Official Sadam Homeschool Course Transcript

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DOB: 08/12/2002
SSN: 149117062
Graduation: 05/15/2020

Test	Score	Date	Test	Score	Date
AP Biology	4	5/16	Biology SAT	780	5/16
AP Calculus BC	5	5/17	Chemistry SAT	800	6/16
AP Computer Science	5	5/18	Math II SAT	800	8/18
			Physics SAT	800	6/19
AP Phys C, Mech	5	5/18			
AP Statistics	5	5/19			
AP Chemistry	5	5/19			
AP Phys C, E&M	PL	5/20			

Test	Score	Date
ACT	35: E=36 R=35 S=35 M=35	12/18
SAT	1510 : R+W =720; M=790	10/19

Credits And GPA	
Credits Completed:	52.5
Credits Planned and In Progress	6
GPA (unweighted):	4.0
GPA (weighted)[1]:	4.96

Subject / Courses	Grade	Level	Credit	Year
Language Arts				
English 9 [2]	A	Honors	(1.0)	MS
English 10[2]	A	Honors	(1.0)	2016
English 11	A	Honors	1.0	2017
College Comp.I / ENGL 1301[4]	A	College	1.0	2017
College Comp. II / ENGL 1302[4]	A	College	1.0	2019
World Literature/ENGL 2333[4]	PL	College	(1.0)	2020
Math				
Algebra I & II[2]	A	Honors	(1.0)	MS
Geometry[2]	A	Honors	(1.0)	MS
Counting and Probability[2]	A	Honors	(1.0)	MS
AMC Preparatory Course[2]	A	Honors	(1.0)	MS
Pre-Calculus[2]	A	Honors	(1.0)	MS
Calculus 1/ MATH 2413[2,4]	A	College	(1.0)	2016
Calculus 2/ MATH 2414[2,4]	A	College	(1.0)	2016
Calculus 3/ MATH 2415[4]	A	College	1.0	2017
Differential Equations/ MATH 2420[4]	A	College	1.0	2018
AP Statistics[3]	A	AP	1.0	2019
Linear Algebra/ MATH 2318[4]	A	College	1.0	2019
Discrete Math/ MATH 2305[4]	A	College	1.0	2019
Science:				
Chemistry with Lab[2]	A	Honors	(1.0)	2016
AP Biology with Lab[2]	A	AP	(1.0)	2016
Physics with Lab	A	Honors	1.0	2017
AP Computer Science[3]	A	AP	1.0	2017
Engineering Physics 1 with Lab/PHYS 2425[4]	A	College	1.0	2017
AP Chemistry with Lab[3]	A	AP	1.0	2019
Chemistry Olympiad Prep	A	Honors	0.5	2019
Physics C, Electricity & Magnetism	A	Honors	1.0	2018
PHY 336K Classical Dynamics[5]	A	College	1.0	2018
PHY 355 Modern Physics & Thermodynamics[5]	A	College	1.0	2019
PHY 373 Quantum Physics 1: Foundations[5]	A	College	1.0	2019
Physics Olympiad Prep	IP	Honors	(1.0)	2019
Communication Studies				
Public Speaking/SPCH 1315[4]	A	College	1.0	2017
Engineering				
Vector Mechanics, Statics/ENGR 2301[4]	PL	College	(1.0)	2020

Subject / Courses	Grade	Level	Credit	Year
Foreign Language				
Introduction to French[2]	A	Honors	(0.5)	2016
French 1 / FREN -1411[4]	A	College	1.0	2017
French 2 /FREN-1412[4]	A	College	1.0	2018
French 3 / FREN-2311[4]	A	College	1.0	2018
History/Economics				
Streams of Civilization	A	Honors	(1.0)	2016
Macroeconomics / ECON 2301[2,4]	A	College	(1.0)	2016
US History I / HIST 1301[4]	A	College	1.0	2017
America: From Past to Present	A	Honors	0.5	2018
World History	A	Honors	1.0	2019
Texas State and Local Govt./GOVT 2306[4]	PL	College	(1.0)	2020
Fine Arts				
Piano Music & Theory 1[2]	A	Honors	(1.0)	MS
Piano Music & Theory 2[2]	A	Honors	(1.0)	2016
Piano Music & Theory 3	A	Honors	1.0	2017
Piano Music & Theory 4	A	Honors	1.0	2018
Physical Education[2]				
Racquetball & Table Tennis[2]	A		1.0	2017
Strength & Conditioning[2]	A		1.0	2018
Masters Swim[2]	IP		(1.0)	2019
Summer Program:				
MIT-BWSI	A	Honors	1.0	2018
Electives				
Physics Everywhere[2]	A	Honors	(0.5)	2016
Cybersecurity	A		0.5	2017
Introduction to Nano Technology				
Modern Electronics	A	Honors	1.0	2017
Optics	A	Honors	2.0	2018
Remote Sensing	A	Honors	1.0	2018
Hovercraft	A	Honors	1.0	2018
Chemistry Lab & Thermodynamics	A	Honors	1.0	2018
Game & Simulation Development	A		1.0	2019
Audio Engineering	A	Honors	1.0	2019

[1]For AP, Honors, and College Courses A= 5.00, [2]Not included in GPA; [3]College Board authorization letter available upon request, [4]Course taken at Austin Community College, [5]Courses audited at UT-Austin, Courses taken before 2017 are not included in GPA, IP= In Progress; PL= Planned, MS= completed in Middle School

Certified by: Sridevi Autoor
School Administrator
(512) 905-4696

Sridevi Autoor 12/27/2019

High School Course Descriptions

Akhil Sadam

LANGUAGE ARTS

Course: English 9

Description: This course focuses on basic literary analysis and introduces students to a host of literary terminology. Weekly in-class writing assignments are conducted, and a research paper, along with several analysis papers, is assigned. Students will focus on constructing proper thesis statements, introductory paragraphs, body paragraphs, conclusions, transitions, MLA essay format, in-text citations, bibliography, proper quotation integration without plagiarism, evaluation of Internet sources, and usage of literary terms & devices. This course also covers the SAT essay, six-word stories, and limericks.

Literary terms covered include Symbolism, Sensory Imagery, Foreshadow, Irony, Simile, Metaphor, Allegory, Allusion, Hamartia (Fatal Flaw), Hubris, Denotation vs. Connotation, Paradox, Genre, Tragedy, Alliteration, Assonance, Consonance, Onomatopoeia, Repetition and Refrain, Rhyme (Perfect Rhyme, Near Rhyme, Eye Rhyme, End Rhyme, Internal Rhyme, Rhyme Scheme), Sonnet Form, Meter (Iamb, Trochee, Dactyl, Anapest, Metric feet - tetrameter, pentameter, etc.). Sub-plot, Epilogue, Play-within-a-play, Malapropism, Mondegreen, quest/odyssey, Transcendentalism, and others.

Readings:

Novels

Bradbury, Ray, *Fahrenheit 451*
Lee, Harper, *To Kill a Mockingbird*
Steinbeck, John, *Of Mice and Men*

Non-Fiction

Bradbury, Ray, *Commencement Speech to Caltech Class of 2000*
Emerson, Ralph Waldo, *Self-Reliance (excerpt)*
Krakauer, John, *Into the Wild*

Plays

Shakespeare, William, *A Midsummer Night's Dream*

Short Stories:

Bradbury, Ray, "The Veldt"
Chopin, Kate, "Ripe Figs", "The Story of an Hour"
Henry, O., "The Gift of the Magi"
Irving, Washington, "The Legend of Sleepy Hollow"
London, Jack, "To Build a Fire"

Provider: Ms. Jennifer Leeds, Homeschool class

Course: English 10

Description: This course focuses on literary analysis and the development of strong writing skills. Students will learn to recognize and use literary tools such as pleonisms, conflict, allegory, pun, point of view, and bildungsroman. Students will learn about and utilize a variety of research tools (data base, archives, periodicals, etc); cite resources using MLA format; use summary vs. analysis, and quotation integration. The course will conclude with each student giving a public presentation about a social activist.

Readings:

Novels

Golding, William*, The Lord of the Flies*
Wein, Elizabeth, *Code Name Verity*

Non-Fiction

Kidder, Tracey, *Mountains Beyond Mountains*

Poems

Child, Lydia Marie, "Thanksgiving Day"
Dickinson, Emily, "Faith is a Fine Invention"
Frost, Robert, "The Span of Life"
Lazarus, Emma, "The New Colossus"
Merwin, W.S., "Separation"
Newton, Violet Wiggins, "Memory"
Reznikoff, Charles, "Te Deum"
Slverstein, Shel, "Point of View"
Williams, William Carlos, "This is Just to Say"

Short Stories

Hughes, Langston, "Thank You Ma'am"
Marquez, Gabriel, Garcia, "One of These Days"
Saki, "The Interlopers"
Updike, John, "A&P"
Wells, HG, "The Treasure in the Forest"

Plays

Shakespeare, William, *Twelfth Night*
Wilde, Oscar, *The Importance of Being Earnest*

Provider: Jennifer Leeds, Homeschool class

Course: English 11

This course in American Literature will continue to develop the student's critical reading skills and writing ability through literary and rhetorical analysis. Students will review terms from the past two years and these new ideas: figurative language (conceit, asyndeton/polysyndeton), modes of persuasion (pathos, ethos, logos), genres (captivity narrative, slave narrative, sermon, almanac, prose poem, literary eras (Puritan, Colonial, American Enlightenment, American Romanticism, Literary Realism, Naturalism, Harlem Renaissance). The course will conclude with each student making a public presentation based on a novel and additional research about an immigration experience.

Readings:

Novels

Twain, Mark, *Huckleberry Finn*
Crane, Stephen, *The Red Badge of Courage*
Cather, Willa, *My Antonia*
Potek, Chaim, *The Chosen*

Plays

Hansberry, Lorraine, *A Raisin in the Sun*
Miller, Arthur, *The Crucible*

Poetry

Bradstreet, Anne, "To My Dear and Loving Husband"
Bryant, William Cullen, "Thanatopsis"
Dickinson, Emily, selected poems
Forche, Carolyn, "The Colonel"
Hughes, Langston, "Harlem (A Dream Deferred)"
Longfellow, Henry Wadsworth, "Paul Revere's Ride"
Miranda, Lin Manuel, Selections from Hamilton: The Musical
Taylor, Edward, "Huswifery"
Williams, William Carlos, "The Red Wheelbarrow"

Short Stories

Bierce, Ambrose, "An Occurrence at Owl Creek Bridge"
Chopin, Kate, "Ripe Figs" and "The Story of an Hour"
Hawthorne, Nathaniel, "Young Goodman Brown"

Other

Bradford, William, *Of Plymouth Plantation*
Douglass, Frederick, *Narrative of the Life of Frederick Douglass*
Edwards, Jonathan, *Sinners in the Hands of an Angry God*
Franklin, Benjamin, Aphorisms and selections from his Autobiography
Johnson, Lyndon, "The Voting Rights Act"
King, Martin Luther, "I Have a Dream" by Martin Luther King
Lincoln, Abraham, "The Gettysburg Address"
Rowlandson, Mary, *Narrative of the Captivity of Mary Rowlandson*
The Declaration of Independence

Provider: Jennifer Leeds, Homeschool class

Course: College Composition I / ENGL 1301

Description: This course is a study of the principles of composition with emphasis on language, the mechanics of writing, the types of discourse, and research and documentation. Students should be able to identify rhetorical purposes and methods of organization appropriate to topic, thesis, and audience; collect, read, analyze, and use information from a wide range of sources; write a coherent essay observing appropriate grammatical, mechanical, and stylistic conventions; write competently in the informative, analytical, and persuasive modes; and evaluate, edit and revise at all stages of the writing process. Five papers are written throughout the course, including a research paper.

Textbooks/Material used: *The Brief Bedford Reader,* 12th Edition
Provider: Professor Amy Ashton Handy, Austin Community College

Course: College Composition 2 / ENGL 1302
Description: A continuation of English 1301 with emphasis on analysis of readings in prose fiction. The goal of English 1302 is to build on skills learned in English 1301 in order to improve student's critical thinking, reading and writing skills. Paper assignments will ask to analyze and interpret short fiction, focusing on formal elements of a text (plot, character, conflict, point of view, setting, and language). English 1302 also expands on the research skills taught in 1301. While the focus of the course will be on the fictional works, each assignment will also require a student to find and incorporate secondary sources, primarily literary criticism. As in 1301, this course will help the student to continue to improve sentences and paragraphs by working on grammar and structure in their writing.
Textbooks/Material used: Bausch and Cassill, *The Norton Anthology of Short Fiction*, shorter 8th edition, Any handbook with the 2016 MLA research documentation updates.
Provider: Dr. Anne-Marie Thomas, Austin Community College

Course: World Literature / ENGL 2333 (Planned)
Description: Introduction to masterpieces of the literary tradition from the 18th century(the Enlightenment) to the present.
Textbooks/Material used: TBD
Provider: TBD, Austin Community College

MATHEMATICS

Course: Algebra I & II
Description: A thorough introduction and fundamental concepts to algebra topics such as linear equations, ratios, quadratic equations, special factorizations, complex numbers, graphing linear and quadratic equations, linear and quadratic inequalities, functions, polynomials, exponents and logarithms, absolute value, sequences and series, and more!
Textbooks/Material used: *Introduction to Algebra*, Student Text, Richard Rusczyk, Text ISBN: 978-1-934124-14-7
Provider: Sridevi Autoor, Self-Study

Course: Geometry
Description: A full course in challenging geometry for students, including topics such as similar triangles, congruent triangles, quadrilaterals, polygons, circles, funky areas, power of a point, three-dimensional geometry, transformations, introductory trigonometry, and more.
Textbooks/Material used: *Introduction to Geometry,* Student Text, Richard Rusczyk, Text ISBN: 978-1-934124-08-6
Provider: Sridevi Autoor, Self-Study

Course: Counting and Probability
Description: A thorough introduction for students to counting and probability topics such as permutations, combinations, Pascal's triangle, geometric probability, basic combinatorial identities, the Binomial Theorem, and more.
Textbooks/Material used: *Introduction to Counting and Probability,* Student Text, David Patrick, Text ISBN: 978-1-934124-10-9.
Provider: Sridevi Autoor, Self-Study

Course: AMC Preparatory Course
Description: Preparation for the AMC 10/12, the first test in the series of contests that determine the United States team for the International Mathematics Olympiad. Many top colleges also request AMC scores as part of the college application process. The course consists of discussions of problems from past exams, as well as strategies for taking the test. The course also includes practicing past AMC 10/12 tests.
Textbooks/Material used: *The Art of Problem Solving, Volume 1: The Basics*, Sandor Lehoczky and Richard Rusczyk, Text ISBN: 978-0-9773045-6-1, Past AMC 10/12 tests
Provider: Sridevi Autoor, Self-Study

Course: Pre-Calculus
Description: A comprehensive course covering precalculus topics. Specific topics covered include trigonometry, complex numbers, vectors, and matrices.
Textbooks/Material used: *The Art of Problem Solving, Precalculus*, Richard Rusczyk, Text ISBN: 978-1-934124-26-0
Provider: Sridevi Autoor, Self-Study

Course: Calculus 1 / Math 2413
Description: A standard first course in calculus. Topics include inequalities; functions; limits; continuity; the derivative; differentiation of elementary functions; Newton's method; applications of the derivative; the integral; integration of algebraic functions and the sine and cosine functions; numerical integration; and basic applications of the integral
Grading: homework – 16%, 4 Tests- each counting for 25%(with the first homework option) or 21% (with the second homework option) of student's grade.
Textbooks/Material used: *Calculus: Concepts and Contexts,* 4th edition by James Stewart, Brooks/Cole 2010, Graphing Calculator.
Provider: Professor Andrea Blum, Austin Community College

Course: Calculus 2/ Math 2414
Description: A standard second course in calculus. Topics include integration of elementary functions; techniques of integration; integrals with infinite limits of integration; integrals of discontinuous integrands; applications of the definite integral; an introduction to differential equations; infinite series; analytical geometry; and other applications.
Grading: Four tests counting 100 points each, weekly quizzes count 80 points, two or three technology projects which will combine to count 20 points.

Textbooks/Material used: Text: *Calculus: Concepts and Contexts* by James Stewart, 4th edition. Sections 5.5 through 5.7, 5.9, 5.10, Chapters 6, 7 and 8 and Appendix H, Graphing Calculator.
Provider: Professor Anthony Vance, Austin Community College

Course: Calculus 3 / Math 2415
Description: A standard third course in calculus. Topics include polar coordinates and polar curves; vectors and analytical geometry in three dimensions; vector-valued functions and curvature; components of acceleration; functions of several variables; limits and continuity in three-space; partial and directional derivatives; gradients, tangent planes, and extreme of functions of two variables; multiple integrals in rectangular, polar, spherical, and cylindrical coordinates; applications of multiple integrals to area, volume, moments, centroids, and surface area.
Grading: Quizzes count 15% of course grade, Participation count 5%, and Exams count 80% of course grade.
Textbooks/Material used: *Calculus, Concepts and Contexts*, 4th edition by Stewart, Brooks/Cole ISBN 9780495560548
Provider: Professor Rosenthal Mary, Austin Community College

Course: Differential Equations/MATH 2420
Description: A course in the standard types and solutions of linear and nonlinear ordinary differential equations, include Laplace transform techniques. Series methods (power or Fourier) will be applied to appropriate differential equations. Systems of linear differential equations will be studied.
Grading:
Tests: There will be 3 exams plus a final exam
Computer Labs: There will also be a series of *Mathematica*-based computer labs and/or computer assignments (probably 2 labs or 1 lab plus several smaller assignments)
Homework: Written homework will be collected regularly for a modest grade.
Textbooks/Material used: *Differential Equations and Boundary Value Problems: Computing and Modeling*, 5th edition, Edwards & Penney & Calvis, Pearson (ISBN # 9780321796981)
Technology: *Mathematica* software is required for the course. The use of calculators or computers in order to perform routine computations is encouraged.
Provider: Professor Marcus McGuff, Austin Community College

Course: AP Statistics
Description: AP Statistics is a college level introductory course in statistics in which students will learn to collect, organize, analyze, and interpret data. These broad conceptual themes are: 1) Exploring Data, 2) Producing Models Using Probability and Simulation, 3) Experimental Design, 4) Statistical Inference
Grading: Student assessment will consist of a combination of multiple choice and free response exams, hands-on activities, home-work and class participation. The exams are graded using the AP exam scoring guidelines.

Textbooks/Material used: *The Practice of Statistics*, Daren S. Starnes; Dan Yates; David S. Moore (2010) Fourth Edition. New York: W.H. Freeman and Co. ISBN-10: 1-4292-4559-X or ISBN-13: 978-1-4292-4559-3. *Fathom, Dynamic Data Software*, Concord Consortium Software, http://fathom.concord.org/download/. Other statistical software such as Minitab is acceptable in place of Fathom.
Technical Requirements: Computer, internet access, e-mail capability, Scanner OR a digitized camera to submit handwritten test material, and a Graphing calculator (TI-84 suggested).
Provider: Ms. Carole Matheny, Pennsylvania Homeschoolers

Course: Linear Algebra / Math 2318
Description: A study of linear equations, linear transformations, matrices, determinants, finite-dimensional vector spaces, and quadratic forms.
Grading: Homework 15%, assigned daily and collected weekly, Tests - 4, 20% each, Final exam 25%.
Textbooks/Material used: *Linear Algebra, A Geometric Approach*, 2nd edition, by Theodore Shifrin & Malcom R. Adams, W.H. Freeman & Co, 2011. ISBN -13: 978-1-4992-1521-3, ISBN-10: 1-4292-1521-6
Provider: Professor Cepparo Gustavo, Austin Community College

Course: Discrete Math/MATH 2305 (In progress)
Description: A course designed to prepare math, computer science and engineering majors for a background in abstraction, notation and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, graph theory, combinatorics, discrete probability, recursion, recurrence relations, elementary number theory and graph theory. One major part of the course focuses on learning to write logically sound mathematical arguments and to analyze such arguments.
Grading: Student grade will be based on 4 tests (worth 22% each) and a homework grade (12%). Since some of the homework will involve proofs, students will definitely be graded on clarity of explanation! On occasion, students will be given additional assignments, to be completed either in class or at home. Some of these assignments may be done in small groups, while others will be done individually.
Textbooks/Material used: *Discrete Mathematics with Applications*, 4th edition, by Susanna S. Epp, Thomson (Brooks/Cole), 2011, ISBN 0-495-39132-8
Provider: Professor Tony Vance, Austin Community College

SCIENCE

Course: Chemistry with Lab
Description: A comprehensive, quantitative, introduction to Chemistry at the high school Honors level, with a laboratory component. Topics covered will include the atomic theory, kinetic theory, chemical bonding, reactions and stoichiometry, aqueous chemistry, and acid/base chemistry. Laboratory work is integral to this course, and will teach careful attention to proper data collection, error assessment, and quantitative reasoning. There will be a strong writing component. Students completing this course will be well prepared for the SAT Chemistry Subject Exam and will be ready to take upper level Chemistry classes such as AP Chemistry.
Textbooks/Material used: *Introductory Chemistry*, Student Text, Nivaldo Tro, Third Edition
Provider: Jeff Brock, Homeschool class.

Course: AP Biology with Lab
Description: This course is designed to prepare students for study as college science majors and provide them with the background and experience necessary to achieve a successful score on the College Board AP Biology test. Students will cover the biological chemistry of life, cell structure and function, enzymes and metabolism, heredity, molecular genetics, evolution theory, plant and animal structures and function, and biological ecology. Thought processes necessary in the discipline of Biology such as the scientific method, experimental processes, and inductive and deductive reasoning will be developed. Associated terminology will be learned as well as the important relationships of biology with other scientific disciplines (e.g., how chemistry relates to cell function, probability to genetics, etc.). Throughout the course students will also develop skills for asking and answering questions in a scientific manner.
Students will participate in regularly planned student interaction sessions to review materials, quizzes and exams to enhance the learning process. In addition, independent and collaborative laboratory exercises will facilitate learning how to work as a scientist and as part of a research team. The lab activities will also help students prepare for "laboratory based" questions on the new AP Biology exam. Daily reading will be required. In order to help reinforce concepts and prepare students for the College Board exam weekly testing of the student's growing knowledge base will occur through AP exam-like multiple-choice questions.
Textbooks/Material used: *Biology* by Campbell and Reece with Mastering Biology (Ninth Edition) Benjamin Cummings
Provider: Dr. Terri Kanner, Pennsylvania Homeschoolers

Course: Physics with Lab
Description: Honors Physics is an algebra-based, introductory college-level physics course. Students cultivate their understanding of Physics through inquiry-based investigations as they explore these topics: kinematics; dynamics; circular motion and gravitation; energy; momentum; simple harmonic motion; torque and rotational motion; electric charge and

electric force; DC circuits; and mechanical waves and sound. This course is laboratory based, with a strong oral and written communication component. Students completing this course will be well prepared for the SAT Physics Subject Exam, and for university or AP Physics courses.
Textbooks/Material used: Giancoli, Douglas C. *Physics: Principles with Applications*. 6th ed., Upper Saddle River, Pearson Education, 2005.
Provider: Jeff Brock, Homeschool class.

Course: AP Computer Science
Description: This course prepares students for the AP Computer Science A Exam. Object-oriented programming methodology with a concentration on problem solving and algorithm development is emphasized. Students will read, answer questions, take quizzes, and most importantly, design, code, document and test Java programs. This is a hands-on, project-based course. There will also be opportunities for students to exercise their creativity by designing their own custom Java classes. Incorporate beginning computers science projects developed at Princeton, University of Washington, and Bucknell. Throughout the year, AP-style questions are practiced. Student will be part of an online community where he/she will post any questions he/she may have about the software, reading material or the homework assignments, answer each others' questions, discuss computer science topics, and upload homework. There will be also some team activities during the year.
Textbooks/Material used: *Introduction to Computer Science Using Java*. Bradley Kjell, *Barron's AP Computer Science A*. Roselyn Teukolsky. Latest edition, Computer with audio, high-speed internet access, *e*-mail, The Java environment that we will be using is Oracle's NetBeans.
Provider: Ms. Cynthia Lang, Pennsylvania Homeschoolers

Course: Engineering Physics I with Lab/ PHYS 2425
Description: Fundamental principles of physics, using calculus, for science, computer science, and engineering majors. The course covers the principles and applications of classical mechanics, including harmonic motion, physical systems and thermodynamics; and emphasizes problem solving. Intended for majors in engineering, physics, chemistry, and mathematics.
Define/discuss and solve problems involving the components of linear motion (displacement, velocity, and acceleration), and especially motion under conditions of constant acceleration, forces and work using Newton's Laws and energy concepts, including conservation of energy, the principles of impulse, momentum, and collisions, the location of the center of mass, rotational kinematics and dynamics, the relationship between linear and rotational motion, simple harmonic motion and its application to real-world, wave motion, the characteristics of solids, liquids, and gases. the gas laws and basics of the Kinetic Theory. the concepts of heat, heat transfer, and the first and second Laws of Thermodynamics. Conduct basic laboratory experiments and prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements

Grading: Labs count 25% for the course grade, quizzes 10%, homework 10%, tests 25%, final exam 30%.
Textbooks/Material used: *Fundamentals of Physics* by David Halliday and Robert Resnick, 9th edition, Wiley publication.
Provider: Professor John Cise, Austin Community College

Course: AP Chemistry with Lab
Description: AP Chemistry is the equivalent of a first-year college chemistry course, thus providing students with a strong foundation to support future advanced work in chemistry. This course is structured around the six big ideas articulated in the AP Chemistry curriculum framework provided by the College Board. It will present a rigorous treatment of the nature of matter, gas laws, thermodynamics, stoichiometry, bonding, chemical kinetics, and chemical equilibria. Student-designed labs will be at the center of this course, with an emphasis on written and oral communication skills.
Textbooks/Material used: *Chemistry*, 10th edition by Raymond Chang, ISBN: 978-0077274313, QSL Advanced Microchem Lab Kit, Graphing Calculator, WebAssign Account, Computer with Internet access.
Provider: Peter Moskaluk, Pennsylvania Homeschoolers

Course: Chemistry Olympiad Prep
Description: Chemistry Olympiad Course will prepare the student to take the local and the National Chemistry Olympiad exams, the first and second tests in a series of tests that determines the members of the US team for the International Chemistry Olympiad. Student will learn the topics such as: Chemical & Molecular Bonding, Equilibrium, Kinetics, Stoichiometry, Organic Biochemistry, Atomic Structure/Periodicity, Oxidation/Reduction, States of Matter, Thermodynamics, and solve and analyze problems taken from past exams.
Textbooks/Material used: Past exams available on the ACS (American Chemical Society) website:
https://www.acs.org/content/acs/en/education/students/highschool/olympiad/pastexams.html
Provider: Sridevi Autoor, Self-Study

Course: Physics C, Electricity & Magnetism with Lab
Description: Physics C Electricity & Magnetism is a calculus-based course designed to expose the student to all the foundational topics needed to understand such concepts as electric force, electric field, electric potential, electric circuits, magnetic effects, electromagnetic induction, and electrical energy. Virtual and actual laboratory activities will prepare the student for lab-based questions on the Physics tests. Each unit of the course contains a "workflow" that guides the student. The workflow is a combination of video lectures, lab activities, practice problems with complete solutions.
Textbooks/Material used: *Physics,Volume1* and *Physics,Volume2* by Robert Resnick David Halliday, Kenneth S. Krane, John Wiley & Sons; 5th edition
Provider: Sridevi Autoor, Self-Study

Course: PHY 336K Classical Dynamics
Description: Classical Dynamics is a higher-level discussion of classical mechanics than what a student experienced in the introductory course. The course will cover key results of Newtonian mechanics in greater depth; study specific important systems; and introduce the Lagrangian and Hamiltonian formulations of mechanics. The course will develop important mathematical techniques that will be used extensively in this class and in further physics courses (such as linear differential equations, the calculus of variations, and linear algebra).
Grading: Homework: 25%, Midterm Exam #1: 25%, Midterm Exam #2: 25%, Final Exam: 25%.
Textbooks/Material used:
Classical Dynamics of Particles and Systems by Stephen T. Thornton and Jerry B. Marion
Provider: Prof. Richard Matzner, University of Texas at Austin

Course: PHY 355 Modern Physics & Thermodynamics
Description: Introduction to modern physics and thermodynamics: photons (spectra, photoelectric effect, blackbody radiation, Compton effect), atoms (Rutherford, Bohr), matter waves (Planck, deBroglie, probability interpretation, Schroedinger), nuclei, particles, special relativity, the laws of thermodynamics, and statistical physics.
Grading: Homework 25%, In-class Exams 30%, Classwork 10%, Final Exam 35%.
Textbooks/Material used: *Modern Physics, from α to Z0*, by J. W. Rohlf.
Provider: Professor John Markert, University of Texas at Austin

Course: PHY 373 Quantum Physics I: Foundations
Description: Postulates of quantum mechanics, the bound states of the finite square well, the harmonic oscillator, operator-eigenvalue formulism and selected examples, the hydrogen atom, angular momentum, rigid rotor, and spin. May include simple scattering theory.
Grading: Homework 20%, Test scores 16% each, and Final Exam 32%. No homework or test scores are dropped.
Textbooks/Material used: David Griffiths and Darrell Schroeter, *Introduction to Quantum Mechanics, 3rd ed.* (Cambridge Univ. Press, 2018) and supplementary course notes posted on Canvas.
Provider: Professor Dan Heinzen, University of Texas at Austin

Course: Physics Olympiad Prep
Description: This Course will prepare the student to take the F=ma exam and USAPhO exam, the first and second tests in a series of tests that determines the members of the US team for the International Physics Olympiad. Student will learn the classical mechanics, electromagnetism, thermodynamics, relativity, nuclear, atomic, and particle physics, waves, optics, data analysis, and solve and analyze problems taken from past exams.
Textbooks/Material used:
Past exams available on the AAPT (American Association of Physics Teachers) website: https://www.aapt.org/physicsteam/2019/exams.cfm
Provider: Sridevi Autoor, Self-Study

COMMUNICATION STUDIES

Course: Public Speaking/SPCH 1315
Description: Public Speaking is the application of communication theory and practice within the public speaking context. Emphasis is placed on audience analysis, speaker delivery, ethics of communication, cultural diversity, and speech organizational techniques to develop students' speaking abilities.
Textbooks/Material used: *Public Speaking: An Audience- Centered Approach*, 9th edition, Beebe & Beebe, Publication Date: 2/25/2014, ISBN: 978-0205914630
Provider: Professor Milton Hunt, Austin Community College

ENGINEERING

Course: Vector Mechanics, Statics/ENGR 2301
Description: Calculus-based study of the composition and resolution of forces. Vector algebra, force systems, freebody diagrams; equilibrium of rigid bodies and structures; centroids, distributed loads, friction; moment of inertia.
Textbooks/Material used: TBD
Provider: TBD, Austin Community College

FOREIGN LANGUAGE

Course: Intro to French
Description: Intro to French is a combination of two programs:

- Beginner French class from Alliance Francaise of Austin
- Mango Languages, an online language learning program

This course focuses on the basics of French language. The four key components of this course are vocabulary, pronunciation, grammar, and culture. Students learn a foreign language by listening to and repeating material focused on practical situations and conversations! After completion of the course, a student can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact with others in a simple way.
Textbooks/Material used: Mango Language Online Learning Program.
Provider: Alliance Francaise of Austin and Local Library

Course: French 1/ FREN-1411
Description: Study of fundamentals of French: conversation, basic writing, listening and reading comprehension, vocabulary building, grammar, and culture. This is a beginning college level language course. In this course students will learn to read, write, speak, and understand French at a novice level, and will increase their knowledge of the culture of French-speaking regions around the world.

Textbooks/Material used: *Horizons 6e Super Bundle Vols 1 & 2* ISBN: 9781305777712 contains: WorkText Volume 1 (Textbook and SAM - Preliminary chapter – Chapter 5), WorkText Volume 2 (Textbook and SAM - Chapters 5-Ch. de révision) iLrn IAC/PAC (6) (24-month access) [SAM = Student Activities Manual]
Provider: Professor John McMinn-Reyna, Austin Community College

Course: French 2/FREN-1412
Description: Continuation of FREN 1411 with more advanced conversation, basic writing, listening and reading comprehension, vocabulary building, grammar, and culture. This course fosters deeper understanding of French-speaking people through cultural comparison and development of written and spoken communication.
Textbooks/Material used:
Horizons 6th edition Super Bundle Vol 2, ISBN : 9781305777729 contains: Worktext Volume 2 (Textbook and SAM - Chapters 5-Ch. De révision) ISBN : 978130530117, iLrn IAC/PAC (24 months) [SAM = Student Activities Manual]
Provider: Professor John McMinn-Reyna, Austin Community College

Course: French 3/FREN-2311
Description: Advanced French grammar, directed composition, conversation, and discussion of culture based on readings. Class conducted mostly in French.
Textbooks/Material used: *Horizons 6th edition Super Bundle Vol 2,* ISBN : 9781305777729 contains: Worktext Volume 2 (Textbook and SAM - Chapters 5-Ch. De revision) ISBN : 978130530117, iLrn IAC/PAC (24 months) [SAM = Student Activities Manual]
Provider: Professor Debra Latimer, Austin Community College

HISTORY/ECONOMICS

Course: Streams of Civilization
Description: Streams of Civilization first course provides insight into different cultures, religions and a comprehensive look at Western, African, and Asian civilizations up to 1620. Second course covers the events of world history with an emphasis on European and American culture since the Reformation. The course traces particular themes within particular time periods, focusing on specific individuals and events with the help of maps, photographs, and the artwork. The principal themes include the history of Christianity and philosophy with their results in culture, politics, economics, society, science, and technology.
Textbooks/Material used*:*
Streams of Civilization, vol. 1, Christian Liberty Press, Student Text, Volume 1 Test Packet
Streams of Civilization, vol. 2, Christian Liberty Press, Student Text, Volume 2 Test Packet
Instructor: Sridevi Autoor, Self-Study

Course: Macroeconomics / ECON 2301
Description: The purpose of this course is to familiarize the student with the generally accepted principles of macroeconomics. Though ultimately based on the actions of individual households and business firms, macroeconomics deals with aggregates--i.e.

consumers as a whole, producers as a whole, exporters and importers as a whole, the effects of government spending and taxation, and the monetary policy of the central bank. Macroeconomics is concerned with such things as unemployment, inflation, and the business cycle. This course is meant to give students insight into the dynamics of our national economy and is also a foundation course that will prepare students for the upper division finance, marketing, business administration, economics, government, and social work courses.
Textbooks/Material used: *Economics Today: The Macro View* plus MyEconLab plus eBook 1-semester Student Access Kit, 18/E, by Roger LeRoy Miller (Pearson/Prentice Hall, 2015).
Provider: Professor Dr. Marianna Sidoryanskaya**,** Austin Community College.

Course: United States History I/ HIST 1301
Description: Independent Course study using computer and text: A study of the history of the United States before 1877, with opportunities for historical research It examines the age of European colonization in North America, the expansion of American slavery, the American Revolution, religion in America, territorial expansion, and the tensions that resulted in the Civil War.
Textbooks/Material used: James Roark et al, *The American Promise,* Volume 1, Sixth edition, Full color paperback ISBN: 978-1-4576-6841-8, "Value" Edition ISBN: 978-1-4576-8793-8
Provider: Professor Teresa Thomas, Austin Community College

Course: America: From Past to Present
Description: This Course covers the ups and downs of the nation past, from before the Columbus to the modern times.
Textbooks/Material used: *A History of US: 11 Volume Set,* Revised Third Edition by Joy Hakim, Oxford University Press, ISBN: 0195327276

1. *The First Americans: Prehistory–1600*
2. *Making Thirteen Colonies: 1600–1740*
3. *From Colonies to Country: 1735–1791*
4. *The New Nation: 1789–1850*
5. *Liberty for All? 1820–1860*
6. *War, Terrible War: 1855–1865*
7. *Reconstructing America: 1865–1890*
8. *An Age of Extremes: 1880–1917*
9. *War, Peace, And All That Jazz: 1918–1945*
10. *All the People: Since 1945*
11. *A History of US Sourcebook and Index*

Supplemented with numerous historical novels, biographies, and movies.
Provider: Sridevi Autoor, Self-Study

Course: World History

Description: This course is an in-depth and literature-rich study of the history of the ancient, medieval, renaissance, and modern world. The world history tells the stories of all peoples, connecting historical events from Europe to the Middle East to the far coast of China, while still giving weight to the characteristics of each country, organized by themes the chaos of the medieval world into a semblance of cohesive law, migratory logic and religious fervor that would later explode into the Renaissance. Dozens of maps provide a clear geography of major events, while timelines give an ongoing sense of the passage of years and cultural interconnection.

Textbooks/Material used:

The History of the Ancient World: From the Earliest Accounts to the Fall of Rome by Susan Wise Bauer, W.W. Norton, 2007, ISBNs: 978-0393059-74-8
The History of the Medieval World: From the Conversion of Constantine to the First Crusade by Susan Wise Bauer, W.W. Norton, 2010, ISBNs: 9780-393059-75-5
The History of the Renaissance World: From the Rediscovery of Aristotle to the Conquest of Constantinople by Susan Wise Bauer, W.W. Norton, 2013, ISBNs: 978-0-393240-67-2
Hittite Warrior by Joanne Williamson
The Art of War by Sun Tzu
Black Ships Before Troy by Rosemary Sutcliff
The Eagle of the Ninth by Rosemary Sutcliff
Augustus Caesar's World by Genevieve Foster
The World of Columbus and Sons by Genevieve Foster
The World of Capt. John Smith by Genevieve Foster
George Washington's World by Genevieve Foster
Abraham Lincoln's World by Genevieve Foster
Poor Richard by James Daugherty
Johnny Tremain by Esther Forbes
Carry On, Mr. Bowditch by Jean Latham
The Great Little Madison by Jean Fritz (note: I read quite a few – but not really HS level)
Of Courage Undaunted by James Daugherty
One Thousand and One Arabian Nights - translated by Richard Francis Burton
Joan Of Arc by Mark Twain
Uncle Tom's Cabin by Harriet Beecher Stowe
Rifles for Watie by Harold Keith
The Red Badge of Courage by Stephen Crane
Virginia's General by Albert Marrin
Up from Slavery by Booker T. Washington
Around the World in Eighty Days by Jules Verne
All Quiet on the Western Front by Erich Remarque
To Kill a Mockingbird by Harper Lee
Stalin: Russia's Man of Steel by Albert Marrin
Never Give In: The Extraordinary Character of Winston Churchill by Stephen Mansfield
The Hiding Place by Corrie Ten Boom
The Diary of Anne Frank by Anne Frank

Victory in the Pacific by Albert Marrin
America and Vietnam: The Elephant and the Tiger by Albert Marrin
Books by G.A. Henty:

- *The Cat of Bubastes, A Tale of Ancient Egypt*
- *The Young Carthaginian: A Story of the Times of Hannibal*
- *Beric the Briton: A Story of the Roman Invasion*
- *For the Temple: A Tale of the Fall of Jerusalem*
- *The Dragon and the Raven: Or, the Days of King Alfred*
- *Wulf the Saxon: A Story of the Norman Conquest*
- *Winning His Spurs: A Tale of the Crusades*
- *In Freedom's Cause: A Story of Wallace and Bruce*
- *St. George for England: A Tale of Cressy and Poiters*
- *The Lion of St. Mark: A Tale of Venice in the Fourteenth Century*
- *Both Sides of the Border: A Tale of Hotspur and Glendower*
- *At Agincourt: A Tale of the White Hoods of Paris*
- *A Knight of the White Cross: A Tale of the Siege of Rhodes*
- *By Pike and Dyke: A Tale of the Rise of the Dutch Republic*
- *St. Bartholomew's Eve: A Tale of the Huguenot Wars*
- *Under Drake's Flag: A Tale of the Spanish Main*
- *By Right of Conquest: Or, With Cortez in Mexico*
- *The Lion of the North: A Tale of Gustavus Adolphus and the Wars of Religion*
- *Won by the Sword: A Tale of the Thirty Years' War*
- *Orange and Green: A Tale of the Boyne and Limerick*
- *With Frederick the Great: A Tale of the Seven Year's War*
- *True to the Old Flag: A Story of the American War of Independence*
- *Held Fast for England: A Tale of the Siege of Gibraltar (1779-83)*
- *With Clive in India: Or, The Beginnings of an Empire*
- *In the Reign of Terror: The Adventures of a Westminister Boy in the French Revolution*
- *No Surrender! A Story of the Revolt in La Vendee*
- *The Tiger of Mysore: A Story of the War with Tippoo Sahib*
- *By Conduct and Courage: A Story of Nelson's Days*
- *At Aboukir and Acre: A Story of Napoleon's Invasion of Egypt*
- *At the Point of the Bayonet: A Tale of the Mahratta War*
- *With Moore at Corunna: A Story of the Penisular War*
- *The Young Buglers: A Story of the Penisular War*
- *Through the Fray: A Story of the Luddite Riots*
- *Under Wellington's Command: A Story of the Penisular War*
- *In Times of Peril: A Tale of the Indian Mutiny*
- *With Lee in Virginia: A Story of the American Civil War*
- *Out With Garibaldi: A Story of the Liberation of Italy*
- *For Name and Fame: Or, Through Afghan Passes*
- *The Dash for Khartoum: A Tale of the Nile Expedition*

Provider: Sridevi Autoor, Self-Study

Course: Texas State and Local Govt. /GOVT 2306 (Planned)
Description: This course is an introduction to Texas state and local government. The course includes a framework for understanding Texas government and politics and the constitutional basis for the processes, the institutions, and the policies of Texas government and politics.
Textbooks/Material used: TBD
Provider: TBD, Austin Community College

FINE ARTS

Course: Piano Music & Theory 1
Description: This course is designed to expand existing piano playing skills, to learn basic music theory, to gain an understanding of musical notation and to develop effective practice techniques. Each student showcases his/her progress by performing in fall and spring recitals.
Textbooks/Material used:

1. *John Thompson's Modern Course for the Piano, The First Grade Book*, The Willis Music Co. Florence, Kentucky
2. *John Thompson's Modern Course for the Piano, The Second Grade Book*, The Willis Music Co. Florence, Kentucky
3. *William Stickles Hymn Music*, Chas. H. Hansen Music Corp. New York 19, N.Y.
4. *A Dozen a Day,* Book one, by Edna-Mae Burnam.
5. *A Dozen a Day*, Preparatory Book (blue), by Edna-Mae Burnam.
6. *A Dozen a Day*, Mini Book (pink), by Edna-Mae Burnam.
7. *Scale Speller*, Level 2, by John W. Schaum
8. *Making Music Method*, Level two, by John W. Schaum
9. *Making Music Method*, Level three, by John W. Schaum
10. *30 note spelling lessons*, Book one, by David Carr Glover
11. *30 note spelling lessons*, Book two, by David Carr Glover
12. *The Leila Fletcher Adult Piano Course*, Book one, Montgomery Music Inc. Buffalo, N.Y.

Provider: Ms. Joyce Rogers, Music Teacher

Course: Piano Music & Theory 2
Description: Continuation of Piano Music & Theory 1 with advanced piano literature, finger drills and music theory. The course provides opportunities for growth in understanding the following musical elements: rhythm, melody, form, tempo, dynamics, timbre or tone color, harmony, expression, articulation, and style. At the conclusion of the course, students will have skills in the following areas: Posture(include leg, back hand positions etc.), Positions (such as G position, Thumb under movement etc.), Notation, Intervals, Meter, Rhythms, Scales, Basic Theory, Hand Independence/Coordination, Sight Reading, Practice, and Music Vocabulary. Each student displays his/her progress by performing in fall and spring recitals.
Textbooks/Material used:

1. *John Thompson's Modern Course for the Piano, The Third Grade Book*, The Willis Music Co. Florence, Kentucky

2. *John Thompson's Modern Course for the Piano, The Fourth Grade Book*, The Willis Music Co. Florence, Kentucky
3. *Piano Exam Pieces*, ABRSM Grade 2
4. *The Nutcracker Suite*, Peter Ilyich Tchaikovsky, arranged by Gayle Kowalchyk and E.L.Lancaster
5. *A Dozen a Day*, Book two, by Edna-Mae Burnam
6. *A Dozen a Day*, Book three, by Edna-Mae Burnam
7. *A Dozen a Day*, Book four, by Edna-Mae Burnam
8. *Theory Workbook*, Level Four, by Wesley Schaum
9. *Fingerpower Transposer*, Level Four, by Wesley Schaum
10. *Arpeggio Speller*, Level Three, by John W. Schaum
11. *Interval Speller*, Level Four, by John W. Schaum
12. *Chord Speller*, Level Five, by John W. Schaum
13. *Theory Lessons*, Book Three, by John W. Schaum

Provider: Ms. Joyce Rogers, Music Teacher

Course: Piano Music & Theory 3

Description: In Piano Music & Theory 3 course, students learn intermediate and advanced piano technique, expand their understanding of music theory to facilitate playing advanced repertoire. Students will prepare and perform assigned pieces of music for fall and spring recitals as well as for the festivals.

Textbooks/Material used:

1. *Bela Bartok* - Mikrokosmos, edited by Boosey & Hawkes
2. *J.S. Bach Two-part Inventions*, edited by Willard A. Palmer
3. *Moonlight Sonata, Piano Sonata in C-sharp Minor, First Movement* by Ludwig van Beethoven
4. *Carl Czerny - The School of Velocity for the Piano: Opus 299*, Books 1 and 2
   The School of Velocity for the Piano No.1, 2, 3, 4
5. *Romanian Dances: Stick Dance (Joc Cu Bata)*, by Bela Bartok
6. *Inventio 1, 2-part*, J.S.Bach
7. *Sonata in D minor L.58*, Domenico Scarlatti
8. *Piano Repertoire, Romantic & 20th Century, Level 8,* Selected & Edited by Keith Snell Repertoire List:
   1. *From Album for the Young, Op.68, Echos from the Theater,* by Robert Schumann
   2. *From Album for the Young, Op.68, The Stranger,* by Robert Schumann
   3. *Prelude in B minor,* by Frederic Chopin
   4. *March of the Dwarfs*, by Edvard Grieg
   5. *Butterfly,* by Edvard Grieg
   6. *From Children's Corner, Dr. Gradus ad Parnassum,* by Claude Debussy
   7. *Bagatelle, Op. 5 No.1,* by Alexander Tcherepnin

Provider: Ms. Melanie Richards, Music Teacher

Course: Piano Music & Theory 4

Description: This course is a continuation of Piano Music & Theory 3, which includes mastery of music reading, musical notation, aural skills, harmonic and melodic dictation, form and analysis, and basic composition. Similar to Piano Music & Theory 3, students will prepare and perform assigned pieces of music for fall and spring recitals as well as for the festivals.

Textbooks/Material used:

Repertoire List

1. *Bumble Boogie,* composed by Jack Fina, Edited by Valery Lloyd-Watts
2. *As Time Goes By*, Herman Hupfeld arr. Dan Coates
3. *Colorado River Rapids (secondo) [1p 4h],* Melody Bober
4. *Sonata in C# minor, op. 27, No. 2, (1st movement)*, Ludwig Beethoven
5. *The Entertainer,* Scott Joplin
6. *Consolation in Db Major,* Dennis Alexander
7. *The Girl with the Flaxen Hair VIII,* Claude Debussy
8. *Intermezzo 2,* Brahms
9. *The Throne Room*, John William / arranged by Phillip Keveren
10. *Turkish March (Alla Turca),* Wolfgang Amadeus Mozart
11. *Impromptu Op.90 No.2* - Allegro, Franz Schubert

Provider: Ms. Ee Lyn Lee, Music Teacher

PHYSICAL EDUCATION

Course: Racquetball & Table Tennis

Description: Racquetball is designed to build strength and stamina whereas Table Tennis emphasizes mind-body stimulation, aerobic exercise, improving hand-eye coordination, reflexes and balance.

Provider: Satish Sadam, Clay Madsen Recreation Centre at Round Rock.

Course: Strength & Conditioning

Description: Strength training exercises using a variety of equipment designed to increase muscular strength, endurance and flexibility. Bursts of cardio complete this full body workout.

Provider: Self-Training, YMCA at Round Rock

Course: Masters Swim

Description: Masters Swim program is a class for swimmers and multi-sport athletes looking to improve their skills or prepare for a specific event. Swimmers will be coached on interval training, drills for strokes, basic workout skills, etiquette and equipment use. Participants will be able to improve their fitness and stroke technique in a positive group environment.

Provider: Multiple instructors, YMCA at Round Rock

SUMMER PROGRAM

Course: MIT – Beaver Works Summer Institute

Description: MIT Beaver Works Summer Institute (BWSI), a rigorous, world-class STEM program for talented, rising high school seniors. Beaver Works is a joint venture between MIT Lincoln Laboratory and the MIT School of Engineering that is envisioned as an incubator for research and innovation. The four-week program teaches STEM skills through project-based, workshop-style courses. Technical areas of focus include vehicle design, system fabrication and integration, detailed analysis and simulation, communication link architectures, command and control, flight testing and certification, and advanced payload development. Autonomous Air Vehicle Racing is part of this program.

Autonomous Air Vehicle Racing will offer students the opportunity to explore some new areas of research and to design their own autonomous capabilities for UAVs (unmanned aerial vehicles). The students will work in teams to develop algorithms for deployment to an advanced quadrotor, the Intel Aero Ready-To-Fly Drone. They will use the Robot Operating System (ROS), popular open-source libraries, and custom algorithms to program the quadrotors. The summer course will culminate in a competition at which the students will apply the knowledge gained from the four-week program's projects and lectures (presented by leading researchers from MIT, Lincoln Lab, and the NASA Jet Propulsion Lab) to a series of racing challenges. This program consists of two components: an online course from January to May open to all interested students and a four-week summer program at MIT from July 8 to August 4 for a small group of students. The online component gives students a background in the course material and provides a solid mathematical foundation that will be critical when completing the more advanced topics of the summer course. Students will demonstrate basic implementations of control and autonomy after each unit of instruction. These lessons will build upon previous instruction to enable students to develop algorithms so that a quadrotor can autonomously navigate a UAV racecourse designed for the summer program.

Provider: MIT – Beaver Works Summer Institute, Cambridge, MA

ELECTIVES

Course: Physics Everywhere

Description:

Physics Everywhere is a compilation of several physics Great Courses: *Physics in Your Life*, *Physics and our Universe*, and *Impossible: Physics beyond the Edge*, and is designed to provide a thorough introduction to the ubiquity of physics.

- *Physics in Your Life* offers a back-and-forth interplay between everyday applications of physics and the concepts needed to understand them.
- *Physics and our Universe: How It All Works* explores the fundamentals of reality with intensively illustrated diagrams, illustrations, animations, graphs, and other visual aids, these lectures introduce a student to scores of fundamental ideas such as: Newton's

laws of motion, Bernoulli effect, Second law of thermodynamics, Maxwell's equations, interference and diffraction, and relativity and quantum theory.

- *Impossible: Physics beyond the Edge* conveys fundamental ideas at the core of physics—all in pursuit of the answer to the question, "Is it possible?". The course includes topics such as: near-absolute zero, time dilation, quantum tunneling, entanglement, thermodynamics. Students will survey the advancing frontier of physics, as startling new theories changed people's perception of what's possible and what's not, including such revolutions as relativity and quantum theory, chaos theory, Noether's theorem, and information theory.

Textbooks/Material used:

Physics in Your Life, The Great Courses from the Teaching Company, DVD format. 36 lectures, avg. 30 minutes each. https://www.thegreatcourses.com/courses/physics-in-your-life.html

Physics and Our Universe: How It All Works, The Great Courses from the Teaching Company, DVD format. 60 lectures, 30 minutes each.
https://www.thegreatcourses.com/courses/physics-and-our-universe-how-it-all-works.html

Impossible: Physics beyond the edge, The Great Courses from the Teaching Company, DVD format. 24 lectures, avg. 30 minutes each.
https://www.thegreatcourses.com/courses/impossible-physics-beyond-the-edge.html

Provider: Professor Richard Wolfson, The Teaching Company Great Courses,
Professor Benjamin Schumacher**,** The Teaching Company Great Courses

Course: Cybersecurity

Description: *Thinking about Cybersecurity* teaches the structure of the Internet, the unique dangers it breeds, and the ways we're learning how to understand, manage, and reduce these dangers. This course engages students in the invisible world of codes, computer viruses, and digital espionage, and offers an enthralling look at the high-stakes battles of tomorrow.

Textbooks/Material used: *Thinking about Cybersecurity: From Cyber Crime to Cyber Warfare*, The Great Courses from the Teaching Company, DVD format.18 lectures, 32 minutes each. https://www.thegreatcourses.com/courses/thinking-about-cybersecurity-from-cyber-crime-to-cyber-warfare.html

Provider: Professor Paul Rosenzweig, The Teaching Company Great Courses

Course: Introduction to Nano Technology

Description: *Introduction to Nanotechnology: The New Science of Small* contains 24 accessible and visually rich half-hour lectures, where a student can get an in-depth explanation of nanotechnology and how it is possible to work in a domain that is nine orders of magnitude smaller than humans—comparable to the difference in scale between a man and the sun.

Professor Sargent begins the course with a series of lectures that orient a student to the nanoscale and then cover some of the most significant developments in electronics that have made use of nanotechnology in computers, communications, and imaging. Then Professor

Kelley delivers a sequence of lectures on her specialty: the biological applications of nanotechnology, especially to medicine.

The two professors combine for a lecture on their respective research teams, giving a fascinating glimpse of the collaboration between scientists and engineers as they probe and create the nanoworld. Professor Sargent follows with a look at the beautiful and distinctive shapes revealed at the nanoscale, as well as a sustained investigation of developments that are transforming the way the modern world produce, store, and use energy. The course concludes with each professor giving a lecture on more futuristic examples of nanotechnology, from biologically based nanorobots to smart dust and invisibility cloaks.
Textbooks/Material used: *Introduction to Nanotechnology*: The New Science of Small, The Great Courses from the Teaching Company, DVD format.
Provider: Professors Ted Sargent and Shana Kelley of the University of Toronto, The Teaching Company Great Courses.

Course: Modern Electronics
Description: A calculus-based foray into the world of electronics with emphasis placed on theoretical understanding.

This course is a combination of self-study using lectures from BerkeleyX, the Georgia Institute of Technology and The Teaching Company Great Courses.
Hands-on projects, including the construction of an audio amplifier, basic logic circuits, a light among others, are accomplished using assorted active and passive circuit elements, along with several ICs, an Arduino Uno and a Raspberry Pi. Some C programming (on the Arduino platform) will be used.

Students learn theory and practice using instruments and devices such as voltmeters, multimeters, oscilloscopes, semiconductors, circuit diagrams, logic gates, truth tables, flip-flop circuits, and basic electronic elements such as MOSFETs, 555 Timers, op-amps like the LM741, and more.
Textbooks/Material used:
Introduction to Electronics, Georgia Institute of Technology via Coursera
Electronic Interfaces EE40LX, BerkeleyX via EdX
Understanding Modern Electronics Course No. 1162, The Great Courses from the Teaching Company, DVD format. 24 lectures, 36 minutes each
https://www.thegreatcourses.com/courses/understanding-modern-electronics.html
Basic Electricity by Van Valkenburgh, Nooger & Neville, Prompt Publications
Basic Electronics, Vol. 5 by Van Valkenburgh, Nooger & Neville, Prompt Publications
Selected units from *Digital Integrated Electronics* by Herbert Taub, Donald Schilling
Selected units from *Integrated Electronics: Analog and Digital Circuits and Systems* by Jacob Millman , Christos C. Halkias, McGraw-Hill Book Company
Operational Amplifier Circuits: Design and Application by David E .Johnson, V. Jayakumar
Engineer's Mini-Notebook Series, by Forrest M.Mims III
Vol 1 : Timer, Op Amp & Optoelectronic Circuits & Projects
Vol 2: Science and Communication Circuits & Projects
Vol 3: Electronic Sensor Circuits & Projects
Vol 4: Electronic Formulas, Symbols & Circuits

Practical Electronics for Inventors by Paul Scherz, Mc Graw-Hill Publishers
Make: Electronics: Learning by Discovery by Charles Platt
Make: More Electronics: Journey Deep into the World of Logic Chips, Amplifiers, Sensors, and Randomicity 1st Edition by Charles Platt
Encyclopedia of Electronic Components Volume 1: Resistors, Capacitors, Inductors, Switches, Encoders, Relays, Transistors 1st Edition by Charles Platt
Provider:
Dr. Bonnie H. Ferri & Dr. Robert Allen Robinson, Jr, Georgia Institute of Technology,
Professors Tom Zajdel & Michel Maharbiz, BerkeleyX,
Professor Richard Wolfson, The Teaching Company Great Courses,
Sridevi Autoor, Self-Study.

Course: Optics
Description: Optics is a Science Olympiad study/lab event designed to teach basic understanding of the geometric and physical optics, such as reflection, refraction, critical angle, electromagnetic and visible spectrum, lenses, and mirrors. In addition, students learn the structure and functioning of the eye and its parts, diseases of the eye, color mixing, additive, subtractive mixing, colored filters, and more. Students practice the Laser Shoot, where students position multiple mirrors around several barriers to accurately deflect a laser beam to a target point on the wall.
Textbooks/Material used: *Optics,* 4th edition by Eugene Hecht, Various online resources.
Provider: Sridevi Autoor, Self-Study

Course: Remote Sensing
Provider: Sridevi Autoor, Self-Study
Description: Remote Sensing is a Science Olympiad study event where teams use remote sensing image, such as photographic and spectroscopic information, to analyze data and/or make climate models. They learn image interpretation as well as the concepts of remote sensing and climate change processes (carbon cycle, aerosols, ozone depletion, ...). This course also includes background material in ecology/biology, meteorology, and basic physics concepts. Individual space programs and NASA satellites, in addition to the types of sensors used, are covered.
Textbooks/Material used: *Introduction to Remote Sensing*, 4th edition by James B. Campbell, Various online resources.
Provider: Sridevi Autoor, Self-Study

Course: Hovercraft
Description: Hovercraft is a Science Olympiad study/lab event, designed to teach basic mechanics, dynamics, and fluid dynamics. Students will also build self-propelled air-levitated vehicles. Hovercraft history and theory will be covered.
Textbooks/Material used: Physics,Volume1 and Physics,Volume2 by *Robert Resnick David Halliday, Kenneth S. Krane,* John Wiley & Sons; 5th edition. Various online resources.
Provider: Sridevi Autoor, Self-Study

Course: Chemistry Lab & Thermodynamics

Description: Chemistry Lab & Thermodynamics is a Science Olympiad event where student participants must learn selected aspects of chemistry and practice labs regarding those aspects.

Topics include:

- Physical Properties, Thermodynamics
- Thermodynamics: Gas Laws
- Gas Laws, Kinetics
- Kinetics, Stoichiometry
- Stoichiometry, Equilibrium
- Equilibrium, Periodicity
- Periodicity, Electrochemistry
- Electrochemistry, Aqueous Solutions
- Aqueous Solutions, Kinetics
- Acids and Bases, Titration Race
- Thermodynamics

Textbooks/Material used: *Chemistry*, 10th edition by Raymond Chang.
Organic Chemistry, David Klein. Excel. Mathematica. Various online resources.
Provider: Sridevi Autoor, Self-Study

Course: Game & Simulation Development

Description:

An introduction to video game and simulation development using Unity, Blender, Substance, the Quixel suite, C#, RUST, and XR, with some focus on cinematics.

This course includes:

- A basic study of technical computer models using Blender. A broad overview of typical studio workflow is covered, with focus on how models, UVs, Texture, character rigging, animation, rendering produce a final product.
- Instruction in three-dimensional (3-D) modeling and rendering techniques including lighting, staging, camera, and special effects in Unity. Emphasis on 3-D modeling building blocks using primitives to create simple or complex objects.
- Techniques of three-dimensional (3-D) modeling utilizing appropriate software. Includes the creation and modification of 3-D geometric shapes, use of a variety of rendering techniques, camera light sources, texture, and surface mapping. Done in Blender.
- Introduction to electronic game development and game development careers. Includes examination of history and philosophy of games, the game production process, employee factors for success in the field, and current issues and practices in the game development industry. Introduction to the tools and concepts used to create levels for games and simulations. Incorporates level design, architecture theory, concepts of critical path and flow, balancing, play testing, and storytelling.

- Simple arch-viz (architecture visualization) was done in Unity to showcase typical workflows.
- Creation of virtual lab simulations for STEM using Unity. Prototyped on the Magic Leap One Creator headset.
- Texture resynthesis and procedural generation is explored through RUST, C#, HLSL, and the Unity Shader Graph. Integration of RUST in the Unity engine is performed through use of DLLs.
- Familiarization with the Substance and Quixel texturing suites and pipeline workflows.

Textbooks/Technology used: Unity Game Engine, Blender, the Substance suite, the Quixel suite, C#, The RUST language, a Magic Leap One headset, assorted books, and online sources.
Provider: Self-Study

Course: Audio Engineering
Description:
A mathematical foray into the techniques of song design and production, through the FL Studio 20 engine. Topics include:

- DSP theory and convolution, acoustic principles, waveform properties
- An introduction to sound synthesis, with additive, subtractive, FM synthesizers, along with basic granular synthesis and sampling.
- Basic compositional theory, including chord progressions, harmonic techniques, melodic structure and flow, and arrangement.
- Mixing and mastering, as well as the use of effect plugins to adjust stereo image.

Generative, modular synthesis and VST design was also explored.
A slight emphasis was placed on cinematic and orchestral scoring.
Projects included song production, remixing, film scoring, and basic VST design.

Textbooks/Material used: FL Studio 20, various selected sample libraries, and the RUST programming language.
Provider: Self-Study