# **Course Alignment for AVT 1101 FlexPace (2 cr hrs)**

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| **CO 1** | Identify early unmanned aerial vehicles, payloads, and missions. |
| **CO 2** | Identify primary systems and vehicles utilized in the unmanned aerial systems industry and their classification and function. |
| **CO 3** | Differentiate between reconnaissance and surveillance payloads, radar, electronic warfare, nuclear radiation and meteorological sensors. |

**Note:** Course Objectives are institutionally mandated and taken from the [Master Syllabus](https://cmt.sinclair.edu/#reports.mastersyllabus).

# **Course Structure and Alignment**

**Note:** Topic Objectives are developed by the course coordinator to align with the Course Objectives.

| **Unit / Topic Name** | **Topic/Module Objectives** | **CO #** | **Materials** | **Activities** | **Assessments** |
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| **Unit 1 | UAS History** | TO 1 Identify early uncrewed aerial vehicles, payloads, and missions. | 1 | * Chapter 1 –History * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 2 Identify the growth and diversity of applications of UAS since 1970. | 1 | * Chapter 1 –History * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 3 Analyze several major technological advances in aircraft systems over the last 50 years that have greatly increased the utility of UAS. | 1 | * Chapter 1 –History * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 4 Describe the primary advantages and disadvantages of removing the pilot from the aircraft | 1 | * Chapter 1 –History * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) * Final Paper * Final Presentation |
| **Unit 1 | UAS Applications and Systems** | TO 1 Identify major types of UAS applications. | 2 | * Chapters 2 & 3 - UAS Applications and Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 2 Analyze the impact of payload on the design of a UAS. | 3 | * Chapters 2 & 3 - UAS Applications and Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 3 Analyze the major components or elements of a UAS and their role within the system. | 2 | * Chapters 2 & 3 - UAS Applications and Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 4 Identify the major types of sensor payloads used in surveillance and aerial sensing missions. | 3 | * Chapters 2 & 3 - UAS Applications and Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 5 Differentiate between methods of aircraft control and levels of automation. | 2 | * Chapters 2 & 3 - UAS Applications and Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| **Unit 1 | UAS Sensing: Theory and Practice** | TO 1 Identify the general categories of data collection and sensing. | 3 | * Chapter 4 - UAS Sensing: Theory and Practice * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 2 Analyze how sensor requirements influence the type of UAV platform to be used. | 3 | * Chapter 4 - UAS Sensing: Theory and Practice * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 3 Describe sensor types and their appropriate applications. | 3 | * Chapter 4 - UAS Sensing: Theory and Practice * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) * Final Paper * Final Presentation |
| TO 4 Define how each of the major sensor type work. | 3 | * Chapter 4 - UAS Sensing: Theory and Practice * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| TO 5 Analyze the applicability, data types, and limitations of aerial sensors used in agriculture | 3 | * Chapter 4 - UAS Sensing: Theory and Practice * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 1 Pre-Assessment * Topic Quizzes (if needed) * Unit 1 Post-Assessment (if needed) |
| **Unit 2 | UAS Design, Airframe Design** | TO 1 Identify steps of the system design process. | 2 | * Chapters 9 , 10  - UAS Design and Airframe Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 2 List the major components of the uncrewed system and describe what each does. | 2 | * Chapters 9 , 10  - UAS Design and Airframe Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 3 Differentiate between design features of UAS and crewed aircraft. | 2 | * Chapters 9 , 10  - UAS Design and Airframe Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 4 Identify basic aerodynamic principles applicable to UAS. | 2 | * Chapters 9 , 10  - UAS Design and Airframe Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| **Unit 2 | UAS Propulsion System Design** | TO 1 Identify propulsion systems available to UAS designers. | 2 | * Chapters 11 - Propulsion System Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 2 Describe appropriate applications for each type of propulsion system. | 2 | * Chapters 11 - Propulsion System Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) * Final Paper * Final Presentation |
| TO 3 Identify propeller types and basic design considerations as applicable to UAS. | 2 | * Chapters 11 - Propulsion System Design * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| **Unit 2 | UAS Electrical and Communication Systems** | TO 1 Identify the basic electrical circuit principles and components applicable to UAS. | 2 | * Chapters 12 & 13 -UAS Electrical and Communication Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 2 Explain basic electric motor operation principles as applicable to UAS. | 2 | * Chapters 12 & 13 -UAS Electrical and Communication Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 3 Identify the basic components of a communications system. | 2 | * Chapters 12 & 13 -UAS Electrical and Communication Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 4 Identify basic antenna principles applicable to UAS | 2 | * Chapters 12 & 13 -UAS Electrical and Communication Systems * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| **Unit 2 | Command and Control** | TO 1 Explain the basic principles of data links. | 2 | * Chapter 14 - Command and Control * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 2 Identify command and control systems applicable to UAS. | 2 | * Chapter 14 - Command and Control * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) |
| TO 3 Describe human interfaces and control systems applicable to UAS. | 2 |  | * Read paper and presentations requirements * Final Paper Abstract (approved by instructor) | * Unit 2 Pre-Assessment * Topic Quizzes (if needed) * Unit 2 Post-Assessment (if needed) * Final Paper Abstract (approved by instructor) * Final Paper * Final Presentation |
| **Unit 3 | UAS Payload / Subsystem Integration** | TO 1 List the steps in the system design process. | 2 | * Chapter 15 - UAS Subsystem Integration * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 2 Identify the main activities in each step of system design. | 2 | * Chapter 15 - UAS Subsystem Integration * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 3 Identify elements of the system testing process as it applies to UAS | 2 | * Chapter 15 - UAS Subsystem Integration * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| **Unit 3 | Detect and Avoid** | TO 1 Define the roles, responsibilities, and standards for avoiding collisions | 2 | * Chapter 16 - Detect and Avoid * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 2 Identify the Functions and Processes used in a Detect and Avoid System | 2 | * Chapter 16 - Detect and Avoid * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 3 Identify Detect and Avoid systems components and applications | 2 | * Chapter 16 - Detect and Avoid * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| **Unit 3 | Counter UAS** | TO 1 Identify the security risks brought about by UAS. | 2 | * Chapter 18 C-UAS and Artificial Intelligence * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 2 Explain the vulnerabilities of Air Defense Systems to UAS. | 2 | * Chapter 18 C-UAS and Artificial Intelligence * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 3 Identify counter-UAS technologies and approaches. | 2 | * Chapter 18 C-UAS and Artificial Intelligence * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| **Unit 3| The Future of UAS** | TO 1 Identify market segments and career opportunities in the UAS industry or industries that employ UAS | 2 | * Chapter 20 – The Future of UAS * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 2 Explain how the FAA is responding to increased demand for UAS. | 2 | * Chapter 20 – The Future of UAS * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 3 Analyze key technology trends that will support advancements in UAS. | 2 | * Chapter 20 – The Future of UAS * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) |
| TO 4 Describe anticipated future applications for UAS. | 2 | * Chapter 20 – The Future of UAS * Learning Activities | * Read assigned textbook chapter * Review topic resources * Prepare for and complete assessments and quizzes | * Unit 3 Pre-Assessment * Topic Quizzes (if needed) * Unit 3 Post-Assessment (if needed) * Final Paper * Final Presentation |
| **Unit 4 | Final Paper and Exam** |  | 1, 2, 3 | * + Previously assigned textbook chapters and course material | * + Read paper and presentations requirements   + Review all course material | * + Final Paper   + Final Presentation (video submission)   + Final Exam |