6 Week LUV Curriculum

About the LUV program

SPIRIT's LUV course is designed to allow instructors and students to work intensively together for a shorter period than a typical semester in order to enhance focus and facilitate learning through real-world application. The students prepare for entering the Licensed Unmanned Vehicle Pilot Certificate, a U.S. Department of Labor 24 month apprenticeship in drones, cobots and robots, enabling a student to operate a Drone, Cobot, or Robot autonomously, using software and real life experience.

The LUV course involves collaborative projects, field work, case studies, problem solving, and/or inquiry-based learning, the goal of immersive courses is to go deep into the disciplinary realm of practice and allow the student to work and learn closely together in their community. In that, Spirit distills the seven programs within the Licensed Unmanned Vehicle Pilot Certificate strategies into an immersive course.

Learning Goals

Over six-weeks students develop skills and apply their content knowledge to authentic, relevant problems and the big questions in the discipline.

Community

While in the LUV program you are building teamwork skills as part of your goal. Over the period of 6 weeks, you will complete surveys, watch online videos, have a few ice-breakers to get to know one another, Q&A sessions, discussion forums and will learn about the community you will be working in. Throughout your 6 weeks, you will provide feedback, as well as have a weekly one on one session to receive feedback on your progress. We want you to be successful, as well as be a part of the community.

Content

We believe in education, but only to the extent necessary for students to achieve their learning goals. Extra content is optional, including readings, videos, and other resources your Dean may suggest for you individually, or as a class.

Assignments to Help Students Stay on Task

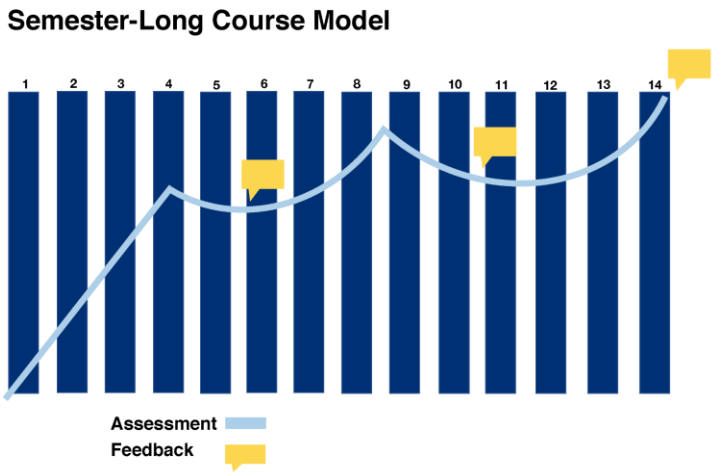
Expectations and assignments are discussed and clarified in the first week of class to give students enough time to finish them in six weeks. The work on end-of-course projects, including your final project is broken into smaller projects each week to assist your progress toward your ultimate goal of employment. At SPIRIT, we believe in students asking questions about how to improve their own learning. We believe in self-assessment and grading using rubrics and working with peer partners to get support and feedback.

Opportunities for Feedback and Formative Assessment

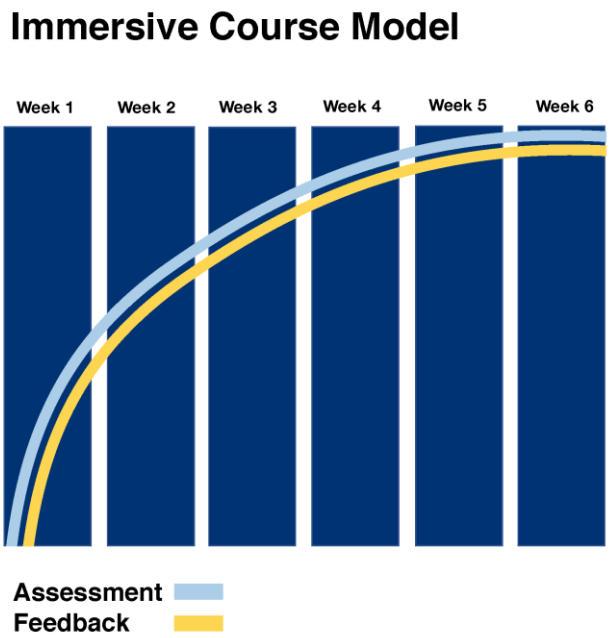
At SPIRIT, feedback opportunities begin in week two and consist of reflection, readings, etc. We want to know right away what you will need to do to succeed. SPIRIT utilizes rubrics and peer feedback to keep you from being overwhelmed.

Normal Semester Long Course

In a typical fourteen-week semester, assignments and assessments will often ramp up around week three or four, with feedback starting to come in a week or two later. The next major assessment might be assigned around week eight or nine, with feedback coming in before students turn in their final assignment or take their final exam. While early and often feedback is always ideal for maximizing student learning, this model still gives students time to learn from the feedback and apply it to their next assignment or exam.



In a six-week immersive course, feedback tracks assessment and begins immediately. The major assessments and assignments of the course are introduced in week one, and students will need feedback immediately to ensure they can apply it in their final drafts or in their next assignments.



SPIRIT 6 WEEK PROGRAM

Some of these recommendations may seem familiar to you, however,when you are learning in an immersive course—especially an immersive course in an online or hybrid format—the need for intentional planning and thoughtful implementation is greatly amplified.

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Student plans

SPIRIT's LUV six-week program allows each student to understand what they will do before-class, during-class, and after-class. During the 6 weeks, we advise students to plan their curriculum activities with the instructor accordingly. SPIRIT likes to help the student to envision each of the six weeks as a different module and align that module with each student's desired occupation in the Licensed Unmanned Vehicle Pilot 24 month apprenticeship.

Each Student receives module identifiers on a weekly basis:

Beginning and end dates
Unit name or topic
Module introduction: How does the topic fit in with what we have been doing so far?
How does it connect to the course learning outcomes?
Learning outcomes
Activities and assignments

- *activities and assignments in the order that should be completed.*
- *links to resources needed and clearly defined due dates.*
- *Multimedia resources*
- *required readings.*
- *reference information and links for required or additional readings and multimedia resources.*
- *Reminders of upcoming or ongoing assignments*
- *Reminders of long-term assignments.*
- *How to prepare for the next week.*

Online requirements for distant learners/live classroom.

- Access to a large computer monitor, preferably two screens
- Fast internet connection
- Access to webcam and mouse
- Participation should take place in quiet surroundings.
- When it comes to Cobotics we believe that proper training is essential when it comes to getting your collaborative robots to perform to their full potential.

In-Class Activities:

SPIRIT's program combines immersive weeks as well as a variety of in-class activities to promote active learning. This includes guest speakers, polls, break-out sessions, collaborative work, chats, debates, discussions, case-based learning, textual analysis, peer review and peer feedback, presentations, simulations, and role-playing scenarios.

GUEST SPEAKERS in the LUV Program

In addition to the curriculum, guest speakers are included.
Below are a few examples of guest speakers, as available.
National Science Foundation
Central Intelligence Agency (museum)
National Park Service
National Laboratories
Federal Aviation Administration
Boston Dynamics
U.S. Department of Labor
Pacific Northwest National Laboratory
Social Media Influencers
And more to be announced…

Instructors and experts in the LUV 6 Week are located worldwide, including but not limited to Dubai, Germany, New Zealand, Los Angeles, Dallas, Texas as well as farm locations.

Week 1:
Media 3D *Mapping Software*

3D Mapping using Disguise.

Monday, Tuesday

Disguise Designer Essentials Workshop

Live from Disguise HQ in the United Kingdom

London HQ On-Site, or Live online

This is 2-day live course is the essential first step in your journey into learning the disguise designer software and mapping.

The course is broken down into 14 sections, all covering different aspects of getting started with the software. Topics include:

- Installing the software and using the d3manager
- Navigating the GUI and menus
- Setting Project Refresh rate and other project settings
- Add screens, props, and other objects to the virtual environment.
- Timeline sequencing, layers, and creating compositions.
- Content management and versioning
- Render Modes
- Animating objects within the virtual environment
- d3Net and networking
- Configuring your virtual screens to output to screens in the real world using the Feed Manager
- Basic Audio configuration

This course will cover:

- Compositing effects in real-time,
- Introduction to Notch and disguise workflows,
- Multi-transports,
- Mapping techniques,
- Sequencing media to the beat,
- Generating HTML content and more...

Wednesday, Thursday

Disguise Systems Integration

This course is intended to introduce you to many of the advanced sequencing techniques in disguise. Learn how to build your complete show in perfect detail, to the beat or to the frame**.**

This course will cover:

- Compositing effects in real-time,
- Introduction to Notch and disguise workflows,
- Multi-transports,
- Mapping techniques,
- Sequencing media to the beat,
- Generating HTML content and more...

Friday: Create your first 3d mapped project.

Week 2:
Cobots *Autonomous Software*

Universal Robots/*Remote Software*

Monday, Tuesday

Core Training

In this two-day immersive live course, you will have experience with a UR robot. You will have programmed the robot several times to perform common tasks, including the operation of common peripherals (conveyors, sensors, grippers). You will be able to optimize a pick and place flow, perform palletization, understand safety concepts, and know the additional resources available to them both online and through other training courses. You will be ready to return to your own robot and create pick and place, palletization, and other common application programs on your own.

LEARN TO

- Manage the robot safely understanding safety concepts.
- Build and optimize programs for several typical applications such as pick & place, palletizing, polishing or dispensing.
- Connect and handle peripheral equipment, such as sensors, grippers or conveyor belts.
- Know the online tools and resources available to help with application programming.

application programs on your own.

NOTE: This training is live in the classroom and uses a simulated robot in a virtual environment for online learning students.

The training takes place in our real-time simulated training environment, where you will program a virtual robot to perform common tasks. All participants that are located remotely get online access to their own virtual environments with a robot and peripherals such as sensors, conveyors, and various end-effectors. Make sure to log in prior to the first half of day 1 to ensure your simulator works properly. Work with your Dean if there is an issue with timing.

You will be able to optimize your program, manage program flow and repetition, perform palletization, and understand safety concepts. The course will also introduce additional resources available online. Participants are encouraged to make use of available peripherals, such as sensors, conveyors, and operate these devices throughout the practical exercises of this course.

Wednesday, Thursday

UR Advanced Training

When you complete the UR Certified Advanced course, you will be able to fully understand and utilize all commands in the Universal Robots “User Interface”. You will also be able to better optimize your application and reduce the number of waypoints used by utilizing variable

waypoints and user defined features. The latter feature can assist you to align the movement of the robot to the installation or environment. Conveyor tracking and advanced force control will also be explored on this training course. This course enables every developer to deploy applications that account for more environmental variables.

THIS CLASS INCLUDES:

- Create and structure your programs in a professional manner.
- In-depth knowledge of functions in UR User Interface
- UR Script programming language
- Work with variable positions and multiple TCPs
- Referencing and shift positions on different coordinate systems for e.g., artificial vision applications
- Track and coordinate the movement of the robot with conveyor belts.
- Use the integrated force/torque sensor for developing complex applications using the force feedback.

Friday, Simulation and remote use of the Arm

Week 3:
Robots: SCOUT & Choreographer
Boston Dynamics

SCOUT, Choreographer

Monday
Safety
Overview of capabilities and attachments
Introduction to Scout

Tuesday, Wednesday
SCOUT Software Core Training

The Boston Dynamics' Scout platform creates a total fleet management solution for your Spot robots. Modify inspection missions, review historical data to identify trends, and watch robots work live from a single control center.

Digital Twin
Centralize all of the data Spot captures, view alerts, and analyze historical trends.
Autonomous Coverage
Modify, manage, and run scheduled missions to gather inspection data.
Follow along with Spot's autonomous missions or teleoperate Spot at remote or unmanned facilities.

CORE TRAINING

- Manage the robot safely understanding safety concepts.
- Understand SCOUT software and SPOT services.
- Build and optimize programs for several typical applications such as pick & place, palletizing, polishing or dispensing.
- Connect and handle peripheral equipment, such as sensors, grippers or conveyor belts.
- Know the online tools and resources available to help with application programming.

Thursday: Introduction to Choreographer Software
Friday: Group Projects with SCOUT & Choreographer

Week 4:

Software/Drones in Industries

Pix4, Magic Vegas, Adobe Premiere, Adobe Photoshop, Agisoft, Image Composite Editor, ***Pix4D Mapper, Pix4DMatic, Pix4dcatch, Pix4dCapture, Pix4DSurvey***, LP360 LiDAR, Leica Evidence Recorder, Luminar Batch GeoProcessing.

OVERVIEW: Introduction to Drone (UA) Use Cases

This five (5) day session will be guided by a live instructor over the course of one week and will focus on how drones (also known as Uncrewed Aircraft or UA for short) are being used in a variety of verticals and software used in various industries.

The curriculum includes:

• Overview of FAA Regulations and Requirements
• Public Safety Implementations (mapping/overwatch)
• Cinematography / Photography
• Construction
• Inspection/ Infrastructure Assessment
• UA Program Management
• UA Safety & Risk Management
• Night UA flight
• Aerial Security
• Equipment Considerations
• Post-Production (Photo/Video)
• Post-Production (Mapping / Forensic Capture)

Attendees can expect a full five (5) hours of instruction per day with scheduled breaks.

Our goal is to provide a best-practice views of how UA are being used in a variety of industries in the field for attendees unsure of how to put their 107 certifications to work, either in the field or in the office processing data.

UAV/SUAS TRAINING OVERVIEW 2023

Monday (6 hours)

INTRODUCTION TO DRONES (UA)

Subject Description Training Time
Introduction of Instructor to Class & Attendees to Instructor 15 minutes
What is a drone/UA/sUAS/UAV and how are they regulated? 30 minutes
Overview of FAA Regulations and Requirements (Airspace) 60 minutes
Safety & Risk Mitigation for All UA Operations 90 minutes
UA Equipment Considerations 75 minutes
Introduction to UA Photography / Cinematography 30 minutes
Final Q&A 15 minutes
Total Session 6 hours

Includes

• Certificate of Completion for UA Safety & Risk Mitigation

Tuesday (6 hours)

DRONES (UA) AT WORK (PUBLIC SAFETY & AERIAL SECURITY)

Subject Description Training Time
Introduction of Instructor to Class & Attendees to Instructor 15 minutes

UA at work in Public Safety Workflows (successful implementations) 90 minutes

UA at work in Public Safety Continued (Real Time Video, Thermal Imaging) 60 minutes.
Aerial Camera Settings for UA Mapping 30 minutes

Introduction to Forensic Capture with UA 45 minutes
Introduction to Aerial Security (Use Cases) 30 minutes

Aerial Security - Workflow & Equipment Considerations 30 minutes
Final Q&A 15 minutes
Total Session 6 hours
Includes
• Certificate of Completion for UA Public Safety & Aerial Security
Page 3
Wednesday (6 hours)
DRONES (UA) AT WORK (INSPECTIONS AND INFRASTRUCTURE)
Subject Description Training Time
Introduction of Instructor to Class & Attendees to Instructor 15 minutes
UA at work in Inspection Workflows (successful implementations) 90 minutes
Inspection Workflows Continued (Data Capture, Thermal Imaging,
Software)
90 minutes
Vertical Inspection Specific Workflow Challenges 45 minutes
Horizontal Inspection Specific Workflow Challenges 45 minutes
Inspection - Equipment Considerations & Final Q&A 30 minutes
Total Session 6 hours
Includes
• Certificate of Completion for Introduction to UA Inspections and
Infrastructure Workflows
Thursday (6 hours)
DRONES (UA) AT WORK (CONSTRUCTION/SURVEY/ENGINEERING)
Subject Description Training Time
Introduction of Instructor to Class & Attendees to Instructor 15 minutes
UA at work on the Construction Site (successful implementations) 60 minutes
Introduction to LiDAR & Photogrammetry 30 minutes
Autonomous UA Flight (Mission Planning) 45 minutes
Introduction to Mapping and 3D Modeling with UA Data (Software) 45 minutes.

Introduction to Modeling Software (process data live) 90 minutes

Best Practices for Data Processing & Final Q&A 30 minutes
Total Session 6 hours
Includes
• Certificate of Completion for Introduction to UA Construction Workflows
Friday (6 hours)
DRONES (UA) FIELD OPERATIONS & POST-PROCESSING

Subject Description Training Time
Introduction of Instructor to Class & Attendees to Instructor 15 minutes
Safety Checklists & Visual Observers (pre-fight, post-flight, VO) 15 minutes
Introduction to LAANC and Requesting Authorizations 15 minutes.
Introduction to UA Flight at Night 45 minutes
Urban Turbulence (Identifying microclimates and how they affect data collection)
30 minutes
Best Practices for UA Cinematography (Creating a flight plan to capture, best shots)
45 minutes
Mapping & 3D Modeling Review of Data Capture Best-Practices 15 minutes
Post-Production Best Practices – Photo/Video (LUT/LOG) 45 minutes
Post-Production Mapping / Modeling Comparison Reporting 45 minutes.
UA Flight Training Techniques to Practice 30 minutes.
Final Q&A 15 minutes
Total Session 6 hours
Includes
• Certificate of Completion for UA Field Operations & Certificate of Completion for Introduction to Post-Processing Software

Week 5:

Agriculture Software/Sentara

Monday/Tuesday

Implementation of Essential Knowledge and Skills for Agriculture, Food, and Natural

The student develops technical knowledge and skills related to soil systems. The student is. expected to:
(A) identify the components and properties of soils.
(B) identify and describe the process of soil formation; and
(C) conduct experiments related to soil chemistry.
(11) The student develops technical knowledge and skills related to plant systems. The student is. expected to:
(A) describe the structure and functions of plant parts.
(B) discuss and apply plant germination, growth, and development.
(C) describe plant reproduction, genetics, and breeding.
(D) identify plants of importance to agriculture, food, and natural resources; and
(E) use tools, equipment, and personal protective equipment common to plant systems.
(12) The student develops technical knowledge and skills related to animal systems. The student is expected to:
(A) describe animal growth and development.
(B) identify animal anatomy and physiology.
(C) identify and evaluate breeds and classes of livestock; and
Agriculture, Food, and Natural Resources
(D) explain animal selection, reproduction, breeding, and genetics.
(13) The student describes the principles of food products and processing systems. The student is expected to:
(A) evaluate food products and processing systems.
(B) determine trends in world food production.
(C) discuss current issues in food production; and
(D) use tools, equipment, and personal protective equipment common to food products and processing systems.
(14) The student safely performs basic power, structural, and technical system skills in agricultural
applications. The student is expected to:
(A) identify major areas of power, structural, and technical systems.
(B) use safe and appropriate laboratory procedures and policies.
(C) create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures.
(D) identify building materials and fasteners; and

(E) use tools, equipment, and personal protective equipment common to power, structural, and technical systems
(15) The student explains the relationship between agriculture, food, and natural resources and the
environment. The student is expected to:
(A) determine the effects of agriculture, food, and natural resources upon safety, health, and the environment.
(B) identify regulations relating to safety, health, and environmental systems in agriculture, food, and natural resources.
(C) identify and design methods to maintain and improve safety, health, and environmental systems in agriculture, food, and natural resources.
(D) research and analyze alternative energy sources that stem from or impact agriculture, food, and natural resources; and
(E) evaluate energy and water conservation methods.
Procedures and regulations for sanitation and safety in the food industry.
The student is expected to:
(A) identify food industry inspection standards, including hazard analysis and critical control points.
(B) describe procedures for insect and rodent control.
(C) identify appropriate chemicals used in the food industry.
(D) assess conditions with regard to safety and health; and
(E) identify specific regulations for organic animal products, grains, and produce.
(6) The student identifies safety and governmental regulations involved in the processing and labeling
of foods. The student is expected to:
(A) research regulations dealing with preserving red meat, poultry, and fish.
(B) describe packaging, labeling, and storage requirements for red meat, poultry, and fish.
(C) explain the impact of temperature in food preservation.
(D) compare and contrast packaging requirements; and
(E) evaluate cultural practices and exotic species in food harvesting and processing.
(7) The student demonstrates an understanding of the trends and issues important to career in the food science industry by comparing and contrasting issues affecting the food science industry, including biotechnology, employment, safety, environmental, and animal welfare issues. The student is expected to:
(A) select solutions for different environmental issues.
(B) identify issues affecting food science.
(C) research history and policies related to food science issues.
(D) analyze and defend solutions for different environmental issues; and
(E) apply economic principles such as supply, demand, and profit to food science systems.
(8) The student describes the processing, packaging, quality analysis, and marketing of red meats and
their by-products. The student is expected to:
(A) describe preparing livestock carcasses for market.
(B) describe the U.S. Department of Agriculture's inspection and grading procedures.
(C) identify wholesale and retail cuts.
(D) evaluate and grade beef, pork, lamb, and goat carcasses and wholesale cuts; and

(E) identify methods of fabricating and marketing processed meats.
(7) The student selects, operates, and maintains tractors and agricultural power systems. The student
is expected to:
(A) select tractors based upon application and power requirements and describe or perform safe operation of tractors in various applications.
(B) maintain intake and exhaust system components, including shrouds, screens, filters, piping, after-coolers, air induction systems, manifolds, exhaust scrubbers, and mufflers.
(C) select lubricants and apply appropriate lubrication as required by maintenance schedules.
(D) identify and maintain various fuel systems, power trains, and hydraulic systems used on farm tractors.
Agriculture, Food, and Natural Resources
(E) explain charging, starting, operating, and igniting direct current electrical systems.
(F) maintain steering and braking systems.
(G) maintain tires and tracks and describe the role of ballasting and traction in farm tractors. and
(H) explain the operation of and maintenance of liquid- and air-cooling systems in tractors.
(8) The student monitors and controls electrical systems as related to agricultural machines and equipment. The student is expected to:
(A) collect data and troubleshoot electrical systems using various meters and test equipment such as digital multimeters.
(B) employ appropriate techniques for applying devices, controls, and grounding in electrical systems.
(C) apply local and national codes and regulations relevant in electrical systems.
(D) select and apply electric controls such as motor controls, switches, circuit breakers, timers, sensors, and relays; and
(E) interpret data generated by electrical monitoring systems.
(9) The student implements control systems related to agricultural machines and equipment. The student is expected to:
(A) analyze schematic drawings for electrical control systems.
(B) describe uses of various electrical control system components.
(C) install control system components such as motor controls, switches, circuit breakers, timers, sensors, and relays and properly use appropriate tools, procedures, and safety. practices; and
(D) identify system performance problems and apply troubleshooting techniques using monitoring or troubleshooting devices.
Wednesday, Thursday
SENTERA Software Programs/Agricultural Overview
Software Overview
Sentera Overview
Agricultural Overview
Growth Basics
Integrating technology into crops and gardens
Senterra Software
Drones and Robots in Law Safety & Protection
Friday: Live from Farm

Week 6

Building Science: Pacific Northwest National Laboratory's Asset Score Software

Monday, Tuesday

Building Science Overview
Building System
Wednesday, Thursday
Asset Score, Pacific Northwest Laboratory/U.S. Department of Energy

PNNL continues to enhance a national energy efficiency rating tool for commercial and multi-family residential buildings. The Building Energy Asset Score, known simply as "Asset Score," provides information for buildings similar to what's found in energy guides for appliances and on vehicle fuel-economy stickers.

Developed at PNNL, the Asset Score combines novel modeling and whole-building energy simulation capabilities to successfully evaluate a building and its systems. As of early 2020, the software tool has been applied to more than 9,300 buildings representing nearly 1.3 billion square feet of commercial space. Asset Score was designed to be readily accessible to building owners, operators, and occupants. It is easy to use, free, relevant for existing and new structures, and requires only basic building information to obtain a rating.

Asset scorecard

The scorecard is similar to an appliance energy guide or vehicle economy sticker, providing a rating and related information for the building owner or manager.

A score and more

For each building, Asset Score assigns a rating from 1 to 10, with 10 reflecting the best possible energy efficiency. The tool provides a tailored set of suggested efficiency improvement measures for the building. The measures are designed for cost-effective implementation. Users can also choose a high-performance building package to view the potential benefits from a deeper application of improvement measures.

The tool takes into account that buildings contain specialized design features, mechanical and electrical systems, and functionalities. The tool also considers building locations, including climate and environmental variations. These differences are factored into the rating.

One of the features in the Asset Score's tool suite, the Audit Template, collects, standardizes, and reports a building's energy audit data. The tool formats the data and verifies its quality so that it can be readily digested and utilized by users, such as municipalities and energy service providers, to foster efficiency objectives. Multiple cities in the U.S. have adopted energy audit ordinances and employ the Asset Score and Audit Template to support their missions.

PNNL, in partnership with the U.S. Department of Energy's Building Technologies Office, continues to work with a wide range of stakeholders to enhance the technology's power, reliability, usability, and transparency.

Friday:
Test case, data collection

NOTES: