



# COURSE SCOPE & SEQUENCE

<b>Course Name:</b> sUAS Scholars Foundations Course (Prep I and Prep II) <b>AINautics Course Code:</b> 1012	<b>Course Credit:</b> 1 <b>Course Requirements:</b> This course is recommended for students in Grades 10-12. <b>Prerequisites:</b> Algebra 1
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**Course Description:** This course provides the fundamentals of aeronautical systems and technologies that leads students to become certified in Federal Aviation Administration (FAA Part 107) certification. After completion of this class, students will have a general knowledge and understanding of FAA Rules and regulations, sUAV (small Unmanned Aerial Vehicles), sUAS (small Unmanned Aircraft Systems) operations, safety procedures and policies, weather reporting, maintenance, and operating procedures.

***NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials.*

Unit Number, Title, and Brief Description	# of Class Periods* (assumes 90-minute periods) Total Number of Days	
<b>Total Number of Days</b>	(1 Semester) 90-days	*Schedule calculations based on 180 calendar days.
<b>Instructional Materials</b>		AINAUTICS Curriculum DIY Building Block Drone Kits with Curriculum Online Flight Simulation Remote Pilot Study Guides
<b>Methods of Student Evaluation</b>		Pre-Assessment Teacher Checklists/Observations Formative Assessments (CFU, Quizzes, Journal Reflections, etc.) Summative Assessments (Tests, Projects, PBL) Post-Assessment FAA Practice Tests

<b>Standards (Learning Outcomes)</b>		<ol style="list-style-type: none"> <li>1. Display knowledge of legal framework in which drones operate.</li> <li>2. Complete risk assessments and site surveys to industry standards.</li> <li>3. Demonstrate confidence in operating drone safely.</li> <li>4. Successfully implement a practical project using drone technology.</li> <li>5. Discuss potential future applications for drone applications.</li> </ol>
<b>Other Standards</b>		<p>Next Generation Science Standards  International Society for Technology Educational Standards  Common Core State Standards for English Language Arts</p>

<p><b>Unit 1: Pathway to Certification</b> This unit provides an in-depth knowledge of Federal Aviation Administration (FAA) Rules and Regulations, safety procedures, and how to obtain a Remote Pilot Certification.</p> <p><i>*Note: Each unit provides extensive vocabulary.</i></p>	<p><b>Suggested Number of Days</b></p> <p>5</p>	<p><b><u>Unit 1 Performance Objectives-Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe the challenges imposed when navigating terrestrially rather than in the airspace.</li> <li>2) Explain events leading up to and the purpose of regulating organizations.</li> <li>3) Describe the main differences between the FAA and the NTSB.</li> <li>4) Describe the challenges imposed due to the emergence of drones in the airspace.</li> <li>5) Describe the challenges encountered by early aviators.</li> <li>6) Discuss past incidents that involved unauthorized and unsafe use of sUAVs.</li> <li>7) Describe the FAA’s approach to regulating drones.</li> <li>8) Explain how “Section 333 Exemptions” came to exist.</li> <li>9) Define “recreational use” of drones and how it applies to students.</li> <li>10) Describe the process required to obtain an FAA Remote Pilot Certification including details about the Aeronautical Knowledge Test.</li> <li>11) Identify ways that drones can be used “commercially.”</li> </ol>
<p><b>Unit 2 - Drone Theory &amp; Aeronautical Basics</b> This unit provides an understanding of drone history, various types of drones, drone computer applications, aerial photography, and the Newton’s Laws of Motion.</p>	<p><b>Suggested Number of Days</b></p> <p>15</p>	<p><b><u>Unit 2 Performance Objectives-Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe terminology commonly used in referring to drone technology and aerodynamic principles.</li> <li>2) Explain why drones were greeted with resistance and disapproval when first introduced to the consumer and commercial markets.</li> <li>3) Explain the various configurations of multicopters including quadcopters, hexacopters, and octocopters.</li> <li>4) Describe the various hardware components common to all drones including airframes, electric motors, propellers, electronic speed controllers (ESCs), flight controllers, batteries, transmitters &amp; receivers, cameras, gimbals, or other payloads, ground control stations &amp; FPV.</li> </ol>

		<p>5) Explain how a gimbal is advantageous when flying your drone for aerial photography.</p> <p>6) Describe how a transmitter controls a drone using only 4 channels.</p> <p>7) Explain the risks of flying a drone using FPV and the importance of using a spotter.</p> <p>8) Describe Newton's Laws of Motion and how they apply to flight.</p> <p>9) Describe Bernoulli's principle and how it applies to the shape of an airfoil.</p> <p>10) Explain the four forces of flight that are in play during flight.</p> <p>11) Explain the three control surfaces that allow an airplane to deflect the airstream to accomplish its three-dimensional directional maneuvers.</p> <p>12) Describe the three axes of rotation and their application to flight maneuvers.</p> <p>13) Explain how a quadcopter maintains balanced flight while hovering.</p> <p>14) Explain how a quadcopter differs from an airplane to accomplish the maneuvers of pitch, roll, and yaw.</p>
<p><b>Unit 3 - Regulations &amp; Operating Rules</b>  This unit discusses FAA regulations and rules to operating a drone, Drug and Alcohol awareness, the importance of documentation, and authorization when near airports.</p>	<p><b>Suggested Number of Days</b></p> <p>10</p>	<p><b><u>Unit 3 Performance Objectives- Students will be able to:</u></b></p> <p>1) Determine that the applicant is knowledgeable in the general regulatory and operating requirements of 14 CFR part 107.</p> <p>2) Identify the official FAA publications used to delineate the rules as they apply to the operation of manned and unmanned aircraft.</p> <p>3) Define "Remote Pilot-in-Command" and describe her/his responsibilities.</p> <p>4) Define "Visual Observer" and describe her/his responsibilities.</p> <p>5) Define "Person Manipulation the Controls" and describe her/his responsibilities.</p> <p>6) List the documentation required to be carried by the Remote PIC.</p> <p>7) Describe how the Unique Identifier must be displayed on a sUAS.</p>

		<p>8) Explain the situational differences when flying under the Special Rule for Model Aircraft.</p> <p>9) Define the weight limitations of a sUAS as defined by the FAA.</p> <p>10) Describe the limitations of night operations imposed on a Remote PIC.</p> <p>11) Explain the conditions necessary to assure VLOS (Visual-Line-of-Sight).</p> <p>12) Describe the allowable conditions when operating a drone from a moving vehicle or water-borne vessel.</p> <p>13) Describe the prohibitions and penalties imposed when flying a sUAS while impaired.</p> <p>14) Describe why a Remote PIC might need to apply for a Waiver or Authorization.</p>
<p><b>Unit 4 - Airspace Classification</b> This units provides concepts of airspace classification, importance of airspace knowledge, aeronautical sectional charts and operating procedures.</p>	<p><b>Suggested Number of Days</b></p> <p>5</p>	<p><b><u>Unit 4 Performance Objectives-Students will be able to:</u></b></p> <p>1) Describe why it is necessary to have a thorough understanding airspace designation constraints.</p> <p>2) Explain how to determine the airspace designations for a particular operation.</p> <p>3) Explain the difference between controlled and uncontrolled airspace.</p> <p>4) Explain the importance of Sectional Charts.</p> <p>5) Identify the characteristics of Class A airspace.</p> <p>6) Identify the characteristics of Class B airspace.</p> <p>7) Identify the characteristics of Class C airspace.</p> <p>8) Identify the characteristics of Class D airspace.</p> <p>9) Identify the characteristics of Class E airspace.</p> <p>10) Identify the characteristics of Class G airspace.</p> <p>11) Identify the characteristics of Restricted airspace.</p> <p>12) Identify the characteristics of Military Operations Area (MOA) airspace.</p> <p>13) Identify the characteristics of an Alert area.</p> <p>14) Identify the characteristics of a Prohibited area.</p>

		<p>15) Identify the characteristics of Warning area.  16) Describe the difference between AGL and MSL.  17) Describe the differences when identifying Military Training Routes (MTRS).</p>
<p><b>Unit 5 - Aviation Weather Effects &amp; Source</b>  This unit discusses the influence of weather, understanding weather reports, and, the effects of flying drone in hazardous weather conditions.</p>	<p><b>Suggested Number of Days</b></p> <p>15</p>	<p><b><u>Unit 5 Performance Objectives-Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe the influence that weather has on flight.</li> <li>2) List different sources that a drone pilot can get access for accurate weather information.</li> <li>3) Explain Military Time.</li> <li>4) Explain ZULU Time.</li> <li>5) Correctly decode METARS.</li> <li>6) Correctly decode TAFS.</li> <li>7) List the various cloud descriptions as used in METARS.</li> <li>8) Explain why pilots need to adjust their altimeters during flight.</li> <li>9) Explain how dew point and temperature interact to affect the weather.</li> <li>10) Describe the 3 different types of Weather Briefings.</li> <li>11) Explain the differences of characteristics between stable air and unstable air.</li> <li>12) Define Surface Friction and how it could affect your flight.</li> <li>13) Describe the 4 types of fog and how each is formed.</li> <li>14) Identify the 4 families of clouds used in weather briefs.</li> <li>15) Explain how wind, temperature, and precipitation could affect your drone flight.</li> </ol>

<p><b>Unit 6 - UAS Loading &amp; Performance</b>  This unit provides in-depth knowledge of aeronautical stability, weight and balance, speed and altitude, and uncontrollable performance factors.</p>	<p><b>Suggested Number of Days</b></p> <p>10</p>	<p><b><u>Unit 6 Performance Objectives-Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Define load factor and describe how it can affect aircraft performance.</li> <li>2) Define payload and identify any payload restrictions imposed on sUAS.</li> <li>3) Explain ways you can determine the proper weight and balance distribution for your drone.</li> <li>4) Describe density altitude and how changes in density altitude can affect your drone’s performance.</li> <li>5) List factors that may require a reduction in weight prior to flight.</li> <li>6) List the effects in performance that may be affected by too much weight.</li> <li>7) Explain how Center-of-Gravity (CG) changes in maneuvers other than “straight and level flight.”</li> <li>8) Describe how stalls can occur.</li> <li>9) Explain the effects caused by a shift in the CG.</li> </ol>
<p><b>Unit 7 - Emergency Flight Operations</b>  This unit discusses how emergency flight operations works.</p>	<p><b>Suggested Number of Days</b></p> <p>5</p>	<p><b><u>Unit 7 Performance Objectives-Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe how a “lost link” happens and what needs to be done.</li> <li>2) Describe how some manufacturers address the requirement for pre-set “lost link” procedures.</li> <li>3) Describe ways that a Remote PIC can incorporate contingency planning in case of an emergency.</li> <li>4) Explain why a “fly-away” is an EMERGENCY situation.</li> <li>5) Describe the steps necessary when a “fly-away” occurs in a Authorization setting.</li> <li>6) Explain why you need to be prepared for in-flight fires.</li> <li>7) Describe the FAA regulations regarding sUAS accident reporting.</li> <li>8) Explain how the FAA defines personal injury and property damage.</li> <li>9) Describe when and how you make a report to the FAA.</li> </ol>

<p><b>Unit 8 - Crew Source Management</b> This unit discuss the aeronautical decision making and judgement, revisits drug and alcohol awareness, the physiological and medical effects of pilot performance.</p>	<p><b>Suggested Number of Days</b></p> <p>3</p>	<p><b><u>Unit 8 Performance Objectives -Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe the responsibilities of a Remote PIC.</li> <li>2) Discuss the concept of Aeronautical Decision-Making (ADM).</li> <li>3) Discuss the concept of Crew Resource Management (CRM).</li> <li>4) List and describe the FIVE Hazardous Attitudes identified by the FAA as potential problems when flying.</li> <li>5) List and describe the SIX Important Medical Factors identified by the FAA as potential problems when flying.</li> <li>6) Describe the FAA regulations regarding medication and drug use.</li> <li>7) Describe the penalties and consequences regarding alcohol use.</li> <li>8) Discuss the important of having a contingency backup plan.</li> </ol>
<p><b>Unit 9 -Radio Communications</b> The unit provides the proper radio procedures and sectional chart frequencies.</p>	<p><b>Suggested Number of Days</b></p> <p>5</p>	<p><b><u>Unit 9 Performance Objectives- Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Describe the importance of radio communications in assuring the safe operation of aircraft in the NAS.</li> <li>2) Explain why it's important for a Remote PIC to understand aviation language and conversation norms.</li> <li>3) Describe the proper verbal format when communicating with ATC using a radio.</li> <li>4) Explain the meaning of the acronyms AWOS, ASOS, ATIS, and CTAF.</li> <li>5) Describe the information found on a US Chart Supplement/AFD.</li> <li>6) Demonstrate how to identify control tower and weather frequencies on a sectional chart.</li> </ol>

<p><b>Unit 10 - Airport Operations</b>  This unit builds upon learning previous knowledge in reading sectional charts, sectional chart symbols, air traffic patterns, and sUAS flight frequencies.</p>	<p><b>Suggested Number of Days</b></p> <p><b>10</b></p>	<p><b><u>Unit 10 Performance Objectives- Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Explain why it's important to know the FAA's conventions, rules, and regulations.</li> <li>2) Describe what a NOTAM is.</li> <li>3) Describe what a TAF is.</li> <li>4) List ways to acquire NOTAMS and TAFS.</li> <li>5) Identify a variety of VFR Sectional Chart symbols.</li> <li>6) Explain the difference between AGL and MSL.</li> <li>7) Describe the various elevations designated with Class E airspace and how to know which one you are in.</li> <li>8) Explain how runways are numbered.</li> <li>9) Describe the Standard Traffic Pattern at airports and why you should know it.</li> <li>10) List the various legs of a traffic pattern and how they apply to landing a manned aircraft.</li> <li>11) List the frequencies approved by the FCC for flying drones.</li> <li>12) List important aspects of the NTIA's "best practices" guide to privacy.</li> <li>13) Explain Isogonic lines and how they apply to magnetic declination.</li> <li>14) Define Victor Airways.</li> <li>15) Explain how Military Training Routes differ in altitude and how to determine them.</li> <li>16) Describe longitude and latitude and how these coordinates are used for location designation.</li> <li>17) Describe the difference between Nautical Miles and Statute Miles.</li> </ol>
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<p><b>Unit 11 - Maintenance &amp; Operating Procedures</b>  The unit provides the basic concepts of maintenance and operating procedures, and the importance of accurate recordkeeping.</p>	<p><b>Suggested Number of Days</b></p> <p>5</p>	<p><b><u>Unit 11 Performance Objectives- Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Explain the difference between a preflight checklist and a mission checklist</li> <li>2) Explain the difference between scheduled and unscheduled maintenance procedures.</li> <li>3) Describe the steps a Remote PIC should take when performing an unscheduled maintenance procedure.</li> <li>4) Explain how accurate and consistent recordkeeping can be beneficial.</li> <li>5) List data that should be included in a Pre-Flight Report.</li> </ol>
<p><b>Unit 12 - Exam Preparation &amp; Career Planning</b>  This unit provides an overall review of Federal Aviation Administration (FAA Part 107) Certification, and various aeronautical careers and salaries.</p>	<p><b>Suggested Number of Days</b></p> <p>2</p>	<p><b><u>Unit 12 Performance Objectives- Students will be able to:</u></b></p> <ol style="list-style-type: none"> <li>1) Students will investigate career and educational opportunities within Aeronautics Industry.</li> <li>2) Students will be able to score 80% or higher on the FAA practice assessment.</li> </ol>