DEFENSE INFORMATION SCHOOL

6500 Mapes Road, Fort Meade, Maryland 20755

Mass Communications Systems Engineer Course (MCSE) - 46T1
Training Program of Instruction

Training Effective Date: 01 October 2025

Supersedes TPI Dated: 24 May 2016

Richard McNorton
Colonel, U. S. Army
Commandant

Intentionally Left Blank

CONTENTS

Intentionally Left Blank

COURSE PREFACE

Purpose

To provide military occupational training for the U.S. Army award of the 46T MOS. The MCSE course provides basic, entry-level concepts and practical skills required to set-up, operate and maintain mass communication systems including television systems in support of Army, joint and combined operations.

Reason for New Training Program of Instruction

This TPI updates the Broadcast Television Equipment Maintenance (BTVEM) course TPI dated 24 May 2016. Changes support training tasks validated by the Army's Training Task Selection Board (TTSB) completed on 12 June 2023. The TTSB also officially renamed the legacy BTVEM course as the Mass Communication Systems Engineer (MCSE) course and shortened the course from 124 training days to 88 training days.

Implementation Date

This TPI begins instruction on 01 October 2025.

Specialty Awarded

U.S. Army 46T MOS

Training Delivery / Training Length

Resident / 17 weeks, 3 days / 88 training days

Course Description

The course provides instruction in the fundamentals of electronics to include electrical safety, AC/DC current, voltage, corrosion control and the principles of troubleshooting. The students apply their new skills in the set-up and operation of studio systems, including radio and television studios, cameras and media storage to include digital editing, audio, maintenance, and transmission systems. The course concludes with a field

training exercise and course capstone assessment where the students set-up, troubleshoot and transmit audio visual products for distribution and archival purposes.

Service and Course Prerequisites

See the Army Training Requirements and Resources System (ATRRS) site: https://www.atrrs.army.mil/atrrscc/ for Service prerequisites. School code 212.

Point of Contact (POC)

The POC for this Training Program of Instruction is the Course Development Office: staffprovostcdo@dinfos.edu

For registration information, contact the DINFOS Registrar at dma.meade.dinfos.list.registrar@mail.mil

TRAINING TASK INVENTORY

This Training Task Inventory (TTI) incorporates feedback from 46T Subject Matter Experts at the June 2023 TTSB.

Terminal Learning Objectives	**Competency**	**Training Importance** High, Medium, Low
	Knowledge / Performance	**USA**
Module 1: Fundamentals		
1.0 Prevent potential electrical hazards	P	H
2.0 Identify characteristics of alternating and direct current	K	H
4.0 Identify powers of ten, decimals and metric prefixes	K	H
3.0 Describe corrosion and its preventive measures	K	H

Terminal Learning Objectives	Competency	Training Importance High, Medium, Low
	Knowledge / Performance	**USA**
5.0 Identify basic electronic circuit theory	K	H
6.0 Describe the use and functions of a multimeter	P	H
7.0 Identify differences between RC and RL filters	K	H
8.0 Identify Transformers and their characteristics	K	H
9.0 Identify power supply circuits and their characteristics	K	H
10.0 Identify digital circuits and their characteristics	K	H
11.0 Identify the Principles of troubleshooting		
Module 2: Computers and Networking		
12. Identify basic computer principles	K	H
13. Perform computer maintenance	P	H
14. Identify principles of LAN/WAN	K	H
21. Maintain a network media storage system	P	H
42.0 Identify a user interface platform	K	H

Module 3: Audio Systems		
Terminal Learning Objectives	**Competency**	**Training Importance** High, Medium, Low
	Knowledge / Performance	**USA**
24.0 Set up, operate and maintain an audio automation system	P	H
25.0 Identify the principles of an audio system	P	H
26.0 Maintain an audio automation system	K	H
27.0 Identify principles of an audio automation system	K	H
Module 4: Cameras and Photo/Video Editing Systems		
15.0 Perform signal measurements using test equipment	P	H
17.0 Identify principles of audio/video signals and their characteristics	K	H
19.0 Maintain a still and video camera	P	H
20.0 Identify principles of cameras	K	H
22.0 Identify principles of photo/video editing system	K	H
23.0 Maintain a photo/video editing system	P	H
Module 5: Production Systems		

28.0 Set up a Production System	P	H
29.0 Maintain a Production System	P	H
30.0 Identify principles of production systems	K	H
Module 6: Transmission Systems		
31.0 Maintain a transmitter system	P	H
32.0 Identify the principles of transmission	K	H
40.0 Construct a soldered cable connector	P	H
41.0 Construct an audio/video cable	P	H

Terminal Learning Objectives	**Competency**	**Training Importance** High, Medium, Low
	Knowledge / Performance	**USA**
33.0 Install a head-end system	P	H
Module 7: System Integration and installation basics		
34.0 Set up, operate and maintain a satellite link	P	H
35.0 Identify the principles of satellite transmission systems	K	H

36.0 Install a wire antenna system	P	H
37.0 Install a microwave system	P	H
38.0 Identify the principles of microwave systems	K	H
39.0 Identify safe and effective practices of installation	K	H

COURSE OUTLINE

Module narratives describe how the course is organized to meet the level of student competency as identified by the Terminal Learning Objectives (TLO's) listed in the TTI and include projected instructional hours for each module.

MODULE 1: Electronic Fundamentals **Academic Hours: 84**

Students will identify and comply with electronic safety applicable to electronics by learning to recognize and avoid potential dangers when working around electricity. They will also learn about safety measures relating to HAZMAT, OSHA, Army and shop standards. Students will identify powers of ten, decimals, and metric prefixes. They will describe basic electronic circuit theory including voltage, switches and circuit protection devices and their characteristics. The students will be able to identify alternating and direct current power fundamentals and their characteristics, such as series circuits, parallel circuits, AC sine wave, to include its frequency, cycle and wavelength. Students will describe AC power fundamentals including grounding, international power, single phase 110 and 220. They will also learn the functions and uses of a multimeter and oscilloscope. Students will identify filter circuits and their characteristics. They will identify transformers and their characteristics. In addition students will identify power supply circuits and their characteristics; identify digital circuits and their characteristics; and the characteristics of electrostatic discharge. Students will identify techniques to control and mitigate corrosion. Lastly, students will identify the principles of troubleshooting.

MODULE 2: Computers and Network Media Storage **Academic Hours: 88**

In module 2, students will identify basic computer principles including computer components, input and output devices, storage drives, operating systems and file maintenance. Students will perform computer maintenance by assembling and disassembling computer components, loading operating systems, and troubleshooting computer systems. Students will construct an audio visual/broadcast local area network by configuring workstations and file servers, discuss uninterrupted power principles, construct LAN cables, establish networks and security firewalls, and interface with AV sources. Students will identify principles of LAN/WAN including terminology, networking and file maintenance concepts, and storage. Students will maintain network media storage by performing operation and diagnostic checks, file maintenance and identifying media storage such as hard drives, flash storage, file servers, and cloud-based storage.

MODULE 3: Cameras — Academic Hours: 96

In Module 3, Students will use test equipment for signal measurements such as waveform monitors, vectorscopes, oscilloscopes, function generators and digital measurement devices. They will identify basic terminology of audio and video signals such as format, compression, and encoding and be able to distinguish between analog and digital audio and video signals. Students will learn to maintain a still and video camera and identify basic principles of cameras to include optical systems, light, lens systems, charge-coupled devices and digital signal processing principles. They will learn to troubleshoot a camera. Students will identify principles of non-linear editing as well as learn to perform non-linear editing and maintain a non-linear editing system.

MODULE 4: Audio Systems — Academic Hours: 104

In Module 4, Students will learn how to set up, operate and maintain an audio system by performing operation checks and troubleshooting studio systems. Students will identify principles of audio systems such as audio components, signal processing, block diagrams, impedance matching, signal principles, audio connectors, compression, digital audio interfacing, and audio distribution systems. They will identify the principles of an audio automation system and learn to perform maintenance on an audio automation system to include software, hardware, media file maintenance, and operation checks of audio automation systems. Students will learn to assemble an audio system by reviewing system layouts and diagrams, installing equipment to racks, installing AC power to racks, and preparing, installing and connecting cables and wiring. They will learn to construct audio cables. Students will configure audio consoles by identifying the principles of audio console operations and performing operational checks of audio consoles.

MODULE 5: Production Systems — Academic Hours: 104

In Module 5, Students will learn to set up, operate and maintain a production system by performing a production system build that includes an operations check and troubleshooting on the Production system. They will also identify principles of production systems such as safety considerations, types of studios, components and purpose of master control, studio automation, signal flow, studio audio and lighting, camera color matching and teleprompters. Students will learn to install a basic cable head-end system and identify its components and functions.

MODULE 6: Transmissions — Academic Hours: 192

In Module 6, Students will identify basic principles of transmissions by defining basic transmission terminology and modulation as well as identify usable frequency spectrum such as AM, FM, and TV. Students will operate and maintain a transmitter system by performing operational checks of a transmitter, utilizing transmission test equipment, setting frequency and output power, troubleshooting a transmitter system, and recording readings into maintenance logs. They will identify principles of transmission such as analog and digital RF transmissions, world-wide transmission standards, and the test equipment associated with transmission. They will perform soldering procedures by identifying principles of soldering, types of solder, safety procedures, American Wire Gauge (AWG) sizes, and soldering and desoldering components to a circuit board. Additionally they will construct soldered cable connections such as XLR, TRS, along with crimp connectors such as BNC, F-type, and LAN connectors.

MODULE 7: FTX — Academic Hours: 40

In Module 7, Students will learn to establish a satellite link by conducting a site survey, setting up the satellite dish, and performing dish alignments while adhering to safety precautions. They will identify principles of satellite transmission systems including types of digital modulation, the purposes and functions of an IRD, and different satellite transmission/receiver devices. Students will learn to erect a wire antenna system using guylines to secure it while adhering to safety precautions. They will establish a microwave link by conducting a site survey, setting up the microwave system, and verifying the link while adhering to safety precautions. They will identify principles of microwave transmission to include safety precautions, microwave spectrums, types, functions and applications of microwave links, the environmental considerations for microwave transmissions, and multipoint microwave distribution systems. Students will identify installation practices to include safety boards and review patch panels, hardware, maintenance of systems, equipment mounting and cabling audio visual equipment, and general installation practices. Students will perform integration practices by preparing, fabricating, testing, installing and dressing cables, and grounding the system. To accomplish this task they will be required to correctly use tools and parts, properly install connectors, and perform a final operational check.

MODULE 8: Capstone — Academic Hours: 40

In Module 8, Students will integrate all MCSE systems in an instructor given scenario. Students will set, operate and maintain, capture, edit and successfully broadcast and transmit a VI product. In order to accomplish this task they will be required to correctly use tools and parts, properly install connectors, and perform a final operational check.

Course Administration **Academic Hours: 12**

The course administration hours include student in- and out-processing, gear issue and graduation.

Total Course Hours: 704

MEASUREMENT PLAN

This Measurement Plan establishes procedures for evaluating student achievement of objectives in the MCSE course. All summative assessments are a permanent part of students' academic records and count toward their final grade. Each assessment is weighted to indicate its relative importance to the overall course grade.

Academic Standard:

Minimum academic standard: The minimum passing score for each evaluated item is 70 percent. The maximum score on a re-administered exam meeting the minimum standard is a score of 70 percent. Students must achieve a minimum passing score on each assessment before progressing in the course.

Recycles/Elimination:

An Academic recycle may be offered to a student who does not meet course standards but shows demonstrated potential to achieve the standards. Students are limited to a maximum of one academic recycle per course.

Academic elimination is initiated when a student does not meet the course's academic standard. A student may be recommended for academic elimination without being recycled.

Module 1 - Electronic Safety and Troubleshooting			Course Weight:	12.5%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Exam Weight**
Written Exam	Safety, Corrosion Control and Powers of 10, Decimals, Metric Prefixes	This written exam tests the students' knowledge of TLOs 1., 3., and 4 as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given lessons on Safety, Corrosion Control, and Powers of 10, Decimals, and Metric Prefixes students will demonstrate their knowledge and understanding of these concepts and associated terminology.	3.75%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Written Exam	Alternating and Direct Current (AC/DC)	This written exam tests the students' knowledge of TLOs 2., 4., 5.,7., and 8., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given lessons on Series, Parallel, and Series/Parallel Circuits, AC characteristics, Ohm's Law and Power, Voltage and Current, AC Power fundamentals, Basic Electronic Circuit Theory, Switches and Circuit Protection Devices, RC/RL Filter Circuits and their Characteristics and Transformers and their Characteristics students will demonstrate their knowledge and understanding of these concepts and associated terminology.	3.75%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Written Exam	Troubleshooting, Digital Circuits and Power Supplies	This written exam tests the students' knowledge of TLOs 9, 10. and 11., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given lessons on Digital Circuits. Power Supplies and their Characteristics, and Principles of Troubleshooting students will demonstrate their knowledge and understanding of these concepts and associated terminology.	**5%**

Module 2 - Computers and Networking				Course Weight: 12.5%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Computer Maintenance	This performance exam tests the students' ability to perform computer maintenance fulfilling tasks 12. and 13. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on maintaining a computer, students will build and maintain a computer system.	8.75%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Network Media Storage Maintenance	This performance exam tests the students' ability to build an audio/visual broadcast LAN fulfilling task 14. and 21., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on maintaining a computer, students will build and maintain a network media storage system.	3.75%

Module 3 - Audio Systems				Course Weight: 12.5%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Written Exam	Principles of Audio Systems	This written exam tests the students' knowledge of TLO 22., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction	Given lessons on the principles and terminology of audio systems students will take a written test to demonstrate their knowledge and understanding of these principles and terminology.	1.25%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Set up, Operate and Maintain an Audio System	This performance exam tests the students' ability to fulfill TLOs 24, and 25, as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on assembling an audio system, audio console and constructing fully functioning audio cables students will assemble a functional audio system with functioning audio cables.	3.125%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Maintenance on an audio automation system	This performance exam tests the students' ability to fulfill TLO 26. and 27. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on maintaining an audio automation system students will perform maintenance on an audio automation system.	8.125%

Module 4 - Cameras and Media Storage			Course Weight: 12.5%	
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Maintain a photo/video camera	This performance exam tests the students' ability to maintain and troubleshoot a camera (still and video) fulfilling task 19. and 20. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on maintaining and troubleshooting a camera (still and video), students will demonstrate how to maintain and troubleshoot a camera (still and video).	6.25%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Test Equipment	This performance exam tests the students' ability to use test equipment fulfilling task 15. and 17. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on using test equipment, students will use test equipment to gather readings.	2.5%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Maintain a photo/video Editing System	This performance exam tests the students' ability to fulfill task 22. and 23. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on NLE Editing, students will demonstrate how to maintain a NLE editing system.	3.75%

Module 5 - Production Systems			Course Weight: 15%	
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Set up, Operate & Maintain a Studio System	This performance exam tests the students' ability to operate and maintain a studio system and make alignments to the system, fulfilling task 28., 29. and 30. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on operating and maintaining a studio system, students will demonstrate how to Operate & Maintain a Studio System with correct alignments and proper routing and dressing of cables.	12%
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**

Performance Exam	Install a head-end system	This performance exam test the students' knowledge of principles and terminology supporting TLO 33., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction	Given lessons on principles and terminology of head-end systems, students will take a performance test to demonstrate their skills, knowledge and understanding of these concepts and terminology.	3%

Module 6 - Transmissions			Course Weight: 15%
Assessment	**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam — Operate and Maintain a Transmitter System	This performance exam tests the students' ability to operate and maintain a transmitter system fulfilling task 31. and 32. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on operating and maintaining a transmitter system, students will demonstrate how to operate and maintain a transmitter system.	8.25%
Performance Exam — Construct an A/V cable, solder a cable connector	This performance exam tests the students' ability to construct an audio/video cable and solder a cable connector fulfilling task 40. and 41. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration and practice constructing audio/video cables and a soldered cable connector, students will demonstrate how to construct an audio/video cable and a soldered cable connector.	4.5%
Assessment	**TLO(s) Tested**	**Performance Outcome**	**Weight**
Written Exam — Identify basic principles of transmissions	This written exam tests the students' knowledge of principles and terminology supporting TLO 32. as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given lessons on AM/FM/TV Transmitter, transmission principles and terminology, students will take a written test to demonstrate their knowledge and understanding of these concepts and terminology.	2.25%
Module 7 - System Integration and Installation Basics			**Course Weight: 10%**
Assessment	**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam — Microwave & Satellite Link	This performance exam tests the students' ability to fulfill TLOs 34., 35. and 37., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on microwave & Satellite links, students will demonstrate how to set up and establish a properly working microwave and satellite link.	7%
Assessment	**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam — Wire Antenna System	This performance exam tests the students' ability to fulfill TLO 36., as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on erecting a wire antenna system, students will demonstrate how to set up and establish a properly working wire antenna system.	3%

Module 8 - Capstone			Course Weight: 10%	
Assessment		**TLO(s) Tested**	**Performance Outcome**	**Weight**
Performance Exam	Capstone	This performance exam tests the students' ability to demonstrate their ability and knowledge to integrate all MCSE systems within a given real-world scenario to capture, edit, broadcast/transmit and VI product, as identified in the course Training Task Inventory located on pages 3-6 of this Training Program of Instruction.	Given instruction, demonstration, and practice on soldering procedures students will demonstrate how to solder.	10%

REFERENCES

29 CFR Occupational Safety and Health Regulations (OSHA Standards). https://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1915 Retrieved on August 18, 2011

AFRTS. (2010). AFRTS Broadcast Center Satellite Handbook. V.3.26. Defense Media Activity CAI software and accompanying texts

Bhatia, B.E. (2020). Electrical Fundamentals: Concepts of Alternating Current. Virginia: PDH Online.com. Retrieved from https://pdhonline.com/courses/e236/CT-12-07-Course%20Material%20-%20AC.pdf

Cavell, G.. (Ed). (2018). National Association of Broadcasters Engineering Handbook - 11th Edition. Focal Press: MA

Chapple, M. & Soper, M. (2023). CompTIA A+ Get Certified Core 1 & 2 Exams 220-1101 & 220-1102. New Jersey: John Wiley & Sons, Inc.

Chapple, M. & Zacker C. (2023). CompTIA Network+ Get Certified. Exam N10-008. New Jersey: John Wiley & Sons, Inc.

Department of the Army. (2020). Army Regulation 750-59: Corrosion Prevention and Control of Army Materials. Retrieved from https://armypubs.army.mil/ProductMaps/PubForm/Details_Printer.aspx?PUB_ID=1007616

Department of Defense. (2010). DoD Instruction 5000.67 incorporating change 2, August 31 2018: Prevention and mitigation of corrosion on DoD military equipment and infrastructure

Department of Defense. (2020).DoD Instruction 5000.88: Engineering of Defense Systems, Section 3.7c, paragraphs 1-3.

Department of Defense. (2021).DoD Instruction 5000.91: Product support management for the adaptive acquisition framework, Section 4.11e.

Frenzel, L. (2007). Principles of Electronic Communication Systems. McGraw-Hill Companies

Kassakian, J., Perreault, D., Verghese, G., & Schlecht, M. (2023). *Principles of Power Electronics* (2nd ed.). Cambridge: Cambridge University Press. doi:10.1017/9781009023894

Kuphaldt, T. (2021). “Lessons in Electric Circuits, Volume I (DC). Fifth edition. https://www.ibiblio.org/kuphaldt/electricCircuits/DC/index.html

Mueller, S. (2010). Upgrading and repairing PCs. Que: IN

Norton, P. & Clark, S. Peter Norton's New Inside the PC – 7th Edition. Ed. Sams: Canada

NTSC Studio Timing: Principles and Application. Grass Valley Group, Inc.

Soldier's Manual and Trainers Guide (SMTG). STP 11-25S14-SM-TG. HQ Department of the Army: Washington D.C: Author