Panel Members:

Rich Brongel, Electronics Instructor, CCSF Engineering Department
Kurt Common, Department Chair, CCSF Engineering
Rich Dale, Manager, MUNI Training and Development
Dale Duncan, MUNI Superintendent of Electronics
Kent Lee, CCSF Electronics Instructor, CCSF Engineering Department, and MUNI Employee
Ben Macri, Chair, CCSF Automotive Skills Department
Rod Santos, CCSF Campus-Wide Curriculum Committee member and Associate Dean of
          Student Advocacy, Rights and Responsibilities
Sam Yee, Acting Supervisor, MUNI Electronic Maintenance Technician

Date: October 16, 2001

Evans Campus, City College of San Francisco

Facilitators: Sami Kudsi and Kitty Moriwaki, California Resource Center
Coordinator: Suzanne Korey, California Resource Center

Note: All classes with ET in front are existing electronic technology courses. TET labeled courses are new and need to be written. You can access the CCSF web site (CCSF.org) and look through the engineering program to see what is already in place. We are using the certificate program in analogue and digital electronics as a basis for this new TET program.
New Instructional Units:

TET Control Circuits (Electromechanical & AC/DC Control) Parts 1 & 2 – 6 units (3 units each)
TET Surveillance Electronics – 2 units
TET Test Equipment Calibration – 2 units
TET Vehicle Operation – 3 units
TET Safety (Electrical) – 2 units
TET Digital Electronics Parts 1 & 2 – 6 units (3 units Each)
DC / AC Theory for TET – 4 units
TET Relay Logic – 2 units
TET Project Management – 2 units
TET Automatic Train Control – 4 units
TET Computer Application Skills – 2 units
TET Professional Development – 1 Unit
TET Fiber optics – 3 units
TET Radio Frequency Electronics – 4 units
TET Audio Frequency Electronics – 4 units
TET Analog Electronics – 4 units
TET Troubleshooting – 4 units

Existing Instructional Units

DC/AC Circuit Analysis (ET 60) – 4 units
Electrical AC Electricity (TIEE 9571) – 108 hours
DC Electricity (TIEE 9572) – 108 hours
Technical Mathematics (ET 50) – 4 units
Practical Mathematics I (ET 108A) – 3 units
Introduction to Digital Circuits and Techniques (ET 63) – 3 units
Conceptual Physics (Phyc 10) – 3 units
Conceptual Physics Laboratory (Phyc 10L) – 1 Unit
Physical Science for Automotive Technology (PSC 88) – 4 units
Intermediate Reading, Study Skills, and Vocabulary (ENGL 90) – 3 Units
Fundamentals of English Grammar / Composition (BSEN 70) – 4 units
Business Correspondence (BSEN 74) – 3 units
Total Quality Management : Principles and Elements (TQM 101) – 3 units
Fundamentals of Oral Communication (Spch 12) – 3 units
College Algebra (Math 92) – 5 units

Total New and Existing units: 92 units
SUGGESTED SEQUENCE OF PROGRAM OF STUDY

Possible Prerequisites

Practical Mathematics I (ET 108A) 3 units
College Algebra (MATH 92) 5 units
Fundamentals of Oral Communication (SPCH 12) 3 units
Intermediate Reading, Study Skills, and Vocabulary (ENGL 9) 3 units
Fundamentals of English Grammar / Composition (BSEN 70) 4 units
College Success (LERN 50) 3 units

Total 24 units

Semester 1

DC/AC Circuit Analysis (ET 60) 4 units
(or Electrical AC Electricity (TIEE 9571) – 108 hours
and DC Electricity (TIEE 9572) – 108 hours)
Conceptual Physics (PHYC 10) and Conceptual Physics Laboratory (PHYC 10L)
(or Physical Science for Automotive Technology (PSC 88)) 4 units
Technical Mathematics (ET 50) 4 units
TET Safety 2 units

Total 14 units

Semester 2

DC / AC Application for TET 4 units
TET Computer Application Skills 2 units
Introduction to Digital Circuits and Techniques (ET 63) 3 units
TET Analog Electronics 4 units

Total 13 units

Semester 3

TET Digital Electronics (Part 1) 3 units
TET Audio Frequency Electronics 4 units
TET Control Circuits (Part 1) 3 units
TET Relay Logic 3 units

Total 13 units
**Semester 4**

- TET Digital Electronics (Part 2) 3 units
- TET Control Circuits (Part 2) 3 units
- TET Radio Frequency Electronics 3 units
- TET Surveillance Electronics (2 units) 2 units

Total 11 units

*(We are not developing the fifth semester at this time but may look at it in the future for managers and supervisors)*

**Semester 5 and Beyond (Professional Development)**

- TET Project Management 2 units
- TET Professional Development 1 units
- TET Troubleshooting 3 units
- Total Quality Management: Principles and Elements (TQM 101) 3 units
- Business Correspondence (BSEN 74) 4 units

Total 13 units
## INSTRUCTIONAL UNITS WITH MAJOR LEARNING OUTCOMES

### TET Safety (Electrical) – 2 units
- **A32** Inspect for wayside safety hazards
- **B18** Inspect for train safety hazards
- **C11** Inspect for trolley safety hazards
- **D9** Inspect for facilities safety hazards
- **G1** Clean up toxic spills
- **G5** Reset hot body detectors
- **G12** Secure dangerous areas
- **K/S** First aid/CPR

### TET Computer Application Skills – 2 units
- **H1** Pull wayside database reports
- **H2** Pull vehicle database reports
- **H3** Pull administrative database reports
- **H4** Enter administrative database data
- **H13** Create maintenance forms
- **H14** Inventory equipment & supplies
- **K/S** Computer programming skills

### TET Analog Electronics – 4 units
- **A20** Maintain VPS systems
- **A21** Maintain 100hz power systems
- **A22** Maintain ET sensors
- **B13** Maintain train light ballasts
- **G10** Repair vital power systems

### TET Digital Electronics 6 units (2 parts - 3 units each)
- **A7** Maintain DVA systems
- **B10** Maintain Train DVA system
- **C9** Maintain trolley DVA system
- **E6** Maintain bus DVA systems
- **A12** Maintain DTS
- **A16** Maintain central control computers
- **A27** Maintain wayside SCADA system
- **A30** Maintain PDS
- **E3** Maintain bus electronic destination signs
- **C6** Maintain trolley electronic destination signs
- **B6** Maintain train electronic destination signs
- **C3** Maintain trolley APSE equipment
- **B3** Maintain train APSE equipment
- **C2** Maintain trolley friction braking control system
B2 Maintain train friction braking control system

Note: Division of content between Part 1 and Part 2 to be determined by Phase III panel.

TET Audio Frequency Electronics – 4 units
A29 Maintain TDS
D3 Maintain Shop PA’s
B14 Maintain train PA system
A34 Station PA systems
C10 Maintain trolley PA system
E7 Maintain bus PA system
A23 Maintain emergency telephones
D4 Maintain division telephone systems
A24 Maintain fire phones
G9 Repair fire phones

TET Control Circuits (Electromechanical & AC/DC Control) - 6 units (2 parts – 3 units each)
A14 Maintain wayside fare collection systems
A3 Maintain cable car ticket machines
B8 Maintain train electronic fare box
C4 Maintain trolley electronic fare box
D1 Maintain electronic fare equipment
E1 Maintain bus electronic fare box
A9 Maintain VPI
B12 Maintain train V-tag systems
A10 Maintain V-tag systems
B15 Maintain train ADA system
A33 Maintain wayside ADA system
B11 Maintain train door controllers
A35 Maintain motor generators
G2 Reset propulsion system
C1 Maintain trolley propulsion systems
B1 Maintain train propulsion systems

Note: Division of content between Part 1 and Part 2 to be determined by Phase III panel.

TET Relay Logic – 2 units
A2 Maintain track signals
A4 Maintain cable car pre-empts
A5 Maintain girder switches
A8 Maintain relay room equipment
A26 Maintain wayside catenary detectors
A28 Maintain interlocking systems
A31 Maintain track circuits
D5 Maintain facilities catenary detectors
G4 Repair track switches
G3 Repair track loops

TET Digital Electronics 6 units (2 parts - 3 units each) (see above for course content)

TET Control Circuits (Electromechanical & AC/DC Control) - 6 units (2 parts – 3 units each) (see above for course content)

TET Radio Frequency Electronics – 4 units
A18 Maintain central control console
A25 Maintain central control radio base stations
E2 Maintain bus radio equipment
B5 Maintain train radio equipment
C5 Maintain trolley radio equipment
D8 Maintain non-revenue vehicle radio system
B9 Maintain train GPS system
C8 Maintain trolley GPS system
E5 Maintain bus GPS systems
D7 Maintain non-revenue vehicle GPS

TET Surveillance Electronics – 2 units
A1 Maintain subway intrusion systems
E4 Maintain bus video surveillance systems
D10 Maintain facilities video system
A15 Maintain platform video equipment
B7 Maintain train video surveillance systems
C7 Maintain trolley video surveillance systems
D2 Maintain division surveillance systems
D6 Maintain wayside observation system

Below are competencies from existing classes that do not need to be written but match the required competencies as gathered through the DACUM.

Fundamentals of English Grammar and Composition (BSEN 70)– 4 units
K/S Writing skills
K/S Reading comprehension
I6 Read technical literature
G13 Write emergency incident reports
H5 Write equipment evaluation report
H7 Write a discrepancy report
H6 Write test report
H8 Update wayside logs
H9 Update vehicle logs
H10  Update administrative logs
H11  Update regulatory logs/forms
H12  Complete materials request forms
H15  Fill out work order forms
H16  Fill out warranty documents

See CCSF college catalog and department course outline of record. Perhaps the Business department could create a specialized version of BSEN 70 to accommodate the needs of a TET.

Business Correspondence (BSEN 74) – 3 units
See CCSF college catalog and department course outline of record. Perhaps the Business department could create a specialized version of BSEN 70 to accommodate the needs of a TET.

Oral Communication Skills (SPCH 12) – 3 units
K/S  Oral communication skills
K/S  Interpersonal skills
K/S  Team player skills
K/S  Listening skills
G11  Notify central control

See CCSF college catalog and department course outline of record. The English department might be encouraged to create a special version of Speech 12 to accommodate TETs.

DC and AC Circuit Analysis (ET 60) – 4 units
See CCSF college catalog and department course outline of record. Engineering department might be encouraged to create a special version to accommodate the needs of TETs.

Electrical AC Electricity (TIEE 9571) – 108 hrs
See CCSF college catalog and department course outline of record. Trade Skills department might be encouraged to create a special version to accommodate the needs of TETs.

DC Electricity (TIEE 9572) – 108 hrs
See CCSF college catalog and department course outline of record. Trade Skills department might be encouraged to create a special version to accommodate the needs of TETs.

Introduction to Digital Circuits and Techniques (ET 63) - units
See CCSF college catalog and department course outline of record. Engineering department might be encouraged to create a special version to accommodate the needs of TETs.

DC/AC Theory for TET - 4 units
A19  Maintain battery banks
Additional curriculum to be created by Phase III panel. Content derived from course outlines on record on DC/AC electricity circuit analysis and further research into the training needs of a TET.
TET Project Management – 2 units
F1 Survey site or equipment
F2 Analyze special project requirements
F3 Develop Potential special project solutions
F4 Design special project systems & devices
F5 Document special project plans
F6 Purchase special project materials
F7 Fabricate special project prototype
F8 Install Prototype
F9 Evaluate prototype
F10 Implement hardware solutions
F11 Implement software solutions
F12 Represent Muni (e.g. meetings, conference, litigation)
F13 Perform technical / engineering functions
F14 Comment on technical specifications
F15 Reconfigure electronic equipment
K/S Decision-making skills

The Phase III panel will determine if this will be a new course or could be implemented into a current course. The panel will also determine which department should teach the course.

TET Professional Development – 1 unit
I1 Participate in vendor training
I2 Participate in computer classes
I3 Participate in Muni supplied training
I4 Participate in trade shows
I5 Participate in seminars
I7 Participate in on-the-job training
I8 Take college classes

TET Fiberoptics – 3 units
A17 Maintain fiber optic communication systems

TET Physics – (Phyc 10 and Phyc 10L or PSC 88) - 6 units
K/S Basic knowledge of physics
See CCSF college catalog and department course outline of record.

Practical Mathematics I (ET 108 A) - 3 units
See CCSF college catalog and department course outline of record.

Technical Mathematics (ET 50) – 4 units
K/S Math Skills
Analytic Skills
See CCSF college catalog and department course outline of record.

**Total Quality Management : Principles and Elements (TQM 101) – 3 units**
See CCSF college catalog and department course outline of record.

**Trouble Shooting – 3 units**
The content of this course will be determined during Phase III. It will most likely be taught in the Engineering Department, but could possibly be taught elsewhere.

**College Algebra (Math 92) – 5 units**
See CCSF college catalog and department course outline of record.

**Intermediate Reading, Study Skills, and Vocabulary (ENGL 9) - 3 Units**
See CCSF college catalog and department course outline of record.