BOARD FOR ARCHITECTS, PROFESSIONAL ENGINEERS, LAND SURVEYORS, CERTIFIED INTERIOR DESIGNERS AND LANDSCAPE ARCHITECTS (APELSCIDLA)

LAND SURVEYORS APPRENTICESHIP AD HOC COMMITTEE MEETING

Wednesday, August 13, 2025 –10:00 a.m.
Training Room 2

Department of Professional and Occupational Regulation
9960 Mayland Drive
Richmond, Virginia 23233

Mission: Our mission is to protect the health, safety and welfare of the public by licensing qualified individuals and businesses enforcing standards of professional conduct for professions and occupations as designated by statute.

I. CALL TO ORDER

a. Emergency Evacuation Procedures

II. APPROVAL OF AGENDA

III. PUBLIC COMMENT PERIOD *FIVE MINUTE PUBLIC COMMENT, PER PERSON*

IV. LAND SURVEYOR APPRENTICESHIP PROGRAM REVIEW

a. **Proposed Draft**

b. **Curriculum Feedback**

V. OTHER BUSINESS

VI. COMPLETE CONFLICT OF INTEREST FORM AND TRAVEL VOUCHER

VII. ADJOURNMENT

- Agenda materials made available to the public do not include disciplinary case files or application files pursuant to §54.1-108 of the Code of Virginia.
- Five-minute public comment, per person, with the exception of any open disciplinary or application file.
- Persons desiring to participate in the meeting and requiring special accommodations or interpretative services should contact the Department at (804) 367-2785 at least ten days prior to the meeting so that suitable arrangements can be made for an appropriate accommodation. The Department fully complies with the Americans with Disabilities Act.

THE PATH

A LAND SURVEYOR'S APPRENTICESHIP

Apprenticeship Related Technical Instruction via Virtual/AI Platform

Introduction

This proposal outlines a comprehensive plan to deliver the Survey 1-5 curriculum, consisting of five modules, each comprising 64 sessions, using a virtual platform. This will satisfy the core component of the Land Surveying Apprenticeship standards, providing 600 hours of Related Technical Instruction. An additional 120 Hours of Elective Content may be made available to satisfy to the total of 720 hours required.

Objectives

- To provide a structured and interactive learning experience.
- To ensure students gain a thorough understanding of surveying principles and practices.
- To prepare students for professional certification and practical application in the field.

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The program will be administered by a mixed board of directors, including licensed surveyors, educators, and engineers. This diverse board ensures a well-rounded and expert-driven approach to the curriculum, providing students with comprehensive and practical knowledge in surveying.

Elective Technical Instruction

In addition to the core curriculum of 600 hours, apprentices will be required to obtain an additional 120 hours of related technical instruction. These hours are made up of electives, chosen by the apprentice and their employer. This allows for customization of the learning experience to better suit the specific needs and interests of the apprentice, ensuring a more tailored and relevant educational journey.

Implementation Plan

1. Platform Setup

- Configure platform to host the course content, including videos, documents, quizzes, and interactive modules.
- Ensure all students have access to the platform and are familiar with its features.

2. Content Delivery

- Content Authors will coordinate with platform, to format and upload relevant content sessions in accordance with the breakdown below.

3. Assessments:

- AI will coordinate regular knowledge check assessments throughout the session, as well as brief quizzes periodically.

- Module Final Exams will be provided (potentially proctored by employer), assessed by Program Administration, and graded accordingly.

-Projects shall be assessed at the end of each Module by Program Administration, and graded accordingly.

Grading Policy

Overall Module Grading Breakdown:

- Session Completion: 50%
- Project Assessment: 20%
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Session Breakdown

Each session will be 1.5 hours long, totaling 96 hours of instruction per Module. The sessions are designed to be interactive, incorporating multimedia resources, practical exercises, and assessments to enhance learning outcomes.

Employer/Sponsor Session

- Session created to introduce both apprentices and their sponsor to apprenticeship requirements, objectives, obligations, etc. Provides instruction on application and compliance with apprenticeship requirements.

Session Breakdown for Module One (64 Sessions)

Introduction to the Course (3 Sessions)

- Session 1: Introduction to Surveying
- Session 2: History of Surveying
- Session 3: Course Overview and Objectives

APELSCIDLA Rules and Regulations (Can be supplemented with state specific content) (1 Session)

- Session 4: Overview of APELSCIDLA, Licensing Requirements, and Professional Ethics, Regulatory Compliance

Survey Mathematics (11 Sessions)

- Session 5: Basic Math Review
- Session 6: Basic Math Review
- Session 7: Algebra in Surveying
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Errors in Measurement (2 Sessions)

- Session 16: Types & Sources of Errors
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Distance Measurement (includes Taping/Corrections) (5 Sessions)

- Session 18: Methods of Distance Measurement
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- Session 21: GPS Distance Measurement
- Session 22: Practical Exercises

Angular Measurement (3 Sessions)

- Session 23: Principles of Angular Measurement
- Session 24: Angle Measurement Techniques & Instruments
- Session 25: Practical Exercises

Leveling (4 Sessions)

- Session 26: Principles of Leveling & Leveling Instruments
- Session 27: Leveling Techniques & Calculations
- Session 28: Error Sources in Leveling & Leveling Corrections
- Session 29: Practical Exercises

Traverse Computations (7 Sessions)

- Session 30: Basics of Traverse Computations
- Session 31: Adjusting Traverses
- Session 32: Adjusting Traverses
- Session 33: Coordinate Computations
- Session 34: Coordinate Computations
- Session 35: Error Analysis in Traverses
- Session 36: Practical Applications

Horizontal Curves (5 Sessions)

- Session 37: Types of Horizontal Curves
- Session 38: Computation of Curve Elements
- Session 39: Computation of Curve Elements
- Session 40: Spiral Curves
- Session 41: Practical Applications

Vertical Curves (4 Sessions)

- Session 42: Types of Vertical Curves
- Session 43: Computation of Curve Element
- Session 44: Computation of Curve Elements
- Session 45: Practical Applications

Topographic / Photogrammetric Surveys (7 Sessions)

- Session 46: Principles of Topographic Surveys
- Session 47: Triangulated Irregular Network - .tin
- Session 48: Instruments and Techniques
- Session 49: Photogrammetry Basics
- Session 50: Applications of Photogrammetry
- Session 51: Data Processing
- Session 52: Practical Exercises

Geodesy / GPS / GIS (6 Sessions)

- Session 53: Introduction to Geodesy
- Session 54: GPS Fundamentals
- Session 55: GIS Basics
- Session 56: Applications of GPS and GIS

- Session 57: Data Integration
- Session 58: Practical Exercises

Emerging Surveying Technologies (4 Sessions)

- Session 59: Overview of Emerging Technologies and Future Trends
- Session 60: UAVs in Surveying
- Session 61: 3D Laser Scanning
- Session 62: Augmented Reality in Surveying

Module I Exam Review (2 Sessions)

- Session 63: Review of Key Concepts and Practice Problems
- Session 64: Final Exam

Starting the Path of a Surveyor

Initial Interview with Mentor/Sponsor at start of 1st Year in Apprenticeship, followed by follow up interview upon completion of the 1st Year. (10 hours)

- To be completed by the 10th Session in Module I:
  - Schedule and complete initial interview with apprenticeship sponsor/mentor.
  - Draft 2 page report per criteria provided
- To be completed prior to final exam for Module I:
  - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
  - Update previous 2 page report with additional information

Session Breakdown for Module Two (64 Sessions) + 30 Hour Project

Theory of Errors in Observations and Coordinate Geometry (COGO) (10 sessions)

- Session 2: Introduction to Theory of Errors
- Session 3: Types of Errors in Observations
- Session 4: Error Analysis Techniques
- Session 5: Introduction to Coordinate Geometry (COGO)
- Session 6: COGO Applications in Surveying
- Session 7: Analysis of Survey Measurements

- Session 8: Adjustments of Survey Measurements
- Session 9: Practical Exercises in Error Analysis
- Session 10: Practical Exercises in COGO
- Session 11: Exam on Theory of Errors and COGO

Horizontal Curves (8 sessions)

- Session 12: A Deeper Dive into Horizontal Curves
- Session 13: Formula Derivations for Horizontal Curves
- Session 14: Note Keeping for Layout
- Session 15: Compound Curves
- Session 16: Reverse Curves
- Session 17: Practical Exercises in Curve Layout
- Session 18: Case Studies in Horizontal Curves
- Session 19: Exam on Horizontal Curves

Control Surveys and Geodetic Reductions (10 sessions)

- Session 20: Introduction to Control Surveys
- Session 21: Horizontal Control Networks
- Session 22: Vertical Control Networks
- Session 23: Geodetic Reductions
- Session 24: National Geodetic Reference System (NGRS)
- Session 25: Practical Exercises in Control Surveys
- Session 26: Practical Exercises in Geodetic Reductions
- Session 27: Case Studies in Control Surveys
- Session 28: Case Studies in Geodetic Reductions
- Session 29: Exam on Control Surveys and Geodetic Reductions

Map Projections and State Plane Coordinates (8 sessions)

- Session 30: Introduction to Map Projections
- Session 31: Lambert Conformal Projection
- Session 32: Transverse Mercator Projection
- Session 33: State Plane Coordinate System
- Session 34: Practical Exercises in Map Projections
- Session 35: Practical Exercises in State Plane Coordinates
- Session 36: Case Studies in Map Projections
- Session 37: Exam on Map Projections and State Plane Coordinates

Astronomic Azimuth Determination (8 sessions)

- Session 38: Introduction to Applied Astronomy
- Session 39: Celestial Coordinate Systems
- Session 40: Techniques for Determining Astronomic Azimuth
- Session 41: Practical Exercises in Astronomic Azimuth Determination

- Session 42: Case Studies in Applied Astronomy
- Session 43: Practical Applications in Surveying
- Session 44: Review of Key Concepts
- Session 45: Exam on Astronomic Azimuth Determination

Photogrammetry (5 Sessions)

- Session 46: Introduction to Photogrammetry
- Session 47: Emerging Technology in Photogrammetry
- Session 48: Achievable Accuracies and Error in Photogrammetry
- Session 49: Processing Photogrammetric Data
- Session 50: Photogrammetry Review and Exam

Global Positioning System (GPS) (10 sessions)

- Session 51: Introduction to GPS
- Session 52: Field Procedures for GPS
- Session 53: Observing Methods in GPS
- Session 54: Achievable Accuracies in GPS
- Session 55: Practical Exercises in GPS Field Procedures
- Session 56: Practical Exercises in Observing Methods
- Session 57: Case Studies in GPS Applications
- Session 58: Advanced GPS Techniques
- Session 59: Review of Key Concepts
- Session 60: Exam on GPS

Additional Topics or Review Sessions (4 sessions)

- Session 61: Advanced Topics in Surveying (as needed)
- Session 62: Practical Applications and Case Studies
- Session 63: Final Exam Review
- Session 64: Final Exam

Photogrammetric Project (30 hours)

- Project Planning and Design (5 hours)
- Data Collection Techniques (5 hours)
- Data Processing and Analysis (10 hours)
- Practical Exercises in Photogrammetry (5 hours)
- Project Presentation and Review (5 hours)

2nd Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module II:

- Schedule and complete follow up interview with apprenticeship sponsor/mentor.
- Update previous report with additional information

Session Breakdown for Module 3 (64 Sessions + 30hr Project)

Leveling and Profiles (8 Sessions)

- Session 1: Introduction to Leveling
- Session 2: Equipment and Methods
- Session 3: Profiles and Cross-Sections
- Session 4: Practical Applications
- Session 5: Field Exercises
- Session 6: Data Analysis
- Session 7: Common Errors and Corrections
- Session 8: Review and Practice

Vertical Curves (8 Sessions)

- Session 9: Introduction to Vertical Curves
- Session 10: Types of Vertical Curves
- Session 11: Design Principles
- Session 12: Calculation Methods
- Session 13: Practical Applications
- Session 14: Field Exercises
- Session 15: Data Analysis
- Session 16: Review and Practice

Cross-Sections Leveling and Typical Sections (8 Sessions)

- Session 17: Introduction to Cross-Sections
- Session 18: Equipment and Methods
- Session 19: Typical Sections
- Session 20: Practical Applications
- Session 21: Field Exercises
- Session 22: Data Analysis
- Session 23: Common Errors and Corrections
- Session 24: Review and Practice

Earthwork Volumes, Linear Projects, Grading Plans, Borrow Pit and Contour Method (8 Sessions)

- Session 25: Introduction to Earthwork Volumes
- Session 26: Calculation Methods
- Session 27: Linear Projects Overview
- Session 28: Grading Plans
- Session 29: Borrow Pit Method
- Session 30: Contour Method
- Session 31: Practical Applications
- Session 32: Review and Practice

Unit Exam/History of Surveying (1 Session)

- Session 33: Unit Exam and History of Surveying

Public Lands Survey System (2 Sessions)

- Session 34: Introduction to Public Lands Survey System
- Session 35: Historical Background

Maps & Photographs (2 Sessions)

- Session 36: Introduction to Maps
- Session 37: Types of Maps

Subdivision Design (2 Sessions)

- Session 38: Research and Schemes
- Session 39: Preliminary Layout

Street Design (2 Sessions)

- Session 40: Street Design Principles
- Session 41: Practical Applications

Lot Computations and Curves (2 Sessions)

- Session 42: Lot Computations
- Session 43: Curve Calculations

Plans and Profiles (2 Sessions)

- Session 44: Creating Plans
- Session 45: Developing Profiles

Street Grading Plan (2 Sessions)

- Session 46: Introduction to Street Grading
- Session 47: Practical Applications

Virginia Sediment and Erosion Control; Stormwater Best Management Practices (2 Sessions)

- Session 48: Introduction to Sediment and Erosion Control
- Session 49: Stormwater Best Management Practices

Lot Grading (2 Sessions)

- Session 50: Lot Grading Principles
- Session 51: Practical Applications

Siting the Dwelling (2 Sessions)

- Session 52: Siting Principles
- Session 53: Practical Applications

Sketching the Lot Grading Plan (2 Sessions)

- Session 54: Introduction to Sketching
- Session 55: Practical Exercises

Plotting Drainage Divides (2 Sessions)

- Session 56: Introduction to Drainage Divides
- Session 57: Practical Applications

S.U.E., Sub-Surface Utilities Engineering, Laws and the Segment of Land Surveying Related to SUE (2 Sessions)

- Session 58: Introduction to S.U.E.
- Session 59: Legal Framework and Practical Applications

Ethics & Minimum Standards (2 Sessions)

- Session 60: Introduction to Ethics
- Session 61: Minimum Standards in Surveying

Construction Layout, Business, Economics, Finance (2 Sessions)

- Session 62: Introduction to Construction Layout
- Session 63: Overview of Business, Economics, and Finance in Surveying

Final Exam (1 Sessions)

- Session 64: Comprehensive Final Exam

CADD Project (Could include basic CADD User Training)

CADD Based Preparation of Site and Subdivision Type Documents, Plats, Plans, etc. (30 hours)

Project Planning and Design (5 hours)

- - Detailed planning and design of the project.

Data Collection Techniques (5 hours)

- - Fieldwork and data integration using CADD.

Data Processing and Analysis (10 hours)

- - Processing the collected data and performing necessary analyses.

Practical Exercises in CADD (5 hours)

- - Hands-on exercises to apply CADD techniques.

Project Presentation and Review (5 hours)

- - Presentation of the project findings and review by peers and instructors.

3rd Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module III:
    - Schedule and complete follow up interview with apprenticeship sponsor/mentor
    - Update previous report with additional information

Session Breakdown for Module 4 (64 Sessions + 30hr Project)

Introduction to Hydrology (8 Sessions)

- Session 1: Introduction to Hydrology
- Session 2: Stormwater Runoff
- Session 3: Urban Water Cycle
- Session 4: Soils/Land Cover & Topographical Changes
- Session 5: Stream Impacts
- Session 6: Water Quality Impacts
- Session 7: Practical Applications
- Session 8: Review and Practice

Hydrology Formulas (4 Sessions)

- Session 9: The Rational Formula

- Session 10: The Anderson Formula
- Session 11: NRCS Technical Release 55 (TR-55)
- Session 12: Practical Applications and Case Studies

Introduction to Hydraulics (8 Sessions)

- Session 13: Introduction to Hydraulics
- Session 14: Fluid Properties
- Session 15: Fluid Statics
- Session 16: Fluid Dynamics
- Session 17: Open Channel Flow
- Session 18: Practical Applications
- Session 19: Field Exercises
- Session 20: Review and Practice

Hydraulic Equations and Sewer Design (8 Sessions)

- Session 21: Manning's Equation
- Session 22: Storm Sewer Hydraulics
- Session 23: Sanitary Sewer Design
- Session 24: Practical Applications and Case Studies
- Session 25: Inlet Design Principles
- Session 26: On Grade Conditions
- Session 27: Sump Conditions
- Session 28: Practical Applications and Case Studies

Systems Head Losses and Culvert Hydraulics (8 Sessions)

- Session 29: Systems Head Losses
- Session 30: VDOT Standard Step
- Session 31: Culvert Hydraulics
- Session 32: Inlet/Outlet "Barrel" Control
- Session 33: Practical Applications
- Session 34: Field Exercises
- Session 35: Data Analysis
- Session 36: Review and Practice

Virginia Runoff Reduction Method (4 Sessions)

- Session 37: Introduction to Virginia Runoff Reduction Method
- Session 38: Stormwater Management
- Session 39: Water Quantity Requirements
- Session 40: Water Quality Requirements

Best Management Practices (BMP) (4 Sessions)

- Session 41: Introduction to BMP
- Session 42: Structural BMP
- Session 43: Non-Structural BMP

- Session 44: Practical Applications and Case Studies

State and Local Regulations (4 Sessions)

- Session 45: State (DEQ) Regulations
- Session 46: MS4/Virginia Stormwater Management Program (VSMP)
- Session 47: VPDES General Permit
- Session 48: Chesapeake Bay TMDL

Sediment and Erosion Control (4 Sessions)

- Session 49: Sediment and Erosion Control Principles
- Session 50: Certifications
- Session 51: Local Ordinances
- Session 52: Fairfax County Stormwater Regulations

Chesapeake Bay (4 Sessions)

- Session 53: Chesapeake Bay Overview
- Session 54: Environmental Impacts
- Session 55: Conservation Efforts
- Session 56: Practical Applications and Case Studies

Advanced Topics and Practical Applications (4 Sessions)

- Session 57: Advanced Topics in Hydrology
- Session 58: Advanced Topics in Hydraulics
- Session 59: Case Studies in Stormwater Management
- Session 60: Practical Exercises in BMP

Additional Topics (2 Sessions)

- Session 61: Advanced Techniques in Water Quality Management
- Session 62: Innovative Stormwater Solutions

Review and Final Exam (2 Sessions)

- Session 63: Final Review Session
- Session 64: Comprehensive Final Exam

Stormwater, BMP, Water Quality Design – Using Structural and Non-Structural Methods (30 hours)

Project Planning and Design (5 hours)

- - Detailed planning and design of the project.

Data Collection Techniques (5 hours)

- - Fieldwork and data collection.

Data Processing and Analysis (10 hours)

- - Processing the collected data and performing necessary analyses.

Practical Exercises (5 hours)

- - Hands-on exercises to apply design techniques.

Project Presentation and Review (5 hours)

- - Presentation of the project findings and review by peers and instructors.

4th Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module IV:
  - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
  - Update previous report with additional information

Sessions Breakdown for Module 5 (64 Sessions + 30hr Project)

Introduction and Fundamentals (10 Sessions)

- Session 1: Course Introduction/Syllabus
- Session 2: Virginia Statutory Law related to the practice of Land Surveying
- Session 3: APELSCIDLA (Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers, and Landscape Architects)
- Session 4: Types of Surveys
- Session 5: Dillon Rule in VA
- Session 6: Subdivision and Zoning Ordinances
- Session 7: Byrd Act
- Session 8: Statute of Frauds
- Session 9: Estoppel
- Session 10: Rights of Way, Discontinuance, Vacation, and Abandonment

Deeds and Legal Descriptions (10 Sessions)

- Session 11: Types of Deeds
- Session 12: Levels of Warranty
- Session 13: Quiet Title Action
- Session 14: Quitclaim Deeds
- Session 15: Legal Descriptions
- Session 16: Reconstruction of Intent
- Session 17: Order of Construction

- Session 18: Weight of Evidence
- Session 19: Conveyances: Sequential and Simultaneous
- Session 20: Reconstruction of Intent Applications in Boundary Solutions: Sequential/Simultaneous

Practical Applications and Research (10 Sessions)

- Session 21: Deed Research/CPAN
- Session 22: Project Outline-Kickoff
- Session 23: Quarter Exam
- Session 24: Introduction to Case Law Research
- Session 25: Unwritten Rights: Boundary by Adverse Possession
- Session 26: Boundary by Agreement
- Session 27: Boundary by Acquiescence and Acceptance
- Session 28: Littoral/Riparian Boundary & Rights
- Session 29: Case Study: Littoral/Riparian Boundary & Rights
- Session 30: Easements

Specialized Surveys and Plans (10 Sessions)

- Session 31: ALTA/NSPS Land Title Survey
- Session 32: Railway Plans
- Session 33: Utility Plans
- Session 34: VDOT Plans and Alignments
- Session 35: Project Management
- Session 36: Virginia Condominium Act
- Session 37: NEED TOPIC
- Session 38: NEED TOPIC
- Session 39: Due Diligence/Records Management
- Session 40: The Weight of Tax Assessment Maps

Advanced Topics and Ethics (10 Sessions)

- Session 41: Informal Consolidations - NOT
- Session 42: Use of GIS in Land Surveying
- Session 43: Ethics for the Surveyor
- Session 44: Advanced Case Law Research
- Session 45: Practical Applications in Boundary Solutions
- Session 46: Advanced Project Management Techniques
- Session 47: Environmental Considerations in Land Surveying
- Session 48: Technology Trends in Land Surveying
- Session 49: Professional Development and Continuing Education
- Session 50: Client Relations and Communication

Additional Topics (12 Sessions)

- Session 51: NEED TOPIC
- Session 52: NEED TOPIC

- Session 53: NEED TOPIC
- Session 54: NEED TOPIC
- Session 55: NEED TOPIC
- Session 56: NEED TOPIC
- Session 57: NEED TOPIC
- Session 58: NEED TOPIC
- Session 59: NEED TOPIC
- Session 60: NEED TOPIC
- Session 61: Review of FLS (Fundamentals of Land Surveying) Content Areas
- Session 62: Review of PLS (Principles and Practice of Land Surveying) Content Areas

Final Preparations and Exams (2 Sessions)

- Session 63: Review Session
- Session 64: Final Exam

Project Breakdown: Land Records Research (30 Hours)

Phase 1: Project Planning and Preparation (5 Hours)

Project Kickoff Meeting (1 Hour)

Research Plan Development (2 Hours)

Gathering Initial Resources (2 Hours)

Phase 2: Data Collection and Analysis (15 Hours)

Land Records Collection (5 Hours)

Document Review and Analysis (5 Hours)

Field Verification (if applicable) (5 Hours)

Phase 3: Synthesis and Reporting (8 Hours)

Data Synthesis (3 Hours)

Drafting the Report (3 Hours)

Review and Revision (2 Hours)

Phase 4: Presentation and Wrap-Up (2 Hours)

Presentation Preparation (1 Hour)

Final Presentation and Feedback (1 Hour)

5th Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module V:
    - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
    - Update previous report with additional information

Assessment and Feedback

- Regular quizzes, interactive exercises, and assignments to assess understanding and provide feedback.
- Final mock exam to prepare students for the Fundamentals of Surveying exam.

Support and Resources

- Provide additional resources such as reading materials, reference guides, and access to expert support through Retrieve/VAS Online.

- Board approved reference material including:

- Basic Text: "Land Surveyor Reference Manual", second edition, Andrew L. Harbin ISBN: 0-912045-09-4, Professional Publications, Inc.

- References: "Solutions Manual for the Land Surveyor Manual", second edition, Andrew L. Harbin ISBN: 0-912045-42-6, Professional Publications, Inc.

- "Surveying", ninth edition, Moffet & Bouchard ISBN: 0-06-500059-5, Harper Collins Publishers, Inc.

- "Elementary Surveying", current edition, Paul R. Wolf and Russell Brinker ISBN: 0-06-500399-3, Harper Collins Publishers, Inc.

- "Basic Occupational Mathematics", David Newton ISBN: 0-8251-1676-7, J. Weston Walch Publisher

- "Brown's Boundary Control and Legal Principles", 6th Edition, Robillard, Wilson, and Brown ISBN: 978-0-470-18354-0, Wiley Publishing

-"Evidence and Procedures for Boundary Location", 3rd Edition, Brown, Robillard, Wilson ISBN: 0471552194, Wiley Publishing All Other Texts as the Instructors Deem Necessary

Conclusion

This proposal aims to deliver a comprehensive and engaging learning experience using a virtual platform, ensuring students are well-prepared for their professional careers in surveying. By leveraging the platform's capabilities, we can provide a structured, interactive, and effective educational program that will provide the classroom component required by the Voluntary Apprenticeship Act (Code 40.1-117 – 40.1-126).

*** Additional Modules to be included if need be. Additional modules may be created to fit state specific needs in lieu of VA based curriculum***

Apprenticeship Related Technical Instruction via Virtual/AI Platform

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- Session 44: Computation of Curve Elements
- Session 45: Practical Applications

Topographic / Photogrammetric Surveys (7 Sessions)

- Session 46: Principles of Topographic Surveys
- Session 47: Triangulated Irregular Network - .tin
- Session 48: Instruments and Techniques
- Session 49: Photogrammetry Basics
- Session 50: Applications of Photogrammetry
- Session 51: Data Processing
- Session 52: Practical Exercises

Geodesy / GPS / GIS (6 Sessions)

- Session 53: Introduction to Geodesy
- Session 54: GPS Fundamentals
- Session 55: GIS Basics
- Session 56: Applications of GPS and GIS

- Session 57: Data Integration
- Session 58: Practical Exercises

Emerging Surveying Technologies (4 Sessions)

- Session 59: Overview of Emerging Technologies and Future Trends
- Session 60: UAVs in Surveying
- Session 61: 3D Laser Scanning
- Session 62: Augmented Reality in Surveying

Module I Exam Review (2 Sessions)

- Session 63: Review of Key Concepts and Practice Problems
- Session 64: Final Exam

Starting the Path of a Surveyor

Initial Interview with Mentor/Sponsor at start of 1st Year in Apprenticeship, followed by follow up interview upon completion of the 1st Year. (10 hours)

- To be completed by the 10th Session in Module I:
  - Schedule and complete initial interview with apprenticeship sponsor/mentor.
  - Draft 2 page report per criteria provided
- To be completed prior to final exam for Module I:
  - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
  - Update previous 2 page report with additional information

Session Breakdown for Module Two (64 Sessions) + 30 Hour Project

Theory of Errors in Observations and Coordinate Geometry (COGO) (10 sessions)

- Session 2: Introduction to Theory of Errors
- Session 3: Types of Errors in Observations
- Session 4: Error Analysis Techniques
- Session 5: Introduction to Coordinate Geometry (COGO)
- Session 6: COGO Applications in Surveying
- Session 7: Analysis of Survey Measurements

- Session 8: Adjustments of Survey Measurements
- Session 9: Practical Exercises in Error Analysis
- Session 10: Practical Exercises in COGO
- Session 11: Exam on Theory of Errors and COGO

Horizontal Curves (8 sessions)

- Session 12: A Deeper Dive into Horizontal Curves
- Session 13: Formula Derivations for Horizontal Curves
- Session 14: Note Keeping for Layout
- Session 15: Compound Curves
- Session 16: Reverse Curves
- Session 17: Practical Exercises in Curve Layout
- Session 18: Case Studies in Horizontal Curves
- Session 19: Exam on Horizontal Curves

Control Surveys and Geodetic Reductions (10 sessions)

- Session 20: Introduction to Control Surveys
- Session 21: Horizontal Control Networks
- Session 22: Vertical Control Networks
- Session 23: Geodetic Reductions
- Session 24: National Geodetic Reference System (NGRS)
- Session 25: Practical Exercises in Control Surveys
- Session 26: Practical Exercises in Geodetic Reductions
- Session 27: Case Studies in Control Surveys
- Session 28: Case Studies in Geodetic Reductions
- Session 29: Exam on Control Surveys and Geodetic Reductions

Map Projections and State Plane Coordinates (8 sessions)

- Session 30: Introduction to Map Projections
- Session 31: Lambert Conformal Projection
- Session 32: Transverse Mercator Projection
- Session 33: State Plane Coordinate System
- Session 34: Practical Exercises in Map Projections
- Session 35: Practical Exercises in State Plane Coordinates
- Session 36: Case Studies in Map Projections
- Session 37: Exam on Map Projections and State Plane Coordinates

Astronomic Azimuth Determination (8 sessions)

- Session 38: Introduction to Applied Astronomy
- Session 39: Celestial Coordinate Systems
- Session 40: Techniques for Determining Astronomic Azimuth
- Session 41: Practical Exercises in Astronomic Azimuth Determination

- Session 42: Case Studies in Applied Astronomy
- Session 43: Practical Applications in Surveying
- Session 44: Review of Key Concepts
- Session 45: Exam on Astronomic Azimuth Determination

Photogrammetry (5 Sessions)

- Session 46: Introduction to Photogrammetry
- Session 47: Emerging Technology in Photogrammetry
- Session 48: Achievable Accuracies and Error in Photogrammetry
- Session 49: Processing Photogrammetric Data
- Session 50: Photogrammetry Review and Exam

Global Positioning System (GPS) (10 sessions)

- Session 51: Introduction to GPS
- Session 52: Field Procedures for GPS
- Session 53: Observing Methods in GPS
- Session 54: Achievable Accuracies in GPS
- Session 55: Practical Exercises in GPS Field Procedures
- Session 56: Practical Exercises in Observing Methods
- Session 57: Case Studies in GPS Applications
- Session 58: Advanced GPS Techniques
- Session 59: Review of Key Concepts
- Session 60: Exam on GPS

Additional Topics or Review Sessions (4 sessions)

- Session 61: Advanced Topics in Surveying (as needed)
- Session 62: Practical Applications and Case Studies
- Session 63: Final Exam Review
- Session 64: Final Exam

Photogrammetric Project (30 hours)

- Project Planning and Design (5 hours)
- Data Collection Techniques (5 hours)
- Data Processing and Analysis (10 hours)
- Practical Exercises in Photogrammetry (5 hours)
- Project Presentation and Review (5 hours)

2nd Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module II:

- Schedule and complete follow up interview with apprenticeship sponsor/mentor.
- Update previous report with additional information

Session Breakdown for Module 3 (64 Sessions + 30hr Project)

Leveling and Profiles (8 Sessions)

- Session 1: Introduction to Leveling
- Session 2: Equipment and Methods
- Session 3: Profiles and Cross-Sections
- Session 4: Practical Applications
- Session 5: Field Exercises
- Session 6: Data Analysis
- Session 7: Common Errors and Corrections
- Session 8: Review and Practice

Vertical Curves (8 Sessions)

- Session 9: Introduction to Vertical Curves
- Session 10: Types of Vertical Curves
- Session 11: Design Principles
- Session 12: Calculation Methods
- Session 13: Practical Applications
- Session 14: Field Exercises
- Session 15: Data Analysis
- Session 16: Review and Practice

Cross-Sections Leveling and Typical Sections (8 Sessions)

- Session 17: Introduction to Cross-Sections
- Session 18: Equipment and Methods
- Session 19: Typical Sections
- Session 20: Practical Applications
- Session 21: Field Exercises
- Session 22: Data Analysis
- Session 23: Common Errors and Corrections
- Session 24: Review and Practice

Earthwork Volumes, Linear Projects, Grading Plans, Borrow Pit and Contour Method (8 Sessions)

- Session 25: Introduction to Earthwork Volumes
- Session 26: Calculation Methods
- Session 27: Linear Projects Overview
- Session 28: Grading Plans
- Session 29: Borrow Pit Method
- Session 30: Contour Method
- Session 31: Practical Applications
- Session 32: Review and Practice

Unit Exam/History of Surveying (1 Session)

- Session 33: Unit Exam and History of Surveying

Public Lands Survey System (2 Sessions)

- Session 34: Introduction to Public Lands Survey System
- Session 35: Historical Background

Maps & Photographs (2 Sessions)

- Session 36: Introduction to Maps
- Session 37: Types of Maps

Subdivision Design (2 Sessions)

- Session 38: Research and Schemes
- Session 39: Preliminary Layout

Street Design (2 Sessions)

- Session 40: Street Design Principles
- Session 41: Practical Applications

Lot Computations and Curves (2 Sessions)

- Session 42: Lot Computations
- Session 43: Curve Calculations

Plans and Profiles (2 Sessions)

- Session 44: Creating Plans
- Session 45: Developing Profiles

Street Grading Plan (2 Sessions)

- Session 46: Introduction to Street Grading
- Session 47: Practical Applications

Virginia Sediment and Erosion Control; Stormwater Best Management Practices (2 Sessions)

- Session 48: Introduction to Sediment and Erosion Control
- Session 49: Stormwater Best Management Practices

Lot Grading (2 Sessions)

- Session 50: Lot Grading Principles
- Session 51: Practical Applications

Siting the Dwelling (2 Sessions)

- Session 52: Siting Principles
- Session 53: Practical Applications

Sketching the Lot Grading Plan (2 Sessions)

- Session 54: Introduction to Sketching
- Session 55: Practical Exercises

Plotting Drainage Divides (2 Sessions)

- Session 56: Introduction to Drainage Divides
- Session 57: Practical Applications

S.U.E., Sub-Surface Utilities Engineering, Laws and the Segment of Land Surveying Related to SUE (2 Sessions)

- Session 58: Introduction to S.U.E.
- Session 59: Legal Framework and Practical Applications

Ethics & Minimum Standards (2 Sessions)

- Session 60: Introduction to Ethics
- Session 61: Minimum Standards in Surveying

Construction Layout, Business, Economics, Finance (2 Sessions)

- Session 62: Introduction to Construction Layout
- Session 63: Overview of Business, Economics, and Finance in Surveying

Final Exam (1 Sessions)

- Session 64: Comprehensive Final Exam

CADD Project (Could include basic CADD User Training)

CADD Based Preparation of Site and Subdivision Type Documents, Plats, Plans, etc. (30 hours)

Project Planning and Design (5 hours)

- - Detailed planning and design of the project.

Data Collection Techniques (5 hours)

- - Fieldwork and data integration using CADD.

Data Processing and Analysis (10 hours)

- - Processing the collected data and performing necessary analyses.

Practical Exercises in CADD (5 hours)

- - Hands-on exercises to apply CADD techniques.

Project Presentation and Review (5 hours)

- - Presentation of the project findings and review by peers and instructors.

3rd Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module III:
    - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
    - Update previous report with additional information

Session Breakdown for Module 4 (64 Sessions + 30hr Project)

Introduction to Hydrology (8 Sessions)

- Session 1: Introduction to Hydrology
- Session 2: Stormwater Runoff
- Session 3: Urban Water Cycle
- Session 4: Soils/Land Cover & Topographical Changes
- Session 5: Stream Impacts
- Session 6: Water Quality Impacts
- Session 7: Practical Applications
- Session 8: Review and Practice

Hydrology Formulas (4 Sessions)

- Session 9: The Rational Formula

- Session 10: The Anderson Formula
- Session 11: NRCS Technical Release 55 (TR-55)
- Session 12: Practical Applications and Case Studies

Introduction to Hydraulics (8 Sessions)

- Session 13: Introduction to Hydraulics
- Session 14: Fluid Properties
- Session 15: Fluid Statics
- Session 16: Fluid Dynamics
- Session 17: Open Channel Flow
- Session 18: Practical Applications
- Session 19: Field Exercises
- Session 20: Review and Practice

Hydraulic Equations and Sewer Design (8 Sessions)

- Session 21: Manning's Equation
- Session 22: Storm Sewer Hydraulics
- Session 23: Sanitary Sewer Design
- Session 24: Practical Applications and Case Studies
- Session 25: Inlet Design Principles
- Session 26: On Grade Conditions
- Session 27: Sump Conditions
- Session 28: Practical Applications and Case Studies

Systems Head Losses and Culvert Hydraulics (8 Sessions)

- Session 29: Systems Head Losses
- Session 30: VDOT Standard Step
- Session 31: Culvert Hydraulics
- Session 32: Inlet/Outlet "Barrel" Control
- Session 33: Practical Applications
- Session 34: Field Exercises
- Session 35: Data Analysis
- Session 36: Review and Practice

Virginia Runoff Reduction Method (4 Sessions)

- Session 37: Introduction to Virginia Runoff Reduction Method
- Session 38: Stormwater Management
- Session 39: Water Quantity Requirements
- Session 40: Water Quality Requirements

Best Management Practices (BMP) (4 Sessions)

- Session 41: Introduction to BMP
- Session 42: Structural BMP
- Session 43: Non-Structural BMP

- Session 44: Practical Applications and Case Studies

State and Local Regulations (4 Sessions)

- Session 45: State (DEQ) Regulations
- Session 46: MS4/Virginia Stormwater Management Program (VSMP)
- Session 47: VPDES General Permit
- Session 48: Chesapeake Bay TMDL

Sediment and Erosion Control (4 Sessions)

- Session 49: Sediment and Erosion Control Principles
- Session 50: Certifications
- Session 51: Local Ordinances
- Session 52: Fairfax County Stormwater Regulations

Chesapeake Bay (4 Sessions)

- Session 53: Chesapeake Bay Overview
- Session 54: Environmental Impacts
- Session 55: Conservation Efforts
- Session 56: Practical Applications and Case Studies

Advanced Topics and Practical Applications (4 Sessions)

- Session 57: Advanced Topics in Hydrology
- Session 58: Advanced Topics in Hydraulics
- Session 59: Case Studies in Stormwater Management
- Session 60: Practical Exercises in BMP

Additional Topics (2 Sessions)

- Session 61: Advanced Techniques in Water Quality Management
- Session 62: Innovative Stormwater Solutions

Review and Final Exam (2 Sessions)

- Session 63: Final Review Session
- Session 64: Comprehensive Final Exam

Stormwater, BMP, Water Quality Design – Using Structural and Non-Structural Methods (30 hours)

Project Planning and Design (5 hours)

- - Detailed planning and design of the project.

Data Collection Techniques (5 hours)

- - Fieldwork and data collection.

Data Processing and Analysis (10 hours)

- - Processing the collected data and performing necessary analyses.

Practical Exercises (5 hours)

- - Hands-on exercises to apply design techniques.

Project Presentation and Review (5 hours)

- - Presentation of the project findings and review by peers and instructors.

4th Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module IV:
    - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
    - Update previous report with additional information.

Sessions Breakdown for Module 5 (64 Sessions + 30hr Project)

Introduction and Fundamentals (10 Sessions)

- Session 1: Course Introduction/Syllabus
- Session 2: Virginia Statutory Law related to the practice of Land Surveying
- Session 3: APELSCIDLA (Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers, and Landscape Architects)
- Session 4: Types of Surveys
- Session 5: Dillon Rule in VA
- Session 6: Subdivision and Zoning Ordinances
- Session 7: Byrd Act
- Session 8: Statute of Frauds
- Session 9: Estoppel
- Session 10: Rights of Way, Discontinuance, Vacation, and Abandonment

Deeds and Legal Descriptions (10 Sessions)

- Session 11: Types of Deeds
- Session 12: Levels of Warranty
- Session 13: Quiet Title Action
- Session 14: Quitclaim Deeds
- Session 15: Legal Descriptions
- Session 16: Reconstruction of Intent
- Session 17: Order of Construction

- Session 18: Weight of Evidence
- Session 19: Conveyances: Sequential and Simultaneous
- Session 20: Reconstruction of Intent Applications in Boundary Solutions: Sequential/Simultaneous

Practical Applications and Research (10 Sessions)

- Session 21: Deed Research/CPAN
- Session 22: Project Outline-Kickoff
- Session 23: Quarter Exam
- Session 24: Introduction to Case Law Research
- Session 25: Unwritten Rights: Boundary by Adverse Possession
- Session 26: Boundary by Agreement
- Session 27: Boundary by Acquiescence and Acceptance
- Session 28: Littoral/Riparian Boundary & Rights
- Session 29: Case Study: Littoral/Riparian Boundary & Rights
- Session 30: Easements

Specialized Surveys and Plans (10 Sessions)

- Session 31: ALTA/NSPS Land Title Survey
- Session 32: Railway Plans
- Session 33: Utility Plans
- Session 34: VDOT Plans and Alignments
- Session 35: Project Management
- Session 36: Virginia Condominium Act
- Session 37: NEED TOPIC
- Session 38: NEED TOPIC
- Session 39: Due Diligence/Records Management
- Session 40: The Weight of Tax Assessment Maps

Advanced Topics and Ethics (10 Sessions)

- Session 41: Informal Consolidations - NOT
- Session 42: Use of GIS in Land Surveying
- Session 43: Ethics for the Surveyor
- Session 44: Advanced Case Law Research
- Session 45: Practical Applications in Boundary Solutions
- Session 46: Advanced Project Management Techniques
- Session 47: Environmental Considerations in Land Surveying
- Session 48: Technology Trends in Land Surveying
- Session 49: Professional Development and Continuing Education
- Session 50: Client Relations and Communication

Additional Topics (12 Sessions)

- Session 51: NEED TOPIC

- Session 52: NEED TOPIC
- Session 53: NEED TOPIC
- Session 54: NEED TOPIC
- Session 55: NEED TOPIC
- Session 56: NEED TOPIC
- Session 57: NEED TOPIC
- Session 58: NEED TOPIC
- Session 59: NEED TOPIC
- Session 60: NEED TOPIC
- Session 61: Review of FLS (Fundamentals of Land Surveying) Content Areas
- Session 62: Review of PLS (Principles and Practice of Land Surveying) Content Areas

****SUGGESTIONS FOR ADDITIONAL TOPICS**:**

- Best Business - Management Practices*

  - Client Relations / Customer Service

  - Operations & Staff Management

  - Marketing a Professional Business

  - Human Resources

  - Preparing Project Contracts & Fee Estimates

  - Business Correspondence

- Professional Business Insurance – Risk Management*
  - Professional Liability Insurance
  - Errors & Omissions
  - Typical Coverage
  - Negligence
  - Misrepresentation
  - Breach of Contract
  - Typical of No Coverage
  - Intentional Wrongdoing
  - Bodily Injury or Property Damage
  - Cyber liability.
  - Business disputes.
  - Important features to consider
- Running a Business as a Sole Proprietor*
  **** Submitted by F.R. Richardson****
- Floodplains and Overview of the NFIP

- Elevation Certificates and LOMA's
- Condominium Surveys, Do's and Don'ts
- VDOT Survey Manual Overview
- Plat "Exhibits", to Seal or not to Seal
- Importance of Site Visits and Site Photos
- Bathymetric Surveys Overview
- LiDAR vs. non-LiDAR Surveys
- APELSCIDLA Regs, "Deep Dive" into Boundary, Topo and Existing Improvement Surveys
- (possibly add this to Module One?)
  ****Suggested by Kevin D. Shreiner****

Final Preparations and Exams (2 Sessions)

- Session 63: Review Session
- Session 64: Final Exam

Project Breakdown: Land Records Research (30 Hours)

Phase 1: Project Planning and Preparation (5 Hours)

Project Kickoff Meeting (1 Hour)

Research Plan Development (2 Hours)

Gathering Initial Resources (2 Hours)

Phase 2: Data Collection and Analysis (15 Hours)

Land Records Collection (5 Hours)

Document Review and Analysis (5 Hours)

Field Verification (if applicable) (5 Hours)

Phase 3: Synthesis and Reporting (8 Hours)

Data Synthesis (3 Hours)

Drafting the Report (3 Hours)

Review and Revision (2 Hours)

Phase 4: Presentation and Wrap-Up (2 Hours)

Presentation Preparation (1 Hour)

Final Presentation and Feedback (1 Hour)

5th Module Follow up Interview with Mentor/Sponsor (5 hours)

- To be completed prior to final exam for Module V:
    - Schedule and complete follow up interview with apprenticeship sponsor/mentor.
    - Update previous report with additional information

Assessment and Feedback

- Regular quizzes, interactive exercises, and assignments to assess understanding and provide feedback.
- Final mock exam to prepare students for the Fundamentals of Surveying exam.

Support and Resources

- Provide additional resources such as reading materials, reference guides, and access to expert support through Retrieve/VAS Online.

- Board approved reference material including:

- Basic Text: "Land Surveyor Reference Manual", second edition, Andrew L. Harbin ISBN: 0-912045-09-4, Professional Publications, Inc.

- References: "Solutions Manual for the Land Surveyor Manual", second edition, Andrew L. Harbin ISBN: 0-912045-42-6, Professional Publications, Inc.

- "Surveying", ninth edition, Moffet & Bouchard ISBN: 0-06-500059-5, Harper Collins Publishers, Inc.

- "Elementary Surveying", current edition, Paul R. Wolf and Russell Brinker ISBN: 0-06-500399-3, Harper Collins Publishers, Inc.

- "Basic Occupational Mathematics", David Newton ISBN: 0-8251-1676-7, J. Weston Walch Publisher

- "Brown's Boundary Control and Legal Principles", 6th Edition, Robillard, Wilson, and Brown ISBN: 978-0-470-18354-0, Wiley Publishing

-"Evidence and Procedures for Boundary Location", 3rd Edition, Brown, Robillard, Wilson ISBN: 0471552194, Wiley Publishing All Other Texts as the Instructors Deem Necessary

Conclusion

This proposal aims to deliver a comprehensive and engaging learning experience using a virtual platform, ensuring students are well-prepared for their professional careers in surveying. By leveraging the platform's capabilities, we can provide a structured, interactive, and effective educational program that will provide the classroom component required by the Voluntary Apprenticeship Act (Code 40.1-117 – 40.1-126).

*** Additional Modules to be included if need be. Additional modules may be created to fit state specific needs in lieu of VA based curriculum***