Apprentice Program

Contents

Welcome

Congratulations on becoming a new apprentice with the Eastern Municipal Water District (EMWD). This apprenticeship program will allow you to receive comprehensive training while receiving full wages and benefits. At the successful completion of the program, the apprentice will be moved into the applicable job classification (i.e. Control Technician I) with all applicable benefits.

Introduction

Apprenticeship combines supervised structured on-the-job training with classroom instruction. The purpose of the program is to provide you with a comprehensive knowledge of your selected occupation. The Fitzgerald Act issued labor standards and enlarged the federal committee on apprenticeship. Adoptions of national standards were formed for various trades under this law, and to this day continue to be amended for the welfare of apprentices. As an apprentice, you will learn on-the-job under the supervision of a journeyperson, while working for EMWD. You will also attend related instruction classes at an approved training site. You will be paid according to a progressive schedule for wage increases over the term of your apprenticeship as listed on your Apprenticeship Agreement.

I. Apprentice Responsibilities

Apprenticeship training is an expensive investment for EMWD. Your signature on the Apprentice Agreement means that you have pledged your best efforts to succeed. You must take responsibility for your own success.

1. Work Safely – You must follow all safety rules and procedures
2. Attendance – You are expected to be at work and on time as scheduled. You must receive prior approval from your supervisor if you must be absent from work or school
3. Attend and participate in related instruction
4. Be involved and show dedication during training
5. Show respect to the skilled journeypersons training and supervising you
6. Comply with the provisions of the Apprentice Agreement
7. Follow EMWD's policies and procedures

II. Apprentice Agreement

Apprentices will be considered "at-will" employees and a condition of accepting an apprentice position. The apprentice agrees to continue employment with the District for a minimum of 12 months after receiving formal training courses or repay the District for the costs incurred for formal classroom training on a pro-rated basis, except in the event of a non-voluntary separation.

The Apprentice Agreement is a legal binding document between you and the District. The terms and conditions of your training are contained in the Agreement including start date of the apprenticeship. Pay raises are determined by the start date along with accumulation of work hours.

Your apprenticeship is valid only for the number of year/hours that are listed on your agreement. Failure to complete the required on-the-job training hours and related classroom instruction in this time frame will result in termination or cancellation from the program.

The District is investing costs and resources to help you succeed through the program.

Please take time to review your copy of the Agreement. It should be thoroughly understood.

III. Qualifications

A. Acceptance of terms of this program.
B. Age Requirement- Minimum age of all applicants to be at least 18 years.
C. Applicants shall have a High School diploma or GED
D. Current EMWD employees wishing to opt into the apprenticeship program agree to the terms and conditions of this program and agreement. Once the employee has opted to participate into this program, their prior position is considered relinquished.
E. Physical Examination – Applicants are subject to a pre-employment physical ability assessment/medical examination given without cost to the individual by a medical provider designated by EMWD.
F. Apprentice Entrance Exam – The practical exam is comprised of tests of general abilities relevant to the position. The written exam has a qualifying weight with a **minimum passing score of 70%**.
G. Oral interview Criterion and Weighting
    - Communication /Dedication 20%
    - Interpersonal Skills 10%
    - Conflict Resolution 10%
    - Adaptability and Flexibility 10%
    - Ability to Work with Others 10%
    - Initiative and Judgment 10%
    - Integrity 10%
    - Ability to Learn 10%
    - Work Ethic 10%
H. Qualification Evaluation

Relative weightings		
Written Exam	60%	
Oral Interview	40%	
Total	**100%**	**Minimum passing score is 70%**

I. Preference Points – Applicants will be evaluated on their previous work and educational experience, if any. A maximum of 25 additional points may be given toward the applicant's overall evaluation ranking where applicable upon proof.

Work Experience	Minimum of 6 months	5 Points
Job Related Courses	Taken in a high school shop class, regional occupational program, community college or technical school.	10 Points
Armed Services of the United States of America	With a discharge or release under conditions other than dishonorable in accordance with California Labor Code 3076.5	10 points

IV. At-will

Apprentices will be considered "at-will" employees and a condition of accepting an apprentice position.

Current EMWD employees who have previously completed initial probation will be subject to the terms and conditions of this agreement if they opt to participate in the Apprentice Program. Within 90 days of entering the apprenticeship program, a current EMWD employee will, at the employee's option or when an employee does not successfully demonstrate the ability to meet the District's required minimum performance standards, be returned to his previously held classification or a classification at the same salary range, at the same step he held before entering apprentice program. The employee's review date will be returned to the date in the previously held classification.

V. Related Instruction and the Importance of School Attendance

Apprenticeship training combines several aspects as part of an overall strategy to train a skilled worker. This strategy combines supervised, structured on-the-job training and related instruction.

It is the District's commitment to release you from work to attend the required training. Failure to attend is a violation of this apprenticeship program. Excessive absenteeism or

tardiness from training may lead to termination or cancellation of your apprenticeship. It is your responsibility to follow the training attendance notification procedure.

VI. Work Records

It is important and mandatory that you and the District maintain a record of your progress. Because the training extends over several years, a record is required to assure all parts of the program have been covered. Your training record will be maintained through the District's training application.

VII. Discipline

You may be subject to disciplinary procedures when failing to make satisfactory progress or failing to meet your responsibilities in the apprenticeship program.

Behaviors that could lead to disciplinary action up to and including termination of your apprenticeship include but are not limited to:

- Failure to abide by safety procedures and District policies
- Failure to follow work rules and procedures established by the District
- Disruptive behavior on-the-job or in related instruction
- Failure to follow the directions of your supervisor
- Failure to submit on-the-job-training records as required
- Failure to fulfill all related instruction requirements on a timely basis
- Unsatisfactory grades for related instruction courses
- Unsatisfactory attendance (including tardiness) for related instruction courses or at job site

VIII. Training Elements

The following training elements are integrated so that each reinforces the other:

On-the-Job Training – This is the actual day- to day hands-on work in which the apprentice "learns by doing"

Classroom Training – Established classroom courses conducted during regular working hours at approved training facilities. The EMWD has contracted with the Metropolitan Water District of Southern California (MWD) to provide the classroom training. Apprentice must follow the determined schedule provided by the MWD.

Home Study – There will be assignments to be completed away from the job and on your own time

IX. Testing, Retesting, and Evaluation

A. Testing Process
    1. Self-Study
        1. Chapter pre-post-examinations will be graded and recorded
        2. End of unit written examinations will be graded and recorded
    2. Classroom study
        1. Classroom and end of period related written final examinations will be graded and recorded
    3. On Job Training (OJT) Practical and Manipulative Training
        1. End of period practical examinations administered by the Apprentice's Team Manager or Proctor
    4. Demonstrated Proficiency Assessment (DPA) – Apprentices shall complete a DPA during their period of instruction. The DPA is defined as individual practical exercises that examine the Apprentice's knowledge, abilities, and competency in core areas specific to their trade.
        1. Apprentices shall demonstrate a minimum competency level of 70% on each of the exercises.
        2. The DPA exercises shall consist of practical tasks or grouping of practical tasks representative of Journey Level technical skills instructed on and practiced during the Program term.
        3. Inability to demonstrate proficiency (70%) on any one or more of the DPA exercises shall result in an apprentice being denied advancement until such time as the Apprentice can properly complete the respective deficiency.
        4. In the event the Apprentice needs remedial training in a specific area as determined during the DPA, the Apprentice's Supervisor and Manager will collaborate to provide an effective training plan for the Apprentice.

B. Minimum Passing Policy
    1. Examinations – minimum passing grade of 70%. Apprentice cannot advance to the next examination unless the previous examination has been satisfactorily completed.
        a. First failure of exam – retest within two weeks or before next class session whichever is sooner – holdback advancement for two weeks (calendar)

Upon request for a test reset from the apprentice, the Apprenticeship Program administrator will send out notification to the apprentice and the apprentice's supervisor indicating the reset and the overall number of test failures

When a second test attempt is successful, regardless of the score, the overall final score for the two tests combined will be 70%.

b. Second failure of exam – recommend to drop apprentice from program and cancel apprenticeship agreement

C. Performance Factors for Overall Performance Evaluation

1. Related Instruction (classroom and self-study) – 15%
2. OJT & Practical Exams – 85%
3. Retesting for failing a mid-term or final exam shall be subject to the approval of the apprentice's supervisor.

   If a mid-term or final exam is retaken the original score is retained.

4. Overall Rating Scale

	Unsatisfactory (<60%)	**Improvement Needed** (60% to 69%)	**Meets Standards** (70% to 79%)	**Exceeds Standards** (80% to 89%)	**Outstanding** (90% to 100%)
Grade	50%	60%	70%	80%	90% 100%
GPA	0	0.5 1	2	3	4

Overall Rating Examples:

Example # 1 Apprentice received 70% score on both Factors

Related Instruction 70% x 100 x 15%= 10.5

OJT / Practical 70% x 100 x 85%= 59.5

Total 70.0% (GPA 1.0)

Example # 2 Apprentice received 70% and 100% scores on Factors

Related Instruction 70% x 100 x 15% = 10.5

OJT / Practical 100% x 100 x 85% = 85.0

Total 95.5% (GPA 3.6)

X. Advancement Policy

A. An overall rating for period advancement requires a minimum passing GPA of 1.0 (70%)

1. This represents the combined grade point average of all written and practical examinations, plus job performance rating.
2. Exception: A period advancement with a minimum GPA of 0.5 (65%) will be allowed one time only, for one period only, during the course of the program.

B. Performance reviews will be performed on approximately six month intervals subject to the following:
    1. Accrual of a minimum 910 hours straight time hours of OJT with a minimum performance rating of “meets standards”.
    2. Satisfactory completion of all the required related and supplemental instruction classes and applicable examinations with a minimum performance rating of 70%.
    3. Approved advancements will become effective at the beginning of the first pay period following the approval.

C. Apprentices denied advancement due to unsatisfactory performance will be placed on an action plan and will be evaluated on a biweekly or monthly basis, as determined jointly by his or her supervisor and the program manager.
    1. Punitive Advancement Deferral
        a. Apprentice shall be held back two weeks for each failure of a written examination with a maximum of two failures of any single examination. Upon the second failure of the same examination, the apprentice shall be recommended for removal from the program.
        b. Apprentice shall be held back for insufficient accrual of the required OJT hours (<910), incomplete home-study, or incomplete examinations. The duration of the advancement withheld shall be contingent on the successful completion of the respective deficiency.
        c. Apprentice shall be held back for sufficient cause resulting from disciplinary actions, as provided in the applicable collective bargaining unit MOU.
    2. Non-Punitive Advancement Deferral
        a. Apprentice shall be held back for insufficient accrual of the required OJT hours (<910), as a result of family leave, medical leave, military leave, bereavement leave, industrial injury, jury duty, or any other protected leave.
        b. The amount of non-punitive deferral, if any, shall be contingent on the extent of the deficient OJT hours, and shall be evaluated on a case-by-case basis by his or her supervisor.
        c. The maximum amount of advancement deferral shall not exceed 12 1/2 % of the duration of the apprenticeship program without supervisor approval. Apprentice who is unable to achieve and maintain to the advancement schedule beyond the maximum

hold back period permissible, may be recommended for discharge.

3. Accelerated advancement may be permitted in an apprentice's final 6-month period for a maximum of the 12 ½% of the program duration where merited based on the following conditions and approval by his or her supervisor.
    a. The job performance rating for each period is "Exceeds Standards" or better.
    b. Apprentice has tested-out in all the related instruction class exams, all end of unit and final exams, job performance and practical exams, and the final demonstrated proficiency exam, and has achieved an average grade overall of 90% or better.
    c. A minimum of 87 ½% (6370 hours) of the required work progress hours have been completed and are balanced across all work progress hours by category.
    d. All safety training and facility specific or systems operations training have been completed.
    e. All required certifications have been acquired.
    f. Apprentice must request the accelerated advancement in writing to his supervisor.

CONDITIONS OF EMPLOYMENT AND LETTER OF ACCEPTANCE

Appointment as apprentice for the _____
(E.g. Control Technician)
Apprentice Program.

AFFIRMATION

The Eastern Municipal Water District (EMWD) has established this position as "at-will". This position contains a feature of required advancement. This means an apprentice must successfully demonstrate the ability to meet the District's required minimum performance standards in order to advance. As such, an apprentice's advancement in the program may be denied and could result in termination of their employment with the District.

Current EMWD employees opting to enter into the Apprentice Program relinquish their prior position after 90 days of entering into the program and are subject to the terms and conditions of the Apprentice Program.

I accept this condition without reservation and recognize that this requirement does not conflict with the employment policies or procedures of the EMWD.

Accepted

Employee Name (Print or Type)	Director of Human Resources or Designee (Print or Type)
Employee Signature	Director of Human Resources or Designee Signature
Date	Date

APPRENTICE AGREEMENT

Last Name	*First Name*	*Middle*	*Social Security Number*

Address	*Birthdate (mm/dd/yy)*	*Veteran Yes* ☐ *No* ☐
	County of Residence	
Occupation **Control Technician**		DOT
Term of Apprenticeship	*Straight Time*	
7,280 Hours within 4 years	Hours per day: **10** Hours per week: **40**	

AGREEMENT: The undersigned parties mutually agree that they will use their best endeavors to secure employment and training for the apprentice. The apprentice agreed to perform satisfactorily all work and learning assignments. The provisions of the Apprenticeship Standards for the above occupation are hereby made a part of this agreement. The apprentice agreement will continue in effect until the training is completed or otherwise terminated in accordance with the standards.

The apprentice commences participation under these standards on the date of execution of this agreement by the apprentice. The apprentice is expected to complete training on or about _____20_____, upon satisfactory completion of the total remaining hours of on-the-job training and hours and /or units of related and supplemental instruction.

APPRENTICE: I, the undersigned apprentice, understand and agree that there is a valid and reasonable necessity that those academic records accumulated throughout related and supplemental instruction during my period of apprenticeship be made available to the EMWD. Further, I agree to release to the EMWD any other academic records which I feel may enhance my status as an apprentice.

Executed _____ day of _____ 20____ by _____
Day *Month* *Year* *Signature of Apprentice*

_____
Director of Human Resources

EXAMPLE OF ON THE JOB TRAINING HOURS

ELECTRICAL PROGRAM
APPRENTICE CONTROL TECHNCIAN
WORK PROCESSES – ON THE JOB (OJT) HOURS

Process Category	Description	Approx. Unit Hours	Approx. Program Hours
A	**Power Systems – Low Voltage – 12V,24V,36V,48V (Installation and Maintenance)**		**160**
	1. Battery Chargers	95	
	2. Low Voltage Power Supplies <u>Preventive Maintenance – Task Examples</u> a. Review safety precautions b. Replenish electrolytes and adjust c. Documentation <u>Corrective Maintenance – Task Examples</u> a. Review safety precautions b. Troubleshooting c. Disassemble, repair/replace, and assemble d. Rigging e. Testing and adjustments f. Documentation	65	
B	**Power Systems – Standard Voltage – AC/DC 120v thru 600V (Installation and Maintenance)**		**2750**
	1. Load Centers, Panelboards & Safety Switches	250	
	2. Circuit Breakers & Fuses	170	
	3. Controllers & Overload Protection	480	
	4. Uninterruptible Power Supplies	80	
	5. Motors	170	
	6. Generators & Alternators	170	
	7. General Conduit and Wiring (all systems)	960	
	8. Electrical Testing	170	
	9. Batteries	80	
	10. Material Handling	160	
	11. Grounding <u>Preventive Maintenance – Task Examples</u> a. Review safety precautions	60	

ELECTRICAL PROGRAM
APPRENTICE CONTROL TECHNCIAN
WORK PROCESSES – ON THE JOB (OJT) HOURS

Process Category	Description	Approx. Unit Hours	Approx. Program Hours
	b. Monitor, clean, inspect, and adjust c. Documentation <u>Corrective Maintenance – Task Examples</u> a. Review safety precautions b. Troubleshooting c. Disassemble, repair/replace, and assemble d. Rigging e. Testing and adjustments f. Documentation		
C	**Power Systems – High Voltage- over 600V (Installation and Maintenance)**		**240**
	1. Substations/Switchrack Arrangements	20	
	2. Circuit Breakers & Fuses	90	
	3. Disconnect Switches	60	
	4. Capacitors	20	
	5. Transformers	25	
	6. Grounding <u>Preventive Maintenance – Task Examples</u> a. Review safety precautions b. Monitor, clean, inspect, and adjust c. Documentation <u>Corrective Maintenance – Task Examples</u> a. Review safety precautions b. Troubleshooting c. Disassemble, repair/replace, and assemble d. Rigging e. Testing and adjustments f. Documentation	25	
D	**Lighting Systems (Installation and Maintenance)**		**350**
	1. Incandescent	35	
	2. Fluorescent	140	
	3. Low Voltage and Specialty	35	
	4. High Intensity Discharge (HID) <u>Preventive Maintenance – Task Examples</u> d. Review safety precautions e. Monitor, clean, inspect, and adjust	140	

ELECTRICAL PROGRAM
APPRENTICE CONTROL TECHNCIAN
WORK PROCESSES – ON THE JOB (OJT) HOURS

Process Category	Description	Approx. Unit Hours	Approx. Program Hours
	f. Documentation Corrective Maintenance – Task Examples g. Review safety precautions h. Troubleshooting i. Disassemble, repair/replace, and assemble j. Rigging k. Testing and adjustments l. Documentation		
E	**Control Systems (Installation and Maintenance)**		**1400**
	1. DC Controls (motors and circuit breakers)	150	
	2. AC Controls (motors and circuit breakers)	460	
	3. SCADA	150	
	4. Programmable Logic Controllers (PLC)	180	
	5. Process Controls	220	
	6. Electric Doors & Entrance Gates	20	
	7. Air Conditioning & Heating Controls	40	
	8. Variable Speed Controllers Preventive Maintenance – Task Examples a. Review safety precautions b. Monitor, clean, inspect, and adjust c. Documentation Corrective Maintenance – Task Examples a. Review safety precautions b. Troubleshooting c. Disassemble, repair/replace, and assemble d. Rigging e. Testing and adjustments f. Documentation	180	
F	**Signal/Instrumentation Systems (Installation and Maintenance)**		**220**
	1. Fire Alarms	45	
	2. Public Address/Sound (PA)	10	
	3. Telephone	20	
	4. Close Circuit TV	45	
	5. Security Systems	65	
	6. Annunciators	25	

ELECTRICAL PROGRAM
APPRENTICE CONTROL TECHNCIAN
WORK PROCESSES – ON THE JOB (OJT) HOURS

Process Category	Description	Approx. Unit Hours	Approx. Program Hours
	7. Grounding <u>Preventive Maintenance – Task Examples</u> a. Review safety precautions b. Monitor, clean, inspect, and adjust c. Documentation <u>Corrective Maintenance – Task Examples</u> a. Review safety precautions b. Troubleshooting c. Disassemble, repair/replace, and assemble d. Rigging e. Testing and adjustments f. Documentation	10	
G	**Operational Procedures**		**400**
	1. Filtration Plant <u>Task Examples</u> a. Assist with plant operator duties	N/A	
	2. Pump Plant <u>Task Examples</u> a. Assist plant operator b. Perform plant operator duties	N/A	
	3. Desalination Plant <u>Task Examples</u> a. Assist with plant operator duties b. Perform plant operator duties	N/A	
	4. Distribution System a. Control structure/hydro plant change over	N/A	
	5. Switching and/or Valving (All)	N/A	
H	**Safety, Job Preparation and Documentation**		**1760**
	1. Apprenticeship Classes (see separate related instruction list)		640
	2. Travel – Apprentice Classes		160
	3. Team Briefings, Toolbox Safety Meetings, Other EMWD Meetings and work Tech Timekeeping		720
	4. Other EMWD Training		240
	Total Program Hours Required		**7280**

EXAMPLE OF ELECTRICAL PROGRAM CURRICULUM

- Applied Mathematics and Mensuration
- Industrial Safety
- Electrical Operation and Maintenance Fundamentals
- Hand and Power Tools
- Drawings and Schematics
- Meters and Test Equipment
- Motor Theory and Maintenance
- Lighting Systems
- Advanced Electricity and Electrical Systems
- Electrical Systems Troubleshooting
- Electronics for Electricians
- Process Control Systems and PLC's
- Signal/Instrumentation Systems
- Electrical Systems Installation
- High Voltage Systems and Equipment
- Water Treatment Operations
- Water Distribution Operations
- Maintenance Management

1st Period Combined
Electrical / Mechanical

Item	Subject	Text	Assignment	Approx Class Hours
1	Period Orientation		Distribution of Materials	0
2	Industrial Health and Safety	TPC #109	All 12 Lessons – Explains government involvement in ensuring a safe workplace. Covers ergonomics, environmental responsibility, and importance of maintaining a safe work environment. Prepare LPT worksheets.	0
3	Review of Industrial Safety and Health	TPC #109	Attend Class – Review materials studied, provide opportunities to discuss topics, apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
4	Using Hand Tools	TPC #107	Lessons 1, 2 3, 5, 6, 8, 9, 10 – Covers the most important hand tools used on the job. It ends with hoisting and pulling tools commonly used in all trades. Prepare LPT worksheets.	0

5	Portable Power Tools	TPC #108	Lessons 1 through 6, 8 through 10 – Covers the uses, selection, safety and care of industrial power tools. Also covers sharpening techniques for selected tools. Prepare LPT worksheets.	0
6	Review of Hand Tools and Portable Power Tools	Instructor Materials	Attend Class – Review materials studied, provide opportunities to discuss topics, apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
7	Plant Math	TPC #103	All Lessons – Begins by introducing mathematical basics, including numerals, subtraction, addition, division, multiplication, fractions, decimal fractions, ratios, proportions, powers and roots. Also includes calculator uses. Covers Algebra, geometry and trigonometry as it applies to daily maintenance tasks. Prepare LPT worksheets.	0
8	Basic Measurements	TPC #104	All Lessons – Covers units of measurements covered in commercial and industrial applications. Applicable to all trades. Prepare LPT worksheets.	0
9	Review of Plant Math and Basic Measurements, plus **Midterm Exam**	Instructor Materials	Attend Class – Review materials studied, provide opportunities to discuss topics, apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session. The **Midterm exam** will be administered the first day of class.	24
10	Basic Mechanics	TPC #301	Lessons 1, 2, 3, 4, 5, 9 and 10 – Covers work and energy and fluid mechanics as applied in industrial maintenance as it applies to both electrical and mechanical applications. “Awareness level only” Prepare LPT worksheets.	0
11	Basic Electricity	TPC #201	Lessons 1- 4 – Covers non-mathematical approach to understanding principles of electricity. Introduces electron theory, static electricity, electron in motion and magnetism. “Awareness level only” Prepare LPT worksheets.	0
12	Lubricants and Lubrication	TPC #302	Lessons 1, 2 and 9 – Principles and characteristics of lubricants. Includes the proper selection, safe handling and the proper storage of lubricants. “Awareness level only”	0
13	Introduction to Bearings	TPC #304	Lessons 2 & 6 – Principles and applications of various types of bearings. Includes bearing seals, lubrication and maintenance practices. “Awareness level only”	0

14	Basic Mechanics, Basic Electricity, Introduction to Lubricants, Lubrication, and Bearings	Instructor Materials	Attend Class – Review materials studied, provide opportunities to discuss topics, apply related hands-on experimentation for further clarification.	16
15	Instructor Materials	Handouts	Potential for instructor materials.	0
16	Period 1 Final Exam	Instructor Materials	Attend Class – Review materials studied, provide opportunities to discuss topics, apply related hands-on experimentation for further clarification. Review for written and practical Final Exam.	16
			Total Hours	97

2nd Period

Item	Subject	Text	Assignment	Approx Class Hours
1.	Basic Electricity & Electronics	TPC201 – Chapters 5 through 10	Read and Study TPC201 Chapters 5 through 10	
2.	Electric Circuit Basics	Arasmith, Electrical Fundamentals for Water and Wastewater	Arasmith Chapter 2, Electric Circuit Basics	
3.	DC Circuits and Batteries	TPC202 – DC Circuits and Batteries	Covers batteries, chemical action and other chemical action processes, DC circuits – series, parallel and series-parallel	
4.	Related Instruction, Session #1, 12E2.1	TPCs 201 & 202, Arasmith Chap 2	Attend Class – Review material studied, preview new assignments. Provide overview of material to be covered in next session.	16h
5.	Electromagnetism, Inductance & Capacitance	Arasmith, Electrical Fundamentals for Water and Wastewater	Arasmith Chapter 3, Electromagnetism, Inductance & Capacitance.	
6.	Transformers & AC Circuits	TPC203 – Transformers & AC Circuits	Covers differences between DC & AC circuits, AC sine-waves, vectors, calculating impedance, capacitance, & resistance. AC power relationships single-phase & three-phase. Transformer maintenance.	
7	Related Instruction, Session #2, 12E2.2	TPC203, Arasmith Chap 3	Attend Class – Review material studied, preview new assignments. Provide overview of material to be covered in next session.	16
8	Measuring Volts, Amperes, & Ohms	Arasmith, Electrical Fundamentals for Water and Wastewater	Arasmith Chapter 7, Electrical Measurements	
9	ABCs of Multimeter Safety	IHO21A, Fluke Application Note	**I**nstructor **H**and-**O**ut 21A is about multimeter safety and recognition of a safe device for the measurements intended.	
10	Electrical Measuring Instruments	TPC204.1 Electrical Measuring Instruments	Electrical Test Instruments operating principles – voltmeter, ammeter, ohmmeter, wattmeter, megohmmeters, and oscilloscopes	

11	Related Instruction, Session #3, 12E2.3 Plus MIDTERM	Arasmith Chapter 7, IHO21A, TPCs 204	Attend Class – Review materials studied. Provide overview of material to be covered in next session. Midterm morning of second day to cover:TPCs201 (5-10), 202, 203; Arasmith 2 & 3.	16
12	Electrical Safety & Protection	TPC205 – Electrical Safety & Protection	Equipment & procedures used to work safely with electricity – PPEs, Lockout-Tagout, First-Aid, grounding, fuses breakers & protection devices	
13	NEC2008 Introduction Article 90	NEC2008, Article 90	90 – Introduction	
14	Welding Inspection Technology	Welding Inspection Technology, IHO21B	This subject section provides information on the differences between code, standard & specification.	
15	Circuit Diagrams	PHEP Chapter 13 – Circuit Diagrams	An in-depth view of the drawing symbols used very early in the industry and on many MWD drawings	
16	Related Instruction, Session #4, 12E2.4	NEC2008 90, IHO21B, PHEP Chap 13 & TPC205	Attend Class – Review materials studied, preview new assignments. Provide overview of material to be covered in next session.	16
17	Related Instruction, Session #5, 12E2.5; Plus FINAL	TPCs, 204, 205; Arasmith Chapter 7; IHO21A & 21B, Principles of Hydroelectric Power Chapter 13	Review for the Period 2 FINAL Exam. All other time will be spent on Motor Circuit Simulator lab.	16
			Total Hours	90

3rd Period				
Item	**Subject**	**Text**	**Assignment**	**Approx Class Hours**
1	Basic Electrical Theory	Petruzella: *Electricity for the Trades* Ch 19	Ch 19 DC Series-Parallel Circuits. Pg 451-490. Do review exercises for LPT	
2	Basic Electrical Theory	Arasmith: *Electrical Fundamentals for Water and Wastewater*	Chapter 2 Electric Circuit Basics Pg 25-78	
3	Basic Electrical Theory	Kuphaldt: *All About Circuits*	Socratic Worksheets from www.allaboutcircuits.com: 1) parallel DC Circuits; 2) Series-Parallel DC Circuits	
4	Industrial Rigging	TPC 318 *Industrial Rigging*	Entire Book Read and prepare LPT	
5	Industrial Rigging	Jacobson: *Knot Tying for the Outdoors*	Read book and practice basic knots using rope.	
6	Electric Motor Control	Petruzella: *Electric Motors and Control Systems*	Chapter 1 Safety Pg 1-13. Read only.	
7	Electric Motor Control	Amatrol MT85 Motor Control Training System	LAP (Learning Activity Packet) 1 Introduction to Electric Motor Control. Read Objectives and complete Self-Check Quizzes.	
8	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
9	Basic Electrical Theory	Petruzella: *Electricity for the Trades* Ch 21	Ch 21: DC and AC Pg 527-573. Do review questions.	
10	Basic Electrical Theory	Arasmith: *Electrical Fundamentals for Water and Wastewater*	Lesson 3 Electromagnetism, Inductance and Capacitance Pg 79-106 Do review questions	

11	Basic Electrical Theory	Kuphaldt: *All About Circuits* Socratic Worksheets from www.allaboutcircuits.com:	1) AC Waveforms; 2) Peak, Average and RMS Measurements	
12	Reading Industrial Drawings	TPC 101 *Reading Blueprints*	Read entire book and prepare LPT packet	
13	Reading Industrial Drawings	Arasmith: *Electrical Fundamentals for Water and Wastewater*	Lesson 6: Reading Electrical Diagrams Pg 233-283 Do review worksheet.	
14	Reading Industrial Drawings	Petruzella: *Electric Motors and Control Systems*	Ch 2 Understanding Electrical Drawings, Parts 1, 2: pg 14 - 24	
15	Electric Motor Control	Amatrol MT85 Motor Control Training System	LAP 2 Manual Motor Control. Read Objectives and complete Self-Check Quizzes.	
16	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
17	Basic Electrical Theory	Petruzella: *Electricity for the Trades* Ch 22	Ch 22: Inductance and Capacitance Pages 575-613. Do review exercises for LPT.	
18	Basic Electrical Theory	Kuphaldt: *All About Circuits* Socratic Worksheets from www.allaboutcircuits.com:	1) Inductance 2) Inductive Reactance 3) Capacitance 4) Capacitive Reactance	
19	Reading Industrial Drawings	TPC 102 *Reading Schematics and Symbols*	Lessons 1 - 9	
20	Electric Motor Control	Amatrol MT85 Motor Control	LAP 3 Control Transformers. LAP 4 Control Ladder Logic. Read Objectives and complete Self-Check Quizzes.	

		Training System		
21	Electric Motor Control	Arasmith: Electrical Fundamentals for Water and Wastewater	Lesson 5: Control System Components Pg 187-231. Do Review Questions starting on pg 229.	
22	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
23	Basic Electrical Theory	Petruzella: Electricity for the Trades Ch 23	Ch 23: Resistive, Inductive, Capacitive (RLC) Circuits in Series, Pgs 615-683. Do review exercises for LPT.	
24	Basic Electrical Theory	Kuphaldt: *All About Circuits* Socratic Worksheets from www.allaboutcircuits.com:	1) Series and Parallel AC Circuits 2) Resonance	
25	Basic Motor Control	Petruzella: *Electric Motors and Control Systems*	Ch 4 Motor Control Devices Pgs 60-86	
26	Electric Motor Control	Amatrol MT85 Motor Control Training System	LAP5 Control Relays and Starters. LAP 6 Introduction to Troubleshooting. Read Objectives and complete Self-Check Quizzes.	
27	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session. This class includes a written Mid-Term Exam.	24
28	Basic Electrical Theory	Arasmith: *Electrical Fundamentals for Water and Wastewater*	Lesson 8: Normal Operations Pg 325-389 Do review questions	
29	Basic Electrical Theory	Petruzella: *Electricity for the Trades* Ch 24	Ch 24: Resistive, Inductive, Capacitive (RLC) Circuits in Parallel Pgs 685-743. Do review exercises for LPT.	

30	Basic Electrical Theory	Kuphaldt: *All About Circuits* Socratic Worksheets from www.allaboutcircuits.com:	1) Resonance 2) Passive Filter Circuits	
31	Basic Motor Control	Petruzella: *Electric Motors and Control Systems*	Ch 6 Contactors and Motor Starters, Pgs 135-158.	
32	Electric Motor Control	Amatrol MT85 Motor Control Training System	LAP 7 Systems Troubleshooting. Read Objectives and complete Self-Check Quizzes.	
33	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
34	Basic Electrical Theory	Petruzella: *Electricity for the Trades* Ch 25	Ch 25: Transformers. Do review questions.	
35	Basic Electrical Theory	Kuphaldt: *All About Circuits* Socratic Worksheets from www.allaboutcircuits.com:	1) Mutual Inductance 2)Transformers: Step-up and Step-down. 3) Autotransformers.	
36	Basic Electrical Theory	*Principals of Hydroelectric Power*	Ch23 Transformers. Do Progress Check Questions at end of chapter.	
37	Basic Electrical Theory	Arasmith: *Electrical Fundamentals for Water and Wastewater*	Lesson 4: The Power System. Pg 104-185. Do review questions in the book.	
38	Basic Motor Control	Petruzella: *Electric Motors and Control Systems*	Ch 8: Motor Control Circuits. Pg 187-203	
39	Electric Motor Control	Amatrol MT85 Motor Control	LAP 8Reversing Motor Control. Read Objectives and complete Self-Check Quizzes.	

		Training System		
40	Related Classroom Instruction		Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	24
			Total Hours	**112**

4th Period

Item	Subject	Text	Assignment	Approx Class Hours
1	MWD Electrical Safety	HSE 112	Covers specific electrical safety requirements for personnel	
2	Troubleshooting Skills	TPC110, Troubleshooting Skills	General overview of troubleshooting, working with people, techniques, aids, schematics, mechanical, electrical, breakdown & planned maintenance.	
3	Related Instruction, Session #1, PE4.1	MWD HSE 112 & TPC110	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	24
4	Electrical Troubleshooting	TPC210, Electrical Troubleshooting	Troubleshooting with schematics, diagrams, control circuits, individual devices, special devices, AC & DC motor circuits, lighting systems and time considerations.	
5	NEC Articles 100 – 230	NEC2002, Articles 100 - 230	Orientation with specific demonstrations for/on: Definitions; Requirements for Electrical Installations; Use and Identification of Grounded Conductors; Feeders, Branch-Circuit and Feeder Calculations; Outside Branch-Circuits and Feeders; and Services.	
6	Related Instruction, Session #2, PE4.2	TPC210 & NEC Articles 100 - 230	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
7	Overcurrent Protection, NEC Article 240	NEC2002, Article 240	Specific orientation to overcurrent protection, location, coordination and high voltage considerations.	
8	Grounding, NEC Article 250	NEC2002, Article 250	Orientation with the grounding article of the NEC.	
9	Surge Arrestors, Transient Voltage Surge Suppressors, & Wiring Methods	NEC Articles 280, 285, & 300	Orientation to installation & connection to surge arrestors and suppressors, and wiring method requirements.	

10	Related Instruction, Session #3, PE4.3	NEC2002 Articles 240 to 300	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session. MIDTERM Exam on HSE112, TPC110 & 210, and NEC articles 110 thru 230 (that means inclusive of 230).	16
11	All about conductors, NEC Article 310	NEC2002, Article 310, Chapter 9 Tables, & Annexes C & D.	Everything you always wanted to know about conductors, but were afraid to ask.	
12	Places for electrical connections, terminations and splices.	NEC2002 Articles 312 & 314	Covers: Cabinets, Cutout Boxes, & Meter Sockets; Outlet, Device, Pull and Junction Boxes.	
13	Related Instruction, Session #4, PE4.4	NEC2002 Articles 310 - 314	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
14	Related Instruction, Session #5, PE4.5; Review for Period 4 Final	MWD/HSE 112, TPC110 & 210, and NEC2002 Articles 100 to 314.	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification of material covered in Period 4. Provide overview of material to be covered in next Period, 5 (only four more periods to go).	16
			Total Hours	97

5th Period

Item	Subject	Text	Assignment	Approx Class Hours
1.	Electrical Troubleshooting Skills	TPC 210 Developing Electrical Troubleshooting Skills	Troubleshooting using various drawings. Troubleshooting electrical circuits and devices. Complete LPT	
2.	NEC Definitions & Installation Requirements	NEC2008 Articles 100, 110	Read National Electrical Code (NEC) Articles 100, 110; Complete related Holt Workbook Exercises.	
3.	Timers	Amatrol LAP 10	Fundamentals of time delay control. Read and study the contents of LAP 10, complete the self-review study guides at the end of each segment.	
4.	Related Instruction, Session #1 PE5.1	TPC 210 Holt Workbook NEC 100, 110 LAP 10	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session. Lab: LAP 10	16
5.	Semiconductors	TPC251, Semiconductors	Read and Prepare LPT. Theory behind semiconductor operation. Characteristics and operation of various diodes and transistors. Environmental considerations, electrostatic discharge, printed circuit boards, radio frequency interference, manufacturer's spec sheets, circuit performance and Q points.	
6.	Meters & Testers	TEES: Chapter 5	Meters and Testers; Complete text activities sheets and related workbook tech-check, trade test sheets	
7.	Grounded Conductors; Branch Circuits; Feeders; Calculations; Outside Branch Circuit & Feeders	NEC2008 Art 200, 210, 215, 220, 225	Grounded conductors, branch circuits, feeders, calculations, outside branch circuits. Complete related Holt Workbook sections.	
8.	Introduction to VFD	Amatrol LAP #16	Basic fundamentals of a typical AC drive: learn to wire and program a VFD to operate with external controls. Read and study the Learning Activity Packet #16 and complete the Self Review Questions prior to Related Instruction 5.2.	
9.		TPC251,		16

	Related Instruction, Session #2, PE5.2	NEC 200, thru 225 Holt Workbook Amatrol LAP 16	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	
10.	Power Supplies	TPC252, Power Supplies	Power Supplies and power conditioners. Cells and batteries. Rectifiers, filters, voltage regulators. Troubleshooting power supplies.	
11.	Special Meters & Instruments	TEES: Chapter 6	Ch 6: Special Meters & Instruments Ch 7: Basic Electrical Circuit Measurement Complete text activities sheets and related workbook tech-chek, trade test sheets	
12.	Services and Overcurrent Protection	NEC2008 Art 230, 240	Services, Overcurrent Protection Complete related Holt Workbook sections.	
13.	VFD Speed & Torque Control	Amatrol LAP 17	Speed control with VFDs including operations above base rated. Compensations for some losses in torque. Read and study the Learning Activity Packet #17 and complete the Self Review Questions prior to Related Instruction 5.2.	
14.	Related Instruction, Session #3, PE5.3	TPC252 NEC Articles 230 & 240 TEES: Ch 6 Amatrol LAP 17	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
16.	Midterm exam	TPC 210 TPC 251 TPC252 TEES: 5 & 6 NEC2008 Arts 100-230	Review previous materials. Discus topics, Written mid-term test.	8
17.	Electrical Circuit Measurement	TEES: Chapter 7	Basic Electrical Circuit Measurement Complete text activities sheets and related workbook tech-chek, trade test sheets	
18.	Relays and Motor Starters	TEES: Chapter 8	Relays and motor starters. Complete text activities sheets and related workbook tech-cheks and trade test sheets	
19.	Grounding, Surge Protectors	NEC2008 Art 250, 280, 285	Grounding, Surge Protectors Do related Holt Workbook sections.	

20.	VFD Accel, Decel, & Braking	Amatrol LAP #18	Acceleration, deceleration, and braking controls with a VFD. Read and study the Learning Activity Packet #18 and complete the Self Review Questions prior to Related Instruction 5.3.	
21.	NEC Art 300, 310	NEC Art 300, 310	Wiring Methods, Conductors These articles will provide guidance on choosing and installing wiring methods and conductors. Do related Holt Workbook sections.	
22.	VFD Faults & Troubleshooting	Amatrol LAP #19 plus instructor generated exercises.	Troubleshooting circuits that contain VFDs; not only mechanical & electrical problems causing malfunctions, but programming errors too – a bit more complicated. Read and study the Learning Activity Packet #19 and complete the Self Review Questions prior to Related Instruction 5.5.	
23.	Related Instruction, Session #4, PE5.4	TEES CH 8 NEC250, 280, 285 NFPA 70E Amatrol LAP 18.	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification.	16
24.	Related Instruction, Session #5, PE5.5	NEC Art 300, 310; Amatrol LAP 19	Attend Class – Review materials studied, provide opportunities to discuss topics, and apply related hands-on experimentation for further clarification. Provide overview of material to be covered in next session.	16
			Total Hours	100

6th Period

Item	Subject	Text	Assignment	Approx Class Hours
1.	Programmable Logic Controllers	PLC LAP#1 – Introduction to Programmable Controllers	Read and Study the PLC LAP#1. Answer all of the Self Review Questions in preparation for the first session of Period 6	
2.	Related Instruction, Session #1, PE6.1	PLC LAP#1 – Introduction to Programmable Controllers	Introduction to the Amatrol PLC simulator. Complete the Learning Activity Packet #1	16
3	Phase Converters, Capacitors, Resisters & Reactors, Storage Batteries, & Equipment Over 600V	NEC2002 Articles 455 – 490	There are no Holt questions for these articles. However, there will be *Instructor* type questions to improve your understanding of these articles.	
4	Introduction to Process Controls	TPC271, Introduction to Process Controls	Covers the function of basic devices for measuring and controlling different kinds of variables in process control.	
5	Basic PLC Programming	PLC LAP#2 – Basic PLC Programming	Read and Study the PLC LAP#2. Answer all of the Self Review Questions. Enter, edit and store PLC programs using PLC software; PLC memory, how it's organized, and what types of numbering systems are used with the PLC	
6	Related Instruction, Session #2, PE6.2	NEC2002 Articles 455 – 490, TPC271, and Amatrol's PLC LAP #2	Attend Class – Review material studied, preview new assignments, and concentrate on PLC lab LAPs. Circuits design from verbal description of characteristics and other assignments for the PLC labs. Provide overview of material to be covered in next session.	16
7	Hazardous (Classified) Locations	NEC2002 Article 500 – Class I, II, & III, Divisions 1 & 2.	Electrical, electronic wiring requirements for all voltages in the Classes with Divisions in flammable gases, vapors, liquids, dusts, fibers, & flyings environments.	
8	Circuit Diagrams	Principles of Hydroelectric	Great training for the symbols and drawing methods used by the District in its older existing facilities.	

		Power (PHEP), Chapter 13		
9	Electrical Energy Conservation	TPC380, Electrical Energy Conservation	Commercial and industrial electric energy consuming devices, rate structures, cost and load management, PF calculations and how it affects energy usage, lighting surveys, light selection for efficiency.	
10	PLC Motor Control	PLC LAP#3 – PLC Motor Control	Read and Study the PLC LAP#3. Answer all of the Self Review Questions. Memory logic elements, adding comments, copy and paste sections of programs.	
11	Related Instruction, Session #3, PE6.3	NEC2002 Article 500, PHEP Chap 13, TPC380, and Amatrol's PLC LAP#3	Attend Class – Review materials studied, preview new assignments, and concentrate on PLC lab LAPs. Circuits design and other assignments for the PLC labs. Provide overview of material to be covered in next session.	16
12	Class I Hazardous locations	NEC2002, Articles 501	Specifically Class I locations	
13	Direct Current Circuits	PHEP Chapter 14 – Direct Current Circuits	An in-depth view of direct current circuits	
14	Class II & III Hazardous Locations and Intrinsically Safe Systems	NEC2002, Articles 502 - 504	Specifically Class II & III and Intrinsically Safe Systems	
15	Discrete I/O Interfacing	PLC LAP#4 – Discrete I/O Interfacing	Read and Study the PLC LAP#4. Answer all of the Self Review Questions. Learn to interface a number of different I/O devices and test their operations	
16	Related Instruction, Session #4, PE6.4 PLUS MIDTERM	NEC2002 Articles 501 & 502 and PHEP Chap. 14, & Amatrol's PLC LAP#4	Attend Class – Review materials studied, preview new assignments, and concentrate on PLC lab LAPs. Circuits design and other assignments for the PLC labs. Provide overview of material to be covered in next session. Midterm to cover TPCs 271 & 380, NEC2002 455 through 501, and Principles of Hydroelectric Power (PHEP) Chapter 13 - Circuit Diagrams.	16
17	Alternating Current Circuits Single-Phase	PHEP Chapter 17 – Alternating Current Single-Phase	An in-depth working of Single Phase circuits to include vector relationship of inductance, capacitance, and resistance	

18	Three-Phase Alternating Current Circuits	PHEP Chapter 18 – Three-Phase Alternating Current Circuits.	An in-depth working of three phase circuits to include vector relationship of inductance, capacitance, and resistance	
19	PLC Event Sequencing	PLC LAP#5 Event Sequencing	Design and interpret PLC programs that control the sequence of operations of entire machines.	
20	Related Instruction, Session #5, PE6.5	PHEP Chapters 17 & 18 and Amatrol' PLC LAP#5	Attend Class – Review materials studied and concentrate on PLC lab LAPs. Circuits design and other assignments for the PLC labs.	16
21	Related Instruction, Session #6, PE6.6; Review for Period 6 Final AND FINAL	NEC2002 - 501 through 504; PHEP Chapters (with supplements) 14 - Direct Current Circuits, 17 - Alternating Current Circuits Single Phase, & 18 - Three Phase Alternating Current Circuits; and the PLC LAPs 4 & 5.	Review for the Period 6 FINAL Exam to cover all text material in Text column. All other time will be spent on PLC lab experiments	16
			Total Hours	106

7th Period

Item	Subject	Text	Assignment	Approx Class Hours
1		Water Treatment Plant Operation Vol I & II,	Chapters 1, 2 for first class. Additional chapters will be assigned in class.	
2	Water Treatment	Water Treatment Plant Operation	Five 8-hour classes on designated Thursdays	40
3	Motor Electrical Problems; Troubleshooting AC Motors	Troubleshooting Electrical Electronic Systems (TEES), Mazur & Proctor, 2nd Ed, Text and Workbook;	Ch 10, Motor Electrical Problems; Ch 13 Troubleshooting AC Motors;	
4	Safety Related Work Practices	Standards for Electrical Safety in the Workplace (NFPA 70E)	Introduction and Chapter 1 Pages 3-155, Annex C Pages 211-213	
5	Electrical Safety	MWD HSE 112 Electrical Safety Program	Purpose, Definitions, Requirements, Training, Responsibilities Pages 1-3	
6	Electrical Safety	All About Circuits, Tony Kaupalt, et al. (e-book)	Read: http://www.allaboutcircuits.com/vol_1/chpt_3/index.html and complete Socratic worksheet on Arc Flash and Arc Blast:	
7	Electrical Safety	Electrical Fundamentals for Water and Wastewater, Arasmith	Chapter 8, Normal Operations Pg 325-350, Ch 9, Troubleshooting 393-406 only (Read only)	
8	Related Instruction Session 7.3	TEES Ch 10, Ch 13; NFPA 70E Ch 1 +	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16

		Annex C; HSE112,		
9	Process Control	TPC 271 Introduction to Process Control	Lessons one through six	
10	Electrical Safety	NFPA 70E Handbook	Chapter 2, Safety Related Maintenance Requirements Pages 157-175, Annex E, F Pages 231-237	
11	Troubleshooting Motor Control Circuits	Troubleshooting Electrical Electronic Systems (TEES), Mazur & Proctor, 2nd Ed	Ch 16 Troubleshooting Motor Control Circuits Text and Workbook.	
12	Process Control	All About Circuits, Tony Kaupalt, et al. (e-book)	Electrical Instrumentation Signals: http://www.allaboutcircuits.com/vol_1/chpt_9/index.html. Read the first three "pages." No worksheet with this one.	
13	Related Instruction Session 7.4	TPC 271, TEES Ch 16, NFPA 70E Electrical Safety Ch 2	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
14	Troubleshooting Motor Drives	Troubleshooting Electrical Electronic Systems (TEES), Mazur & Proctor, 2nd Ed	Ch 17 Electric Motor Drives; Ch 18 Troubleshooting Electric Motor Drives, Text and Workbook	
15	Electrical Safety	NFPA 70E Handbook	Chapter 3 Pages 177- 205, Annexes F - N Pages 233-263	
16	Electrical Safety	MWD HSE 112 Electrical Safety Program	Appendix A - Safe Work Practices	
17	Related Instruction Session 7.5	TEES Ch 17, Ch 18; NFPA 70E Ch 3 + Annexes; HSE112 Appendix A;	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
			Total Hours	88

8th Period

Item	Subject	Text	Assignment	Approx Class Hours
1	Power Distribution	Troubleshooting Electrical Electronic Systems, 2nd Ed (TEES) Ch 14	Introduction to understanding and troubleshooting the design and faults of common power distribution systems and transformers	
2	Transformers	National Electrical Code (NEC) Article 450. Includes Mike Holt workbook questions.	Installing code compliant transformer installations. Includes Mike Holt workbook questions.	
3	Power Quality Lab	Handout.	Southern California Edison Power Quality Lab. Location to be announced.	8
4	Transformers	Principles of Hydro-Electric Power (PHEP) Ch 23: Transformers	Understanding the function and installation of transformers for power distribution and metering. Review questions for LPT.	
5	Related Classroom Instruction Session 8.1	TEES CH 14; NEC Art 450; PHEP Ch 23	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
6	Power Quality	TEES Ch 15	Understanding the effect power quality problems have on electrical systems.	
7	Electrical Safety	Handbook for Electrical Safety in the Workplace (NFPA 70E).	Ch 2 Safety Related Maintenance Requirements	
8	Related Instruction Session 8.2	TEES Ch 15; NFPA 70E Ch 2;	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
9	Lighting Circuits	TEES Ch19	Lighting terminology, lamps, and luminaires.	
10	Troubleshooting Lighting Circuits	TEES Ch 20	Troubleshooting lamps, luminaires, switching controls, ballasts and reading lighting blueprints.	

11	Safety requirements for special equipment	NFPA 70E Chapter 3	Electrolytic cells, batteries, battery rooms, lasers, power electronic equipment.	
12	Switches and Receptacles.	NEC Art. 404 and 406.	Switches and receptacles. Includes Mike Holt workbook questions.	
13	Related Instruction Session 8.3	TEES Ch 19 and 20; NFPA 70E Ch 3; NEC Art 404 and 406	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
14	Luminaires, lampholders and lamps.	NEC Art 410. Includes Mike Holt workbook questions	Achieving code compliance in installations with luminaires.	
15	Mechanical and Solid State Switches	TEES Ch 22	Troubleshooting circuits containing mechanical and solid state switches.	
16	Session 8.4 Related Instruction	TEES Ch 22; NEC Article 410	Attend Class: Review materials, discuss topics, and apply hands-on experimentation.	16
17	General Motor Maintenance	TEES Ch 26	Preventative maintenance, lubrication, mounting, recording meters, lockout/tagout enclosures, belt tracking.	
18	Session 8.5 Related Instruction	TEES CH 26; Session 8 Written Final Exam	Attend Class: Review materials, discuss topics, and apply hands-on experimentation. Note: this session will have an in-class end of unit test.	16
19	Period 8 Demonstrated Proficiency		Each student will be assigned one day only between dates	8
			Total Hours	96

WAGE SCALE

Will be based on current Board approved salary schedule

Apprentice Wage Scale	
1st Period	**Range 203 Step 1**
2nd Period	**Range 203 Step 2**
3rd Period	**Range 203 Step 3**
4th Period	**Range 203 Step 4**
5th Period	**Range 203 Step 5**
6th Period	**Range 203 Step 6**
7th Period	**Range 203 Step 7**
8th Period	**Range 203 Step 8**
At completion of program, participant to be placed at their applicable job classification.	