (Ph.D.) degree and the Master of Science degree (M.S.). The M.S. degree can be obtained by taking courses only or by a combination of courses and writing a thesis. Students who are interested in a research career are encouraged to apply directly to the Ph.D. program. An M.S. degree is not a pre-requisite to enroll in the Ph.D. program.

A student who completes the Ph.D. degree will have demonstrated original research that is published in world-class prestigious conferences, journals, and other research forums. This degree is appropriate for those who want to pursue a career in research either in academia or industry.

A student who completes the Master of Science degree by taking courses and writing a thesis will have demonstrated ability to perform directed research and complete a research project. This degree is appropriate for students who wish to pursue a Ph.D. degree later.

A student who completes the Master of Science degree by taking only courses will have demonstrated strong performance in graduate-level courses that prepare the student for a career of advanced research and development in industry.

The scope of research in the Computer Science program at KAUST includes the following areas:

- Artificial Intelligence and Machine Learning
- Computational Biosciences
- Computer Systems and Databases
- High Performance Computing
- Theoretical Computer Science
- Visual Computing

2. Applications and Admissions

The Computer Science program considers applications from students who have completed a B.S., B.Sc., B.Eng., or M.S. degree in computer science or computer engineering. Applications are also encouraged from students who hold a B.S., B.Sc., B.Eng. or M.S. degree in a related field in science, engineering or mathematics, provided that these applications show some proficiency in basic computer science. All students

considered for admission must attend an academic interview administered by the faculty over the Internet.

There are three possible application tracks, namely M.S., M.S./Ph.D. and Ph.D. Students who hold a bachelor degree can apply to any of the three tracks. An application to the Ph.D. track requires the applicant to contact a Professor in the Computer Science program who would be willing to sponsor the application. Most of the time, this Professor will be the academic advisor of the student's research toward the Ph.D. degree. Students may change advisors after being on campus subject to the approval of the program. Students who apply to the M.S./Ph.D. track are not required to arrange for a sponsor prior to the application.

Students who already hold an M.S. degree must apply to the Ph.D. program. KAUST does not encourage students to apply for a second M.S. degree. The M.S. degree holder is expected to have successfully completed courses that are equivalent to the M.S. degree requirements at KAUST

Students, regardless of degree or background, are encouraged to engage in research under a faculty supervisor as soon as possible.

3. Student Study Plan

3.1. Student Advisor

Upon arriving to the campus, students enroll in an orientation week managed by the university. During the orientation week, each student is expected to meet with his or her faculty advisor. Each student is initially assigned to a faculty advisor regardless of degree. For students enrolled toward the Ph.D. degree, the advisor is the same as the application sponsor and the Ph.D. dissertation advisor. The advisor is responsible for designing a study plan toward the respective degree. The study plan is presented to the program and must be approved by a committee consisting of the associate dean of education, the program chairs and the dean (or designee).

After the first semester of registration, the student may elect to switch to a different faculty advisor (with the approvals of the faculty involved and the program). Students also have the opportunity to select two co-advisors. The advisor has to be a Computer Science faculty member or an affiliated member from another program.

3.2. Placement Test

Students come to KAUST from a wide variety of programs and backgrounds. To facilitate the design of an appropriate study plan for each student, all incoming students will take a placement test in the orientation week. There is no grade for the examination, and there is no passing or failing. The purpose of the examination is to determine the gaps that may impede a student from successful completion of the degree requirements so that they can be addressed in the study plan. The advisor uses the results of the tests to design the list of courses that would lead to a degree (the study plan). Students are

encouraged to prepare for the examination by refreshing their general knowledge that they gained from their undergraduate education before arrival on campus.

3.3. Transfer of Credit

Students entering the program may transfer in up to nine credits of coursework completed as part of their prior degree, subject to the approval of the advisor and the program.

4. Master of Science Degree

4.1. M.S. Degree General Requirements

There are two options to earn an M.S. degree, namely with or without a thesis. Both varieties require all students to satisfy the general requirements spelled out in this section. The additional requirements specific to each option are explained in Sections 4.2 and 4.3. In total, 36 credits are required to earn an M.S. degree under either option.

4.1.1. Basic M.S. Course Requirements

For every student enrolled toward the M.S. degree, the study plan should include the *Basic M.S. Course Requirements.* These courses are defined as 24 credits of coursework:

- 12 credits from the CS Core Courses.
- 12 credits selected from graduate courses at the 200 or 300 levels except CS297 and CS397. These courses can be from outside the program, subject to the approval of the advisor and program.

Some courses enable students to engage in research, such as Directed Research (CS299) where a student performs research under the supervision of a CS faculty member. Students also can earn up to a maximum of six credits by enrolling in research-based summer internships (CS295). Summer internships are subject to approval by the student's academic advisor and the program.

4.1.2. Master Seminar Requirement

All Master students register for CS 298 (non-credit seminar course) for the first two semesters of their studies at KAUST (Fall and Spring only).

4.1.3. M.S. GPA Requirements

Graduation with an M.S. degree in CS requires an average GPA of 3.0; a minimum grade of B- or better is required in all courses presented for the degree.

4.1.4. Master's Non-Thesis Option Degree Requirements

- Fulfill the M.S. General Requirements (see Section 4.1.)
- Earn additional 12 credits from graduate courses at the 200 or 300 levels. These can include courses from outside the program, subject to the approval of the advisor and program.

4.1.5. Master's Thesis Option Degree Requirements

For an MS. Thesis Option degree, a student must fulfill the following requirements:

- Secure a member of the regular faculty who is willing to supervise the research. The thesis option is not guaranteed to every student.
- Earn a minimum of 12 credits of M.S. Thesis Research (CS 297). Students are permitted to register for more than 12 credits of M.S. thesis research as necessary with the permission of the thesis advisor.
- Fulfill the M.S. Degree General Requirements (See section 4.1).
- Write and successfully defend an M.S. thesis in a public seminar.

The student must form a thesis committee including the advisor and two faculty members whose primary appointment is with the CS program. In certain cases, e.g. interdisciplinary work, the advisor may add additional committee members.
The student is responsible for scheduling the thesis defense date with his/her advisor and committee members. The student must submit a written copy of the thesis to the thesis committee members at least two weeks prior the defense date and inform their Graduate Program Coordinator on their intent to defend **one month** prior to the defense date. The student must present the results of the thesis research at an announced division-based seminar, which has to be communicated to his Graduate Program Coordinator.
After the Oral Defense all committee members can vote for the following options:

- Pass Unconditionally: The thesis is acceptable as it is. If all members vote likewise the student is deemed to have passed the defense.
- Pass With Minor Revisions: The thesis requires minor revision. If all members vote "Pass Unconditionally" or "Pass With Minor Revisions", the committee shall compile a list of the required revisions and communicate them to the candidate. The thesis advisor will be responsible for ensuring that all minor revisions have been incorporated in the final thesis.
- Fail with Major Revisions: The thesis requires major revision and another oral defense. If one or more members select this vote, and the other votes are "Pass Unconditionally or "Pass with Minor Revisions", the committee shall compile a list of the required revision and communicate them to the candidate. A new oral defense is scheduled after the candidate incorporates all revisions. Only one major revision is allowed.
- Fail Unconditionally: The thesis is unacceptable. If one member selects this vote he or she will provide a written justification that is delivered to the candidate, the

committee, and the dean. The case is presented to the faculty for a vote. The issue is referred to the faculty in a subsequent meeting who can either vote to retry the defense with a different committee or terminate the candidacy, in which case the student is terminated from the program.

5. Doctor of Philosophy Degree

5.1. Summary of Ph.D. Degree Requirements

For the Ph.D. degree, a student must fulfill the following requirements:

- For students who enter the Ph.D. program with the B.Sc. degree, they need to complete 42 credit hours of courses including at least 6 credit hours of 300-level courses. Students can earn an M.S. degree if they complete the requirements for the M.S. degree (see Section 4) while pursuing the Ph.D. degree. A total of 96 credits are required to complete the Ph.D. degree. Students may get credit from prior degrees.
- For students who enter the Ph.D. program with an M.S. degree, they need to complete 6 credit hours of 300-level courses.
- Enroll in the Winter Enrichment Program at KAUST at least once.
- Fulfill the Ph.D. seminar requirement.
- Complete the Ph.D. qualification examination.
- Submit an annual progress report each year.
- Complete the Ph.D. research proposal examination.
- Fulfill the Ph.D. publication requirement.
- Submit a dissertation, which embodies the candidate's original scholarly work.
- Pass a dissertation defense oral examination.

5.2. Ph.D. Qualification Examination

The Ph.D. qualification examination is a written subject examination in the following three courses: CS260 (Design and Analysis of Algorithms), CS240 (Computer Systems and Concurrency), CS220 (Artificial Intelligence, Machine Learning, and Data Analytics). Course materials including syllabus, books, and previous examinations are provided to students by the Graduate Program Coordinator of the Computer Science Program at the beginning of the Fall and the Spring semesters. The qualifying examination is given twice a year, during the final examinations of the Fall and Spring semesters, respectively.
The Ph.D. qualification examination will precisely be the Final Examination of each of the above courses given during the Fall semester. It will also be a three hours examination per subject (similar to the Fall semester) prepared by the faculty during the Spring semester. The qualifying examination will be consistent in load and in timing between the semesters. Therefore, it will span over two days during the Spring semester. M.S. students who pass the three examinations (in the same semester) are also considered to

have passed the Ph.D. qualification examination even if they have not yet decided to go for Ph.D.
Each examination is graded with a number from 0-100 along with a Pass/Fail grade. Students Pass/Fail decision is as follows:

- Three Passes imply a straight Pass.
- Three or Two Fails imply a straight Fail.
- Two Passes and One Fail require a decision by a committee.

Students who fail must retake the entire examination during the final examination period of the next semester when the qualifying examinations are offered for their second and final chance. If they fail the second attempt, they will not be permitted to continue their Ph.D. program. No partial pass is permitted. Students who fail the examination must retake the three subject examinations even if they previously passed a part of them. No subject waving or change is permitted.

5.3. Ph.D. Research Proposal Examination

The research proposal examination tests the student's preparedness to pursue thesis research. It is an oral presentation of a research proposal together with questioning by the advisory committee. Please inform your Graduate Program Coordinator on your intent to defend your proposal at least **one month** prior to the set date.
The student submits a written research proposal to the advisory committee **two weeks** prior to the oral presentation. The advisory committee consists of the advisor and two faculty members from within the program as close to the proposed research area as possible. In certain cases, e.g. interdisciplinary research, the advisor may add additional committee members. The candidate must convince the committee that the chosen research area is suitable and demonstrate an appropriate breadth of knowledge in the chosen area. The committee should decide if the proposal constitutes an original thesis in the area and whether the candidate is capable of completing such a thesis. The committee decision can be:

- Pass: The student may proceed to work on the dissertation.
- Conditional Pass: The student collects the committee feedback and attempts to correct deficiencies. The committee can request another informal/individual oral examination. A Pass must be obtained by the end of the following semester.
- Fail: The student is judged not capable of completing the degree with an original thesis in a reasonable amount of time.

The committee reports the results to the student and to the division in writing.

5.4. Ph.D. Seminar Requirement

Each Ph.D. candidate must present at least two publicly announced seminars (or classroom lectures, possibly in 200-level courses) during the program. The purpose of this requirement is to ensure that each student participates in the

academic life of the university and to enhance his or her presentation skills. The advisor and one other faculty member must attend the seminar.

5.5. Annual Progress Reports

Progress reports must be filed at the end of each academic year by M.S. candidates under the dissertation option and by Ph.D. students. They are intended to assist the student to focus on making timely progress through the program requirements. To get the template of a progress report, please see your Graduate Program Coordinator. The entire faculty will review that report on a yearly basis. Students who are not performing at a satisfactory level may receive a warning letter with specific remedial actions. A period of six months is given to remedy any deficiencies. Failure to address the problem may result in dismissal from the program.

5.6. Ph.D. Publication Requirement

At least one paper out of the dissertation work should have been published in well-recognized research conferences or journals prior to approval of the final Ph.D. dissertation defense.

5.7. Ph.D. Dissertation

The Ph.D. dissertation embodies the candidate's original scholarly work.

5.8. Ph.D. Oral Defense

The student must schedule the final oral defense after completion of all other degree requirements including the doctoral research and writing of the dissertation. This examination will be a defense of the doctoral dissertation and a test of the candidate's knowledge in the specialized field of research. The student must submit a copy of the dissertation at least eight weeks prior to the defense date.
The format of the examination will be a public seminar presented by the candidate. The date must be specified and announced by the Graduate program Coordinator at least two months in advance. The public seminar ends with an open question period, followed by a private examination by the final examination committee.
The final examination committee shall consist, *as a minimum*, of the following members:

- The dissertation advisor who is a member of, or affiliated faculty with, the Computer Science program.
- Two KAUST faculty members from the Computer Science program whose areas of research are as close to the dissertation area as possible.
- One KAUST faculty member outside of the program and whose area of expertise is *different* from the dissertation topic. This member of the committee should not be affiliated with the Computer Science program.
- A faculty external to KAUST (holding a faculty position or equivalent position at another institution, with approval by both the student's advisor and division Dean

(or designee)). The external faculty should be an active researcher in the area of the dissertation.

In certain cases, e.g. interdisciplinary research, the advisor may add additional committee members. The only requirement for commonality with the proposal examination committee is the research advisor, although it is expected that other members will carry forward to the dissertation committee.
After the Oral Defense all committee members can vote for the following options:

- Pass Unconditionally: The dissertation is acceptable as it is. If all members vote likewise the student is deemed to have passed the defense.
- Pass With Minor Revisions: The dissertation requires minor revision. If all members vote "Pass Unconditionally" or "Pass With Minor Revisions", the committee shall compile a list of the required revisions and communicate them to the candidate. The dissertation advisor will be responsible for ensuring that all minor revisions have been incorporated in the final dissertation.
- Fail With Major Revisions: The dissertation requires major revision and another oral defense. If one or more members select this vote, and the other votes are "Pass Unconditionally or "Pass with Minor Revisions", the committee shall compile a list of the required revision and communicate them to the candidate. A new oral defense is scheduled after the candidate incorporates all revisions. Only one major revision is allowed.
- Fail Unconditionally: The dissertation is unacceptable. If one member selects this vote he or she will provide a written justification that is delivered to the candidate, the committee, and the dean. The issue is referred to the faculty of the program in a subsequent meeting who can either vote to retry the defense with a different committee or terminate the candidacy, in which case the student is terminated from the program.

6. Computer Science Courses

6.1. Overview

Graduate courses at KAUST are classified into three levels: 100-level courses, which are basic preparatory courses, 200-level courses, which are basic graduate courses, and 300-level courses, which are advanced graduate courses. 100-level courses do not earn credit toward any degree offered at KAUST. Four 200-level courses are designated as *core* and must be completed by all students studying toward the M.S. or M.S./Ph.D. degrees in computer science. Students who hold a prior M.S. degree and are enrolled toward the Ph.D. degree are not required to complete the core courses. However, an advisor may recommend completing one or more core courses depending on the level of student preparedness and the topic of the dissertation.
Some courses consist of supervised research either at the Master or Doctoral level. These courses may be taken more than once, since they are customized to an individual

student, or they are seminar courses with fresh material from the professional community/literature each semester.
The scope of intellectual discovery at the Computer Science program consists of six areas, each with its designated list of courses. The program is designed to allow students to either gain depth by focusing their study plan on a particular area, or gain breadth by exploring courses from multiple areas.

6.2. Core Courses

Students enrolled toward the M.S. or M.S./Ph.D. degrees are required to complete the following four core courses:

- (CS 220) Data Analytics
- (CS 240) Computing Systems and Concurrency
- (CS 260) Design and Analysis of Algorithms
- (CS 280) High Performance Computing and Architecture

The core courses are designed to cover the basic skills and competence that are expected off any student holding an advanced degree.

6.3. Course Listing by Area

6.3.1. Artificial Intelligence and Machine Learning

- (CS 220) Data Analytics **[Core Course]**
- (AMCS 212) Linear and Nonlinear Optimization
- (CS 229) Machine Learning
- (CS 245) Databases
- (CS 340) Computational Methods in Data Mining
- (CS 341) Advance Topics in Data Management
- (CS 361) Combinatorial Machine Learning
- (CS 390A) Special Topics: Probabilistic Graphical Models

6.3.2. Computational Biosciences

- (B 204) Genomics
- (B 205) Protein Structure and Function
- (B 224) Fundamentals of Cell Biology
- (CS 290A) Special Topics: Introduction to Computational Biology
- (CS 321) Applications of AI in Bioinformatics
- (CS 340) Computational Methods in Data Mining
- (CS 361) Combinatorial Machine Learning
- (CS 390B) Special Topics: Algorithms in Bioinformatics

6.3.3. Computer Systems

- (CS 140) Systems Programming and Architecture

- (CS 142) Programming (C++)
- (CS 240) Computing Systems and Concurrency **[Core Course]**
- (CS 244) Computer Networks
- (CS 245) Databases
- (CS 341) Advanced Topics in Data Management
- (CS 344) Advanced Topics in Computer Networks
- (CS 346) Advanced Topics in Operating Systems
- (CS 348) Cloud Computing I
- (CS 380) GPU and GPGPU Programming

6.3.4. High Performance Computing

- (CS 280) High Performance Computing and Architecture **[Core Course]**
- (CS 291) Scientific Software Engineering
- (CS 292) Parallel Programming Paradigms
- (AMCS 311) High Performance Computing I
- (AMCS 312) High Performance Computing II
- (CS 380) GPU and GPGPU Programming

6.3.5. Theoretical Computer Science

- (CS 160) Data Structure and Algorithms
- (CS 161) Theory of Computer Science
- (CS 212) Linear and Nonlinear Optimization
- (CS 229) Machine Learning
- (CS 260) Design and Analysis of Algorithms **[Core Course]**
- (CS 261) Combinatorial Optimization
- (CS 361) Combinatorial Machine Learning
- (CS 337) Information Networks
- (CS 372) Computational Geometry
- (390 C) Special Topics: Computational Complexity

6.3.6. Visual Computing

- (CS 248) Computer Graphics
- (CS 247) Scientific Visualization
- (CS 272) Geometric Modeling
- (AMCS 271) Applied Geometry
- (CS 380) GPU and GPGPU Programming
- (EE/AMCS 396) Mathematical Modeling in Computer Vision
- (CS 390 D) Special Topics: Computational Imaging and Display

6.4. Interdisciplinary Research and Studies

Inter-disciplinary research and studies are encouraged. As seen in Section 6.3, students in Computer Science often enroll in courses in Applied Mathematics and Computational Sciences, Biology, Electrical Engineering, Mechanical Engineering, and Statistics. With computing becoming part and parcel of the fabric of many other fields, we would like to enable KAUST students to be at the forefront of the new trends in science. Therefore, the study plan of a student may contain courses from outside the program list, including outside those in Section 6.3. All study plans are subject to the approval of the advisor and the program.

Balancing breadth and depth is always a delicate endeavor. The Computer Science program aims at preparing students to be competent computer scientists who are well versed in their core areas, but also who can apply their science to other fields. When faced with a conflict between depth and breadth, the program will ensure first that depth requirements are met before allowing breadth courses from outside the program other than those listed in Section 6.3.

6.5. Research Courses

6.5.1. Master-level Research

- (CS 297) Master Thesis Research
- (CS 298) Master Graduate Seminar
- (CS 299) Master Directed Research

6.5.2. Doctoral-level Research

- (CS 397) Doctoral Dissertation Research
- (CS 398) Doctoral Graduate Seminar
- (CS 399) Doctoral Directed Research

7. Computer Science Course Description

Note: Several courses listed below are cross-listed in the Applied Mathematical and Computational Science (AMCS) or Electrical Engineering (EE) program. Also, there are several courses offered by both programs that Computer Science students can enroll in toward fulfilling their course requirements. Below is the list of courses that the CS program offers. Students should consult the course listings of other programs for the specific details and prerequisite for each course.

Notation: Each course is listed prefaced with its unique number and post fixed with (*l, r, c*) where:

- l is the lecture hours, to count toward fulfilling the student workload during a semester.
- r is the recitation or laboratory hours.

- c is the credit hours toward fulfilling a degree course requirement.

Not all courses are offered every year. Students should consult the Graduate Program Coordinator or the Associate Dean for the timing of offering of a particular course of interest.

100 Level Courses

CS 140	Systems Programming
CS 142	Programming
CS 160	Data Structure and Algorithms
CS 161	Theory of Computer Science

CS 140. Systems Programming and Architecture (3-0-0)

This course provides a comprehensive and unified introduction to operating systems and concurrency control topics. It emphasizes both design issues and fundamental principles in contemporary systems and gives students a solid understanding of the key structures and mechanisms of operating systems. It also prepares the students to master concurrent and parallel programming by exposing the concepts of parallelism, synchronization and mutual exclusion. The course discusses design trade-offs and the practical decisions affecting design, performance and security. The course illustrates and reinforces design concepts and ties them to real-world design choices through the use of case studies.

CS 142. Programming (C++) (3-0-0)

This course is the same as CS207 but is restricted to CS students. The course covers computer programming and the use of abstractions; software engineering principles of data abstraction and modularity; object-oriented programming; fundamental data structures (such as stacks, queues, sets) and data-directed design. The course is designed for students who lack experience in imperative programming languages with explicit memory management. It covers also the practical implementation of concepts such as recursion; recursive data structures (linked lists, trees, graphs); and basic time and space complexity analysis. The course uses the C++ programming language as a vehicle and also covers the mechanics of C++.

CS 160. Data Structures and Algorithms. (3-0-0)

This course teaches techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics covered include: sorting; search trees; heaps; hashing; divide-and-conquer; dynamic programming; amortized analysis; graph algorithms; shortest paths; network flow; computational geometry; number-theoretic algorithms; polynomial and matrix calculations; caching; and parallel computing.

CS 161. Theory of Computer Science (3-0-0)

The course will progress through finite automata, circuits and decision trees, Turing machines and computability, efficient algorithms, reducibility, the P versus NP problem,

NP-completeness, the power of randomness, and computational learning theory. It examines the classes of problems that can and cannot be solved by various kinds of machines. It tries to explain the key differences between computational models that affect their power.

CS 199. Directed Study in CS (3-0-0)

This course is a self-study in a particular topic directed by a faculty. Students do not register for this course. They may be required to enroll in it based on the recommendation of a faculty and approval of the program.

CS 207. Programming Methodology and Abstractions (3-0-3)

This course is intended for students outside the Computer Science program. Computer Science students are not allowed to enroll in this course but they may enroll in the identical CS 142. The course covers computer programming and the use of abstractions; software engineering principles of data abstraction and modularity; object-oriented programming; fundamental data structures (such as stacks, queues, sets) and data-directed design. The course is designed for students who lack experience in imperative programming languages with explicit memory management. It covers also the practical implementation of concepts such as recursion; recursive data structures (linked lists, trees, graphs); and basic time and space complexity analysis. The course uses the C++ programming language as a vehicle and also covers the mechanics of C++.

CS 220. Data Analytics (3-0-3)

Prerequisites: familiarity with algorithm runtime analysis (e.g., big O notations), probability theory (e.g. Gaussian distribution and conditional probability), and programming language (e.g., MATLAB or C++). The course covers basic concepts and algorithms for artificial intelligence, data mining and machine learning. The main contents are: artificial intelligence (task environment, performance measure, and problem solving by searching), data mining (data and patterns, summary statistics and visualization, unsupervised feature selection, and supervised feature selection), and machine learning (cross validation and supervised learning).

CS 229. Machine Learning (3-0-3)

Prerequisites: linear algebra and basic probability and statistics. Familiarity with artificial intelligence recommended. Topics: linear and non-linear regression, nonparametric methods, Bayesian methods, support vector machines, kernel methods, Artificial Neural Networks, model selection, learning theory, VC dimension, clustering, EM, dimensionality reduction, PCA, SVD, and reinforcement learning.

CS 240. Computing Systems and Concurrency (3-0-3)

Prerequisite: solid computer programming skills (at least at the level of CS 142). Operating systems design and implementation. Basic structure; synchronization and communication mechanisms; implementation of processes, process management, scheduling and protection; memory organization and management, including virtual memory; I/O device management, secondary storage and file systems. Concurrency at the hardware, programming language, and operating system level.

CS 241. Probability and Random Process (3-0-3)

Prerequisites: Advanced and multivariate calculus. Introduction to probability and random processes. Topics include probability axioms, sigma algebras, random vectors, expectation, probability distributions and densities, Poisson and Wiener processes, stationary processes, autocorrelation, spectral density, effects of filtering, linear least squares estimation and convergence of random sequences.

CS 244. Computer Networks (3-0-3)

Packet switching, Internet architecture, routing, router architecture, control algorithms, retransmission algorithms, congestion control, TCP/IP, detecting and recovering from errors, switching, Ethernet (wired and wireless) and local area networks, physical layers. clocking and synchronization. Assignments intro duce network programming, including sockets, designing a router and implementing a transport layer.

CS 245. Databases (3-0-3)

Prerequisites: working knowledge of basic discrete mathematics (e.g., sets, functions and relations) and programming skills. Database design and use of database management systems for applications. The relational model, relational algebra and SQL, the standard language for creating, querying and modifying relational and object-relational databases. XML data including the query languages XPath and XQuery. UML database design and relational design principles based on functional dependencies and normal forms. Other topics include indexes, views, transactions, authorization, integrity constraints and triggers. Advanced topics from data warehousing, data mining, Web data management, Datalog, data integration,data streams and continuous queries and data-intensive Web services.

CS 247. Scientific Visualization (3-0-3)

Prerequisites: Linear algebra, basic multivariate calculus, C/C++ programming experience. Recommended additional prerequisites: CS 248, CS 380, OpenGL programming experience. Techniques for generating images and interactive visualizations of various types of experimentally measured, computer generated, or gathered data. Grid structures. Scalar field and volume visualization. Vector field and flow visualization. Tensor field visualization. Applications in science, engineering, and medicine.

CS 248. Computer Graphics (3-0-3)

Prerequisites: solid programming skills and linear algebra. Input and display devices, scan conversion of geometric primitives, 2D and 3D geometric transformations, clipping and windowing, scene modeling and animation, algorithms for visible surface determination, local and global shading models, color and real-time rendering methods.

CS 260. Design and Analysis of Algorithms (3-0-3)

Prerequisites: computer programming skills, knowledge of probability, understanding of basic data structures, basic knowledge in discrete mathematics. Fulfills University Mathematics Requirement. Review of algorithm analysis (search in ordered array, binary insertion sort, merge sort, 2-3 trees, asymptotic notation). Divide and conquer algorithms (master theorem, integer multiplication, matrix multiplication, fast Fourier transform). Graphs (breadth-first search, connected components, topological ordering, depth-first search). Dynamic programming (chain matrix multiplication, shortest paths, edit distance, sequence alignment). Greedy algorithms (binary heaps, Dijkstra's algorithm, minimum spanning tree, Huffman codes). Randomized algorithms (selection, quick sort, global minimum cut, hushing). P and NP (Cook's theorem, examples of NP-complete problems). Approximate algorithms for NP-hard problems (set cover, vertex cover, maximum independent set). Partial recursive functions (theorem of Post, Diophantine equations). Computations and undecidable problems (undecidability of halting problem, theorem of Rice, semantic and syntactical properties of programs).

CS 261 Combinatorial Optimization (3-0-3)

Prerequisite: familiarity with discrete algorithms at the level of AMCS 260
Topics: Maximum flow, minimum cut. Polytopes, linear programming, LP-relaxation, rounding. Greedy algorithms, matroids. Approximation algorithms for NP-complete problems. Randomized algorithms. These techniques are applied to combinatorial optimization problems such as matching, scheduling, traveling salesman, set cover, maximum satisfiability.

CS 272. Geometric Modeling (3-0-3)

Prerequisites: Advanced and multivariate calculus, and linear algebra, computer graphics, and programming experience. Terminology, coordinate systems, and implicit forms. Parametric and spline representations of curves and surfaces and their uses. Basic differential geometry of curves and surfaces. Subdivision surfaces. Solid modeling paradigms and operations. Robustness and accuracy in geometric computations. Applications.

CS 280. High Performance Computer Architecture (3-0-3)

Prerequisites: programming experience. Architecture of processors, cache hierarchies, memory systems, storage and IO systems, interconnection networks, and message-

passing multi-processor systems. History of high performance computing. Processing and communication benchmarks. Parallel programming models. Single-node performance and parallel scaling of real applications. Locality, synchronization, communication and computation overlap, performance/power trade-offs, and reliability.

CS 290 A: Special Topics: Introduction to Computational Biology (3-0-3)

The course details applications of statistical, machine learning and pattern recognition methods to different areas in Bioinformatics. At the end of the course the students should have a good understanding of the various techniques and the ability to use these them in practice. The students should to be able to find solutions of real world bioinformatics problems, using the toolbox of practical methods presented in the lectures.

CS 291. Scientific Software Engineering (3-0-3)

Prerequisites: programming experience and familiarity with basic discrete and numerical algorithms. Practical aspects of application development for high performance computing. Programming language choice; compilers; compiler usage. Build management using make and other tools. Library development and usage. Portability and the GNU auto-configure system. Correctness and performance debugging, performance analysis. Group development practices and version control. Use of third-party libraries and software licensing.

CS 292. Parallel Programming Paradigms (3-0-3)

Prerequisites: programming experience and familiarity with basic discrete and numerical algorithms. Distributed and shared memory programming models and frameworks. Thread programming and OpenMP. Message passing and MPI. Parallel Global Address Space (PGAS) languages. Emerging languages for many core programming. Elements to be covered will include syntax and semantics, performance issues, thread safety and hybrid programming paradigms.

CS 297. Master Thesis Research (variable credit)

Master-level supervised research.

CS 298. Master Graduate Seminar (variable credit)

Master-level seminar focusing on special topics within the field.

CS 299. Master Directed Research (variable credit)

Directed research under the supervision of a faculty member.

CS 308. Stochastic Methods in Engineering (3-0-3)

Prerequisite: CS 241. Review of basic probability; Monte Carlo simulation; state space models and time series; parameter estimation, prediction and filtering; Markov chains and processes; stochastic control and stochastic differential equations. Examples from various engineering disciplines.

CS 321. Applications of AI in Bioinformatics (3-0-3)

Prerequisite: C/C++, HPC (parallel computing) programming experience
Recommended additional prerequisites: Course consists of selected projects. These projects cover application of AI to some of the relevant problems of analysis of large biological data and generally deal with complex information. Each year problems change. Students get assigned one project and they work either alone or in groups of 2. Students in the interactive discussions with the whole class and the instructor solve the project problems. Students regularly present their progress and defend their approach and results in front of the whole class. During one semester several types of topics are dealt with. Students get direct experience in research methodology, report writing, presentations and, most importantly, different ways of approaching solving AI problems

CS 337. Information Networks (3-0-3)

Prerequisite: probability. Network structure of the Internet and the Web, performance modeling, experimental design, performance measurement, model development, analytic modeling, single queue facility, networks of queues, stochastic systems, deterministic systems, birth-death model analysis, closed network model, bottleneck, interactive networks, M/M/m queues, M/G/1 priority queues, Markovian queuing model, random numbers, discrete event simulation, verification and validation of simulation models, workload characterization and benchmarks.

CS 340 Computational Methods in Data Mining

*Prerequisites***:** *Probability and Statistics, Linear Algebra, Artificial Intelligence.* Focus is on both classical and new emerging techniques in data mining. Topics include computational methods in supervised and unsupervised learning, association mining, collaborative filtering and graph mining. Individual or group applications-oriented programming project is required.

CS 341. Advanced Topics in Data Management (3-0-3)

Prerequisites: CS 245. Topics in Data Management will be analyzed and discussed. Students will engage in research and project presentations. Topics will vary by semester.

CS 344. Advanced Topics in Computer Networks (3-0-3)

Prerequisites: CS 244. Solid computer networks background, excellent skills in C/C++ and TCL, suing network simulators such as NS-2, working with Linux systems. Topics in Computer Networks will be analyzed and discussed. Topics will vary by semester.

CS 346. Advanced Topics in Operating Systems (3-0-3)

Prerequisites: Solid computer programming skills (at least at the level of CS 207) and solid background in at least one operating systems (CS 240) or computer architecture (at least at the level of CS 209 or CS 280), or permission of instructor. Topics in Operating Systems will be analyzed and discussed. Topics will vary by semester.

CS 361. Combinatorial Machine Learning (3-0-3)

Prerequisites: CS 260. Lower and upper bounds on complexity and algorithms for construction (optimization) of decision trees, decision rules and tests. Decision tables with one-valued decisions and decision tables with many-valued decisions. Approximate decision trees, rules and tests. Global and local approaches to the study of problems over infinite sets of attributes. Applications to discrete optimization, fault diagnosis, pattern recognition, analysis of acyclic programs, data mining and knowledge discovery. Current results of research.

CS 380. GPU and GPGPU Programming (3-0-3)

Prerequisite: CS 280. Recommended optional prerequisites: CS 248, CS 292. Architecture and programming of GPUs (Graphics Processing Units). Covers both the traditional use of GPUs for graphics and visualization, as well as their use for general purpose computations (GPGPU). GPU many-core hardware architecture, shading and computer programming languages and APIs, programming vertex, geometry, and fragment shaders, programming with CUDA, Brook, OpenCL, stream computing, approaches to massively parallel computations, memory subsystems and caches, rasterization, texture mapping, linear algebra computations, alternative and future architectures.

CS 390 B. Special Topics: Algorithms in Bioinformatics (3-0-3)

Advanced computational techniques that are applied in modern approaches to solve complex molecular biology problems. To teach the use of current methods as well as interpretation of results.
The learning outcome should be mastery of the principles and algorithms used by practitioners in computational biology to use them effectively in knowledge discovery and contribute to advances to the field.

CS 390 A: Special Topics: Probabilistic Graphical Models (3-0-3)

This is a research-oriented seminar-based course on probabilistic graphical models (PGMs), which are an important area of artificial intelligence and an active research topic that has various applications in many fields. The course will cover representation, inference and learning of both directional models and undirectional models, including Bayesian networks, hidden Markov models, Markov random fields, and conditional random fields. Students are expected to be familiar with probability theory, algorithms, machine learning and programming languages. The course will consist of both instructor-driven lectures and student-driven presentations. A semester-long project will be done by each student to conduct theoretical work on PGMs or apply PGMs on a real research problem. A comprehensive report on the project, which is potentially publishable, is expected as the outcome of the project.

CS 390 B. Special Topics: Algorithms in Bioinformatics (3-0-3)

Advanced computational techniques that are applied in modern approaches to solve complex molecular biology problems. To teach the use of current methods as well as interpretation of results.
The learning outcome should be mastery of the principles and algorithms used by practitioners in computational biology to use them effectively in knowledge discovery and contribute to advances to the field.

CS 390 C: Special Topics: Computational Complexity (3-0-3)

Prerequisites: CS 260. Hardness of Computational problems, models of computations including turing machines (universal, probabilistics), Boolean Circuits. Complexity classes (P, NO, coNP, PSPACE, NL, P/poly, BPP) and their relations. Diagonalization, space complexity, randomaized computation. Selection topics such as interactive proofs, cryptography, quantum computation, hardness of approximation, decision trees, or albebraic computational models.

CS 390 D: Special Topics: Computational Imaging and Display (3-0-3)

Prerequisites: AMCS 251/
This course provides an introduction to computational imaging and display. Starting from image formation models for conventional and unconventional camera designs, we derive inverse problems for image reconstruction in 2D and 3D. Specific applications include standard camera imaging pipelines, light field and high dynamic range cameras, 3D imaging using conventional cameras as well as transient and time-of-flight approaches. Finally we will discuss how to apply the same techniques to the design of computational displays with extended capabilities.

CS 397. Doctoral Dissertation Research (variable credit)

Doctoral-level supervised research.

CS 398. Doctoral Graduate Seminar (variable credit)

Doctoral-level seminar focusing on special topics within the field.

CS 399. Doctoral Directed Research (variable credit)

Doctoral-level supervised research.

KAUST PROGRAM Guide

Fall 2014

8. KAUST Program Guide

8.1. Program and Degrees

King Abdullah University of Science and Technology (KAUST) advances science and technology through bold and collaborative research. It educates scientific and technological leaders, catalyzes the diversification of the Saudi economy and addresses challenges of regional and global significance, thereby serving the Kingdom, the region and the world.

Research and education, as well as their transformative potential, are central to KAUST's mission. KAUST has a three-part mission:

Research at KAUST – both basic and goal-oriented – is dedicated to advancing science and technology of regional and global impact. Research excellence inspires teaching and the **training o**f future leaders in science and technology.
Research and education at KAUST energize innovation and enterprise to support knowledge-based economic diversification.

Through the synergy of science and technology, and innovation and enterprise, KAUST is a catalyst for transforming people's lives.

In support of this mission, King Abdullah University of Science and Technology offers eleven graduate programs leading to M.S. and Ph.D. degrees.

9. KAUST offers the following two Degrees

- The M.S. degree typically takes three semesters and a summer to complete (18 months). The degree allows flexibility for internships, research, and academics. Learn more about M.S. degree requirements.
- The **Ph.D.** degree is typically a three- to four-year post-master's degree. The Ph.D., involves original research, culminating in a research dissertation. Learn more about Ph.D. degree requirements.

Three academic divisions, these are:

Biological and Environmental Sciences and Engineering (BESE)

- Bioscience (B)
- Environmental Science and Engineering (EnSE)
- Marine Science (MarS)
- Plant Science

Computer, Electrical and Mathematical Sciences and Engineering (CEMSE)

- Applied Mathematics and Computational Science (AMCS)
- Computer Science (CS)
- Electrical Engineering (EE)

Physical Sciences and Engineering Division (PSE)

- Chemical and Biological Engineering (CBE)
- Chemical Sciences (ChemS)
- Earth Science and Engineering (ErSE)
- Materials Science and Engineering (MSE)
- Mechanical Engineering (ME)

Each program is administered by a Graduate Committee and a Graduate Chair. Courses for each program will be listed at the 100 (non-credit), 200, 300 or 400 level.

10. Program Requirements

Master's program

Admissions

Admission to the M.S. program requires the satisfactory completion of an undergraduate B.S. degree in a relevant or related area, such as Engineering, Mathematics or the Physical, Chemical and Biological Sciences.

Master's Degree requirements

The MS degree requires successful completion of 36 credits. Students are expected to complete the MS degree in three semesters plus one summer session. Degree requirements are divided into three sections: Core Curriculum; Elective Curriculum; and Research/Capstone Experience.

- Core Curriculum (9-15 credits): This portion of the degree program is designed to provide a student with the background needed to establish a solid foundation in the program area over and above that obtained through undergraduate studies.
- Elective Curriculum (9-15 credits): This portion of the degree program is designed to allow each student to tailor his/her educational experience to meet individual research and educational objectives. Depending upon the program and the objectives, this may be met by added coursework or by additional research experience.
- Research/Capstone Experience (12 credits): The details of this portion of the degree program are uniquely determined by the student and his/her advisor and will involve a combination of research and other capstone experiences that build on the knowledge gained in coursework.

- Satisfactory participation in KAUST's Summer Session and Winter Enrichment Period (WEP) is mandatory. Summer Session courses are credit bearing and apply toward the degree. WEP courses do not earn credit towards the degree.

At least thirty-six (36) degree credits must be completed in graduate-level courses and research projects. These courses should be 200-level or above and must be approved by the student's advisor. Additional non-credit bearing activities, such as graduate seminars, may be required by the Program. Details on the specific program expectations, as well as the difference between the thesis and non-thesis degree options can be found through the link in the Program Guide (http://www.kaust.edu.sa/academics/programs/degrees.html). For a list of eligible faculty advisors, see: http://www.kaust.edu.sa/faculty-advisors.html

11. Thesis Requirements

Students wishing to pursue a thesis as part of their MS degree, must identify a research advisor and must file for Thesis status.

1. The application for the thesis option is due to the Registrar's Office by the ninth week of the student's second semester at KAUST.

2. Criteria for Acceptance into the Master's Degree with Thesis program.
    a. Students should have a well-constructed thesis proposal that includes a time-line for completion.
    b. The thesis proposal must be approved by the research advisor and the Dean of the Division.
    c. In the case of an optional thesis program, the student should have a minimum GPA of 3.2 and at least 12 credit hours completed at the conclusion of the first semester and be registered in at least 12 credit hours during the second semester.
    d. The research advisor must indicate that he/she endorses the thesis topic and scope of work and that it could reasonably be completed by the end of the third semester. Alternatively, the faculty member agrees to a longer time frame, not to exceed the end the fourth semester, and to cover the student and experimental costs that accrue during this period.

The student's program of study should be structured such that the student may change to the MS without Thesis option and finish the degree by the end of the student's third semester.

Committee Structure and Thesis Defense

Evaluation of satisfactory completion of MS thesis work is performed by a committee comprising the M.S. thesis advisor and two other faculty members. The chair of the committee must be a faculty member within the program. One external faculty member or one Research Scientist may be allowed. The evaluation of MS thesis credits comprises of a satisfactory or unsatisfactory grade. The requirement of a public seminar based on the student's work is left to the discretion of the MS thesis advisor.

The student is responsible for scheduling the thesis defense date with his/her supervisor and committee members. It is advisable that the student submits a written copy of the thesis to the thesis committee members at least two weeks prior the defense date.

12. Non Thesis Option

Students wishing to pursue the Non Thesis options must complete a minimum of 6 credits of directed research credits (299) is required. Summer internship credits may be used to fulfill the research requirement 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.
- Ph.D.-Level Courses: Courses numbered 300 or greater. Any course in the PhD core requirements that is passed with a minimum grade of B– may be used towards meeting the core PhD requirements of the program if the student chooses to continue for a PhD degree in at KAUST.
- Internship: Research-based summer internship (295). Students are only allowed to take one internship.

It should be noted that a student may also combine courses to satisfy the six-credit requirement. For example, a student could take one Ph.D.-level course and one graduate-level course in another program. A student may not enrol in two summer internships.

Thesis format requirements are described in the KAUST Thesis and Dissertation Guidelines (http://libguides.kaust.edu.sa/theses).

For a list of eligible faculty advisors, see:

http://www.kaust.edu.sa/faculty-advisors.html

Students may select a KAUST faculty member from another program to act as a research advisor (for either thesis or directed research), but must provide a one-page description of the research and an explanation of how such research would be relevant to the degree program. Upon approval by the program and the Dean, the faculty member would be allowed to act as an affiliated faculty member and advisor for the student.

Please Note: Degree Programs may have additional requirement to those listed above.

13. PhD Program

Admissions

Ph.D. students apply for and enter a specific degree program. A faculty advisor is either immediately designated (in the case of a student being recruited by a specific faculty member) or temporarily assigned; in the latter case, the student is expected to identify a research advisor by (at the latest) the end of the first year.

There are three phases and associated milestones for Ph.D. students:

- Passing a qualifying exam;

- Passing an oral defence of the dissertation proposal
- Dissertation phase with a final defense milestone.

PhD Degree Requirements

Ph.D. program requires the successful completion of at least 96 credit hours, (inclusive of previous Masters Degree coursework). Qualification and advancement to candidacy are contingent upon: (i) successfully passing Ph.D. coursework, (ii) designating a research advisor, (iii) successfully passing a qualifying exam, and (iii) writing and orally defending a research proposal. Possible outcomes include pass, failure with complete retake, failures with partial retake, and failure with no retake. Students not permitted to retake the exam, or who fail the retake, will be dismissed from the University. The maximum allotted time for advancement to candidacy for a student entering with a M.S. degree is two years; three years for students entering with a B.S.

Satisfactory participation in KAUST's Summer Session and Winter Enrichment Period (WEP) is mandatory. Summer Session courses are credit bearing and apply toward the degree. WEP courses do not earn credit towards the degree.

The required coursework is outlined below:

M.S. Degree

- Core courses
- Elective courses

Ph.D. Degree

- Two or more courses at the 300 level
- Graduate seminar if required by the program.

Students entering the program with a relevant M.S. from another institution may transfer coursework toward the requirements of the M.S. degree listed above upon approval of the program.

Students entering the program with a M.S. from KAUST may transfer coursework toward both the M.S. and Ph.D. requirements listed above upon approval of the program and based on their program of study at KAUST.

Students entering with a B.S. from another institution may transfer in up to 9 credits of graduate level coursework towards the above requirements upon approval of the program. In addition, students entering with a B.S. may also qualify to earn a M.S. degree by satisfying the MS degree requirements as part of the Ph.D. program.

Some degree programs may require a diagnostic entrance exam as a basis for admission, and students may be required to complete additional coursework depending on their degree-granting institution. If the M.S. degree is from a subject other than the Ph.D. degree program, there may be additional courses required and specified by the advisor.

Candidacy

Achieving Ph.D. candidacy is contingent upon successfully passing a qualifying examination, acceptance by the research advisor of a written research proposal and successfully passing an oral examination. Details should be confirmed in the individual degree program material. For a list of eligible faculty advisors for any degree program see: http://www.kaust.edu.sa/faculty-advisors.html
Passing the qualification phase is achieved by acceptance of all committee members of the written proposal and a positive vote of all but, at most, one member of the oral exam committee. If more than one member casts a negative vote, one retake of the oral defense is permitted if the entire committee agrees. A conditional pass involves conditions (e.g., another course in a perceived area of weakness) imposed by the committee, with the conditional status removed when those conditions have been met. Once constituted, the composition of the qualification phase committee can only be changed upon approval by both the faculty research advisor and the division dean.

Dissertation Research Credits

Besides coursework (6 or more credit hours), dissertation research (course number 397) must be earned during the first (proposal preparation and defense) and second phases of the Ph.D. program. A full-time workload for Ph.D. students is considered to be 12 credit hours per semester (courses and 397) and 6 credit hours in summer (397 only). There is a minimum residency requirement (enrolment period at KAUST) of 2.5 years for students entering with an M.S. degree, 3.5 years for students entering with a B.S. degree. The maximum enrolment period is 5.0 years, extendable upon approval of both the faculty research advisor and the division dean.

Dissertation and Dissertation Defense

The Dissertation defense is the final exam of the PhD degree. It involves a public presentation of the results of the dissertation research followed by a question and answer session. The Dissertation and defense committee consists of 4 members of which at least 3 must be KAUST faculty members. The committee Chair plus one other member must be an affiliated faculty member. The committee must also include one

external examiner who must write a report on the dissertation and attend the dissertation defense. Qualified Visiting Professors may be involved as on-campus committee members. It is the responsibility of the student to inform the dissertation committee of his/her progress and meet deadlines for submitting defense date and graduation forms. It is expected that students will submit their dissertations to their committee six weeks prior to the defense date in order to receive feedback from the committee members in a timely manner. However, the advisor may approve exceptions to this expected timeline. The dissertation format requirements are described in the KAUST Thesis and Dissertation Guidelines.
(http://libguides.kaust.edu.sa/theses).

The result of the defense will be made based on the recommendation of the committee. There are four possible results: (1) Pass: the student passes the exam and the dissertation is accepted as submitted; (2) Pass with revisions: the student passes the exam and the student is advised of the revisions that must be made to the text of the dissertation; (3) Failure with retake: normally this means the student must do more research to complete the dissertation. The student must revise the dissertation and give another oral examination within six months from the date of the first defense; and (4) Failure: the student does not pass the exam, the dissertation is not accepted, the degree is not awarded, and the student is dismissed from the University.

Program Descriptions

The Master's and Doctoral degree program requirements listed above represent general university-level expectations. The specific details of each degree requirements are outlined in the descriptions of the individual degree programs.

14. University Guidelines

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	C	=	2.00	I	= INCOMPLETE
A-	=	3.67	C-	=	1.67	IP	= IN PROGRESS
B+	=	3.33	D+	=	1.33	W	= WITHDREW
B	=	3.00	D	=	1.00	S	= SATISFACTORY
B-	=	2.67	D-	=	0.67	U	= UNSATISFACTORY
C+	=	2.33	F	=	0.00	WF	= WITHDREW FAILED

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. Incompletes not completed by the end of the second week of the following semester or session will be changed to F (failing) 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.

In Progress grade (IP)

Thesis Research (297) or Dissertation Research (397) should be graded as **IP** (In Progress), **S** (satisfactory) or **U** (unsatisfactory) 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)

Research or Seminar courses

Use the following grades for these research or seminar courses:

297	Thesis Research	Either IP or U
397	Dissertation Research	Either IP or U
295/395	Internship(summer)	Either S or U
298/398	Seminar	Either S or U
299/399	Directed Research	Either S or U

Summer Session and Winter Enrichment Program

Satisfactory participation in KAUST's Summer Session and Winter Enrichment Period (WEP) is mandatory. Summer Session courses are credit bearing and apply toward the degree. WEP courses do not earn credit towards the degree.

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.

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: (1) Good Standing; (2) Academic Notice; (3) Academic Probation; and (4) Academic Dismissal.

Cumulative Assessment

GPA	ACADEMIC STANDING
3.00 – 4.00	Good Standing
2.67 – 2.99	Academic Notice
2.33 – 2.66	Academic Probation
Below 2.33	Academic Dismissal
S/U PERFORMANCE	ACADEMIC STANDING
0 – 2 credits	GPA Standing
3 – 5 credits	GPA Standing less one category
6 – 8 credits	GPA Standing less two categories
9+ credits	Academic Dismissal

Semester Assessment

CREDITS EARNED	ACADEMIC STANDING
12 +credits	GPA Standing
9 – 11 credits	GPA Standing less one category
6 – 8 credits	GPA Standing less two category
0 – 5 credits	Academic Dismissal

Summer Session Assessment

CREDITS EARNED	ACADEMIC STANDING
6 credits	GPA Standing
3 – 5 credits	GPA Standing less one category
0 – 2 credits	GPA Standing less two categories

Definitions

Good Standing:
Student is making satisfactory academic progress toward the degree.

Academic Notice:
Student is not making satisfactory progress toward the degree. A student placed on Academic Notice will be monitored in subsequent semesters to ensure satisfactory progress toward 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 toward the degree. A student placed on Academic Probation will be monitored in subsequent semesters to ensure satisfactory progress toward 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 toward 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 (1) 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 U grades, a faculty member giving a U grade for a course involving 6 or more credits must obtain concurrence 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 6 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 3.00. A student not in good standing due to U grades may return to Good Standing by completing at least 12

credits during the subsequent semester with no U grades and a semester GPA of at least 3.00 in traditionally graded courses.

15. Transferring Credits

A student may petition to transfer graduate credits from another university, upon approval of the Program Chair and the Registrar. Each student's application will be reviewed on a case-by-case basis. The following rules apply:

- Up to three graduate-level courses not to exceed nine credits may be transferred for credit. Courses transferred for credit cannot have been counted as credits for another granted degree.
- 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 toward meeting the major track requirement if their equivalence is confirmed by the program chair.

Students transferring from other PhD 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 enrollment of such students at KAUST is two years.

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 eighth week, students can drop a course but the course will appear on the student's transcript with the grade of "W" (withdraw). After the eighth week of a full semester, courses may be dropped only under exceptional circumstances and with the approval of the Course Instructor, the Program Chair and the Registrar.

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.