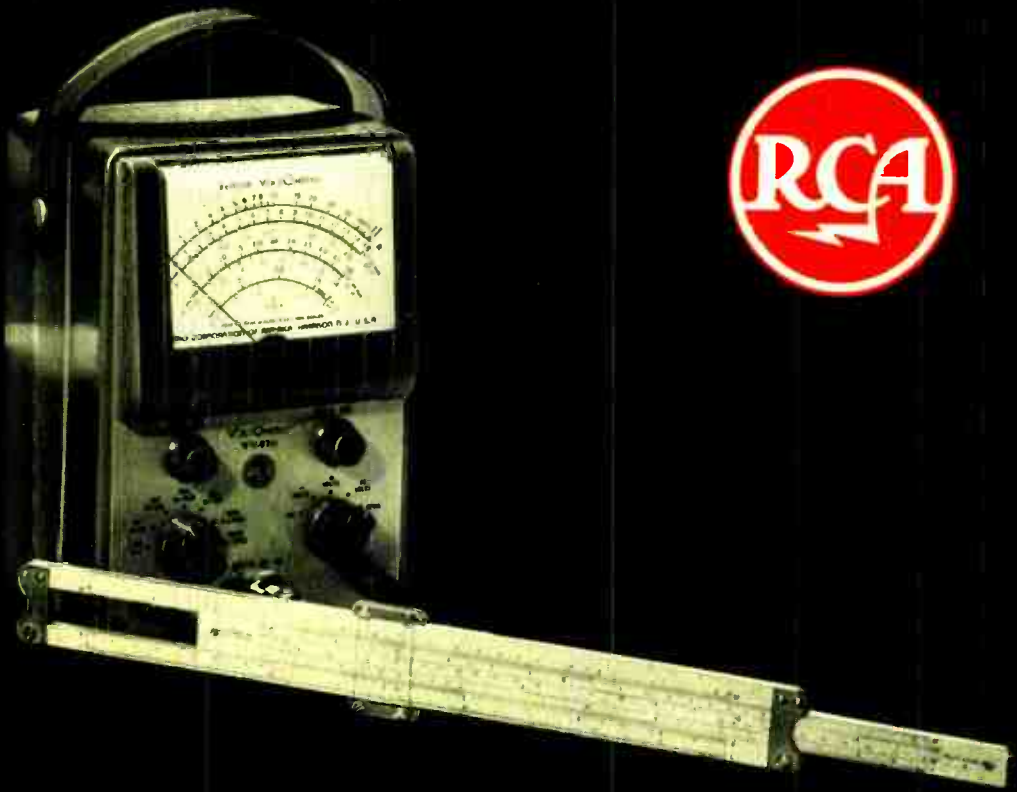
RCA INSTITUTES

School of Radio and Television Technology



A SERVICE OF RADIO CORPORATION OF AMERICA

350 West Fourth Street, New York 14, N. Y.

Calendar for 1955

JANUARY						
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Calendar for 1956

JANUARY						
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DECEMBER						
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RCA INSTITUTES, INC.

School of Radio & Television Technology

A Service of Radio Corporation of America

CATALOG 5504

350 West 4th Street

(Near 8th Ave. and W. 13th St.)

New York 14, N. Y.

WAtkins 4-7845

SCHOOL CALENDAR

1955 - 1956

(Each Term Consists of 58 School Days)

1955 SPRING TERM

Feb. 28 1955 (Mon.)	First Day of Term
May 18, 1955 (Wed.)	Last Day of Term

1955 SUMMER TERM

May 23, 1955 (Mon.)	First Day of Term
May 30, 1955 (Mon.)	Memorial Day
July 4, 1955 (Mon.)	Independence Day
Aug. 12, 1955 (Fri.)	Last Day of Term

1955 FALL TERM

Sept. 7, 1955 (Wed.)	First Day of Term
Sept. 26, 1955 (Mon.)	Holiday
Nov. 24, 1955 (Thurs.)	Thanksgiving
Nov. 29, 1955 (Tues.)	Last Day of Term

1955-1956 WINTER TERM

Dec. 2, 1955 (Fri.)	First Day of Term
Dec. 26, 1955 (Mon.)	Christmas Holiday
Jan. 2, 1956 (Mon.)	New Year's Holiday
Feb. 22, 1956 (Wed.)	Washington's Birthday
Feb. 24, 1956 (Fri.)	Last Day of Term

1956 SPRING TERM

Feb. 28, 1956 (Tues.)	First Day of Term
May 17, 1956 (Thurs.)	Last Day of Term

1956 SUMMER TERM

May 21, 1956 (Mon.)	First Day of Term
May 30, 1956 (Wed.)	Memorial Day Holiday
July 4, 1956 (Wed.)	Independence Day Holiday
Aug. 10, 1956 (Fri.)	Last Day of Term

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Benjamin Zeines, *B.E.E., Radio and Television Broadcasting*
David Zekaria, *Radio Physics and Mathematics*
William Zvonik, *B.M.E., Radio Physics and Mathematics*

GENERAL INFORMATION

RCA Institutes, Inc., offers programs of education or training in the technical branches of radio and television communication on both the Technical Institute and Vocational School areas of education.

The Institutes are part of the Radio Corporation of America family which includes National Broadcasting Company, Inc., Radiomarine Corporation of America, RCA Communications, Inc., RCA Engineering Products Division, RCA Estate Appliance Corporation, RCA International Division, RCA Laboratories, RCA Service Company, Inc., RCA Victor Distributing Corporation, RCA Victor Home Appliance Division, RCA Victor Home Instrument Division, RCA Victor Record Division and RCA Tube Division.

The School is truly a service to the radio industry. Its primary purpose is to afford adequate facilities for broad and thorough training of its students, thereby providing dependable, trained personnel to carry on the technical work of the industry in its many phases.

LOCATION

RCA Institutes is located at 350 West 4th Street, a few steps west of 8th Avenue at West 13th Street. The building is very near the 14th Street station of the Independent subway (8th Ave. line). This station is the 8th Avenue Station on the BMT subway. The 14th Street station of the 7th Avenue IRT subway is also near. A station of the Hudson Tubes system is at 14th Street and 6th Avenue. Thus the school is easily reached from all parts of the Metropolitan area. It should be noted that the nearest subway stations are at 14th Street and *not* 4th Street. A street map is on Page 36 of this catalog.

The second and third floors (20,000 sq. ft. each) of this modern building are devoted to the work of the Institutes.

HISTORY

RCA Institutes has developed from the first classes started in New York City in 1909 to train "wireless" operators for the only radio service then known —marine communication, using the International Morse Code. With the formation of the Radio Corporation of America in 1919, the school became a part of the RCA family as a service to the radio industry. The present name was adopted in 1929. The nature of the courses, or programs of education or training, offered by RCA Institutes has changed through the years as the art has progressed, so that its graduates may go into industry fully prepared to meet existing requirements.

RECOGNITION

RCA Institutes is a service of Radio Corporation of America. The practices followed in its lecture and laboratory classes must meet with the approval of the Institutes' Board of Technical Advisers. Members of this Board are leading engineers of Radio Corporation of America.

The school is licensed by the New York State Education Department. The Advanced Technology Course is approved by the Engineers' Council for Professional Development which is an accrediting body representing the combined engineering societies of the United States. RCA Institutes is also approved by the Veterans Administration.

The school is a member of the National Council of Technical Schools, of the American Society for Engineering Education and of the Greater New York Council for Foreign Students.

Students at RCA Institutes are eligible for student membership in the Institute of Radio Engineers and in the Audio Engineering Society.

Graduates of the Advanced Technology Course are often granted advanced standing when applying for admission to engineering colleges and universities.

VISITORS

Visitors to the school are welcome. Classrooms and laboratories are open to visitors from 9:00 a.m. to 8:00 p.m. Monday through Friday. Visitors are received in the office on the third floor.

CLASSROOM AND LABORATORY FACILITIES

Theory classes are conducted in well lighted, well ventilated, comfortable classrooms. The laboratories are designed for maximum convenience. The constantly increasing supply of equipment is planned for the effectiveness of teaching and of familiarization with the representative types of equipment in industry.

In the Transmitter and High Frequency Laboratories, the equipment includes transmitters, ranging from long wave to ultra-high frequencies. Transmitter types include self-excited, crystal controlled, continuous wave, interrupted continuous wave, modern A-M and F-M telephone transmitters, commercial types of television transmitters, klystron, and line controlled transmitters. These laboratories also contain several types of standard commercial receivers, standard radio direction finders, automatic alarm receivers and other standard ship equipment for marine radio. Adequate supplies of instruments are available, such as frequency meters, thermo-couple indicating

meters, primary and secondary standards, signal generators and cathode ray oscilloscopes. There are also supplies of component parts for the construction of experimental transmitter and receiver circuits, as well as experimental circuit breadboards for testing purposes.

The Receiver Laboratories are well supplied with unassembled receiver kits and with commercial receivers of various types, for amplitude modulation and for frequency modulation, as well as automobile, battery operated, a-c or d-c, short-wave and all-wave types. Repair and test equipment is provided in ample quantity, including set analysers, tube checkers, test oscillators, beat frequency oscillators, signal generators, cathode ray oscilloscopes and a wide assortment of miscellaneous meters and replacement parts.

The Video Frequency Laboratory is well equipped with iconoscopes, kinescopes, monoscopes, electro-optical devices, as well as special power supply units, multivibrators, and square wave generators. An assortment of television circuits, in work-chassis form and in commercial form, are provided for testing purposes, and modern sweep generator equipment is available so that rapid and accurate testing and alignment procedure may be taught.

The Audio Frequency Laboratory has benches containing the rack mounted basic measuring equipment needed for experiments. This includes the audio oscillator, voltohmyst, oscilloscope, high sensitivity vacuum tube voltmeter, VU meter, calibrated adjustable attenuator, and regulated power supply. The bench storage space contains a wide variety of test units such as audio and video amplifiers, voltage multipliers, multivibrators, synchronizing generators, delay lines, selsyns, thyratron generators, and transistor breadboards. A number of commercial amplifiers and portable disc and tape recorders are available from the central stockroom. Associated with the laboratory is a control room containing a modern RCA radio broadcast consolette, three speed transcription turntable, professional tape recorder, and microphone. The control room is separated from a small studio by an observation window.

The Electrical Technology Laboratory provides a wide range of apparatus for experimentation in electric circuits. In addition to a wide assortment of fixed and variable resistors, inductors and capacitors there are accurate audio oscillators, power supplies for experiments in vacuum tubes, a-c bridges, cathode-ray oscilloscopes, meters, phase shifters, synchronous switches for the production of repeated transient phenomena, a curve tracer for the graphical presentation of vacuum tube characteristic curves. Much of the equipment is permanently mounted in individual laboratory benches. The benches are wired for direct current, 60-cycle and 500-cycle alternating current and for special signal circuits.

The drafting room is designed for alternate use as an assembly room or for code practice.

VISUAL AND AURAL AIDS

To supplement theory and laboratory instruction a large number of visual and aural aids are used in all courses. The school has sound motion picture projectors as well as other projectors. There are disc and tape recorders. Dynamic demonstration equipment includes such items as superheterodyne receivers, oscilloscope, monochrome and color television receivers, RCA circuit demonstrator, vacuum tube characteristic curve tracer. The school owns a diversified, constantly modernized, well stocked training film library containing sound and silent films, film strips and slides.

INSPECTION TRIPS AND SPECIAL LECTURES

Students of certain courses are taken on inspection trips to important communications and industrial centers located in or near New York. These trips are made under the guidance of instructors from the Institutes, together with engineers and technicians of the companies concerned. An opportunity is thus afforded to visit transmitters, studios and manufacturing establishments.

Last-term students in all day courses are required to attend a series of Senior Assemblies, held weekly for approximately nine weeks, covering the various fields of employment open to our graduates, the procedure in applying for jobs and the influence of personal qualities in making one's way in industry. Well qualified engineers and personnel directors are invited to address these Assemblies on pertinent topics.

REQUIREMENTS FOR ADMISSION

Applications for Enrollment should be forwarded to the Registrar sufficiently in advance of the class starting date to insure admittance if accepted. New classes are limited in capacity, and applications received after the quota is completed must necessarily be deferred until the starting date of the next available term.

A matriculation fee of $15 must accompany the Application. If the Application is not accepted, or if the applicant is unable to begin in the desired class, this fee will be refunded upon written request. Veteran trainees are referred to the data presented under that heading (Page 13).

Candidates for admission to the Advanced Technology Course must be high school graduates or the equivalent. The program taken should have included Elementary and Intermediate Algebra, Plane Geometry and Physics.

Applications for the Advanced Technology Course will be considered for admission into the first term (1a) unless accompanied by a specific request

for advanced standing. Admission into the upper terms of the course is by examination or by the submission of transcripts.

Candidates for admission to the Radio Servicing, Operating and Broadcasting Courses should have completed a high school curriculum of at least two years, including algebra, and physics or general science.

Standard aptitude tests are used as an additional aid in screening candidates and in determining the course for which the candidate is best fitted.

Prospective students are invited to visit the school or write the Registrar for further information.

ADVANCED STANDING

Qualified applicants who have completed the equivalent of any part of the desired course may be admitted to advanced standing. The proper point of entrance may be determined either by presentation of records certifying to the work already completed, or by examination. Qualified persons may enroll for short time periods or individual units or groups of units. These possibilities are particularly attractive to persons in industry and to school teachers. The tuition fees for advanced standing and other partial program cases will be stated on request.

FEES

Every new student, except those enrolling for Code instruction, is required to pay the matriculation fee with the application for enrollment. This fee is paid only once and is refundable until the student attends his first class after which it is not refundable. Subsequent admissions may be completed by an enrollment agreement and one week's advance tuition payment.

The tuition fee for each course is stated with the course data. The tuition is payable weekly at the rate shown in this catalog until the total tuition for the course has been paid or until the student discontinues his training. If the entire tuition fee is paid in advance and training is discontinued prior to the completion of the course, the unused portion of the tuition will be refunded in accordance with the paragraph above.

Tuition fees for units within the several courses are shown with the unit descriptions. The tuition rate for the repetition of any unit or units will be one half the regular charge for such unit or units provided the original attendance was during September, 1948 or later.

Students are expected to purchase books and supplies each term as needed. The cost of these items is indicated with the data for each course. This cost is not included in the tuition fees. The school maintains a book store for the convenience of the students. Veteran trainees are referred to the data presented under that heading (Page 13).

SCHOLARSHIPS

Three scholarships at RCA Institutes are offered annually to qualified young men and young women high school seniors. The successful candidates may enroll in the Advanced Technology Course or any other of the regular courses. Only students of United States citizenship in the senior year of public or private high school courses are eligible to compete. Contestants must be recommended by their high school principals. The competitive examination, held each spring at RCA Institutes, is composed mainly of standard aptitude tests.

The Board of Directors of the Radio Corporation of America has authorized the award of one annual scholarship to graduates of RCA Institutes for university study in science or engineering, the amount of each scholarship to be $800 per year for a maximum of four years. The selection of the graduate and the university to be attended, and the extension of each such scholarship beyond the first year, are subject to the approval of the RCA Education Committee.

LIVING ACCOMMODATIONS AND EXPENSES

RCA Institutes does not maintain student dormitories. There are residences located within convenient distance of the school building, and the student may choose from a range of accommodations. Comfortable single rooms may be obtained from $10.00 per week up, with lower rates for double occupancy. An expenditure of $30 to $35 per week should cover living expenses. Students are expected to make their own arrangements for quarters, but the school does make recommendations and assists students find living accommodations.

SCHOOL REGULATIONS

RCA Institutes is organized on a basis of four terms per year, each term comprising 58 days (approximately three months). The School is in session throughout the calendar year except for holidays and recesses indicated by the school calendar.

RCA Institutes reserves the right to change at any time the instruction outlines, class schedules, rules governing admission, tuition rates and other charges, and the issuance of certificates, or any other regulation affecting the student body, and such changes shall go into effect whenever approved by proper authority and shall apply to matriculated students as well as to prospective students.

The student is expected to attend regularly all scheduled classes. Students who absent themselves from classes without acceptable reason, or for five days during a term, or who are habitually late, will be subject to dismissal.

A passing grade of not less than 65% based on examinations, classroom

work, homework and laboratory reports must be attained by the student in each unit in order to be eligible for promotion to the classes of the following term. Students will be required to repeat units in which they fail to attain a passing grade.

RCA Institutes, Inc., reserves the right to reject any applicant or to expel any student for what it considers improper conduct or scholastic insufficiency.

REPORT CARDS AND CERTIFICATES

The progress of the student in each subject is determined by periodic tests and by final examination at the end of the term. A report card is sent to the parents (or sponsor) and/or the student, indicating grades received.

A certificate is granted at the graduating exercises to indicate successful completion when a student graduates from the course for which he enrolled. Special recognition is given to graduates attaining honor-level scholastic records. A lost certificate cannot be duplicated but a certified statement may be issued as a substitute. It is the policy of RCA Institutes, Inc., to grant a certificate to a student admitted with advanced standing only if the student has been in attendance for at least one-third of the course, and not less than one term (290 hours).

A transcript stating the student's grades and dates of attendance is available on request. The first transcript is available without charge; additional copies entail a fee of one dollar.

VETERAN TRAINEES

Veterans eligible for educational benefits under Public Law 550 (Korean G.I. Bill), may enroll for the course of training which best suits their objectives. P.L. 550 veterans are entitled to a monthly education and training allowance from the government. Veterans pay their own tuition and other school expenses.

Veterans eligible for training under Public Laws 894 or 16 should seek enrollment approval through the Education and Training Section of the Veterans Administration located in their vicinity.

RCA Institutes has trained a large number of World War II veterans under the provisions of Public Law 346 and will accept those who still qualify for training under this act.

WOMEN STUDENTS

Women students attend RCA Institutes on the same basis and under the same regulations as male students and are most welcome. There are many opportunities for employment at the present time for trained women technicians in the radio electronic industry.

FOREIGN STUDENTS

The student and graduate rosters at RCA Institutes, Inc., include many from countries outside the United States of America. Among the countries represented are Afghanistan, Argentina, Bermuda, Brazil, Canada, Chile, Colombia, Cuba, Ecuador, Iceland, India, Iran, Iraq, Israel, Jamaica, Lebanon, Liberia, Mexico, Nigeria, Pakistan, Panama, Peru, Singapore, Thailand, Turkey. Prospective students from foreign lands may apply for admission under the same school regulations as domestic students. Visas and other matters are the responsibility of the student, particularly with regard to the rules and regulations of the Immigration and Naturalization Service. RCA Institutes is approved by the Immigration and Naturalization Service of the U. S. Department of Justice to accept qualified foreign students for full time courses of study. A candidate for admission should submit the Application for Enrollment accompanied by the matriculation fee and transcripts of his educational background. A formal letter of acceptance will be mailed when the application has been received and approved. The letter of acceptance should be shown when requesting a visa to study at this school.

DAY AND EVENING CLASSES

All courses are given in both day and evening classes. Day classes are in session each week day except Saturdays, holidays and scheduled recesses. Day classes are conducted in morning or afternoon sessions. Assignment to morning or afternoon sessions depends on scheduling facilities; some terms being given only in the morning and some only in the afternoon. Evening courses meet an average of 8⅓ hours per week, 3 evenings (10 hours) one week and 2 evenings (6⅔ hours) the next. Evening classes are held 6:30 p.m. to 9:50 p.m. Evening courses take three terms to complete the work of one term in the day school.

ADULT EDUCATIONAL PROGRAM

This program is for adults of adequate scholastic background who desire a refresher course in specific subjects or who wish to upgrade themselves in industry by expanding their technical knowledge.

A qualified adult may select those units which suit his immediate needs. See pages 22 and 42 for a list of units, which are fully described in the pages that follow. Our counselors will be glad to assist in working out a program.

The matriculation fee of $15 is required of each new registrant in addition to the charges given in the detailed description of each unit. One matriculation fee covers any number of units. Most units are given both in the day and evening classes. A transcript stating the student's grades and dates of attendance is available on request. The first transcript is available without charge; additional copies entail a fee of one dollar.

HOME STUDY COURSES

Two Home Study or Correspondence courses are offered by RCA Institutes to persons in the radio-television industry. The first covers the theory and servicing of black-and-white television receivers. The second, for experienced servicemen, is a recently developed, complete course in Color Television. These courses are described in bulletins which may be obtained by writing to the school.

EMPLOYMENT

RCA Institutes has an excellent record of employment for the graduates of all its courses. An active Placement Service under a full-time Director has broad contacts throughout the radio electronic industry. Through this Service the qualifications of our past and prospective graduates are brought regularly to the attention of the industry and reputable companies, broadcasting stations, etc. are invited to interview and select prospective graduates to fill positions in their organizations. A statistical review of our recent job placement record is on pages 53-54.

While it is highly desirable that students devote their entire time to their studies, those who must have part time employment to support themselves while attending may also be assisted by the employment counselor. Available part time jobs are offered to students.

TRAINING FOR MILITARY SPECIALTIES

Men who expect to be called to military service will find our courses an excellent preparation for assignments to radio, radar, and related specialties in the Armed Forces. At the request of the military authorities, a statement is furnished each graduate or student entering active service, showing the course completed or pursued at RCA Institutes, and the military occupational specialties (MOS) for which he is fitted.

PROGRAMS OF EDUCATION OR TRAINING
Courses and Objectives

Each of the following listed courses constitutes in itself, or in combination with another course when so indicated, a complete program of education or training for the attainment of the stated professional or vocational objective.

Course	Expected Job Objective
T3	Laboratory development work in radio and electronics; operating and development work in broadcast, television and other stations; factory test work on all radio transmitters and receivers.
V7	Laboratory work; operating in broadcast, television, and other stations; factory test work on all radio transmitters and receivers; servicing of all types of radio and television receivers.

V3 & V8 Servicing of all types of radio and television receivers; factory test work on all receivers; laboratory work on all radio receivers, including television.

V5 Station operating in marine, mobile, and point-to-point communication services.

V4 This Course does not constitute a complete program of education or training. This course is of value to those who desire knowledge of the International Morse Code to be used in connection with further technical training otherwise obtained.

SUMMARY OF COURSE DATA

Course				Day		Evening		
	Tuition	*Hrs.*	*Lec. %*	*Terms*	*Wk. Hrs./*	*Terms*	*Wk. Hrs./*	*Supplies Books &*
T3	$1440	2610	69	9	25	27	8⅓	$210
V7	960	1740	59	6	25	18	8⅓	95
V3	480	870	56	3	25	9	8⅓	65
V8	230	290	20	—	—	3	8⅓	25
V5	480	870*	57	3	25*	9	8⅓*	70
V4	4 wk.	Indef.	0	—	—	Indef.	6⅔	0

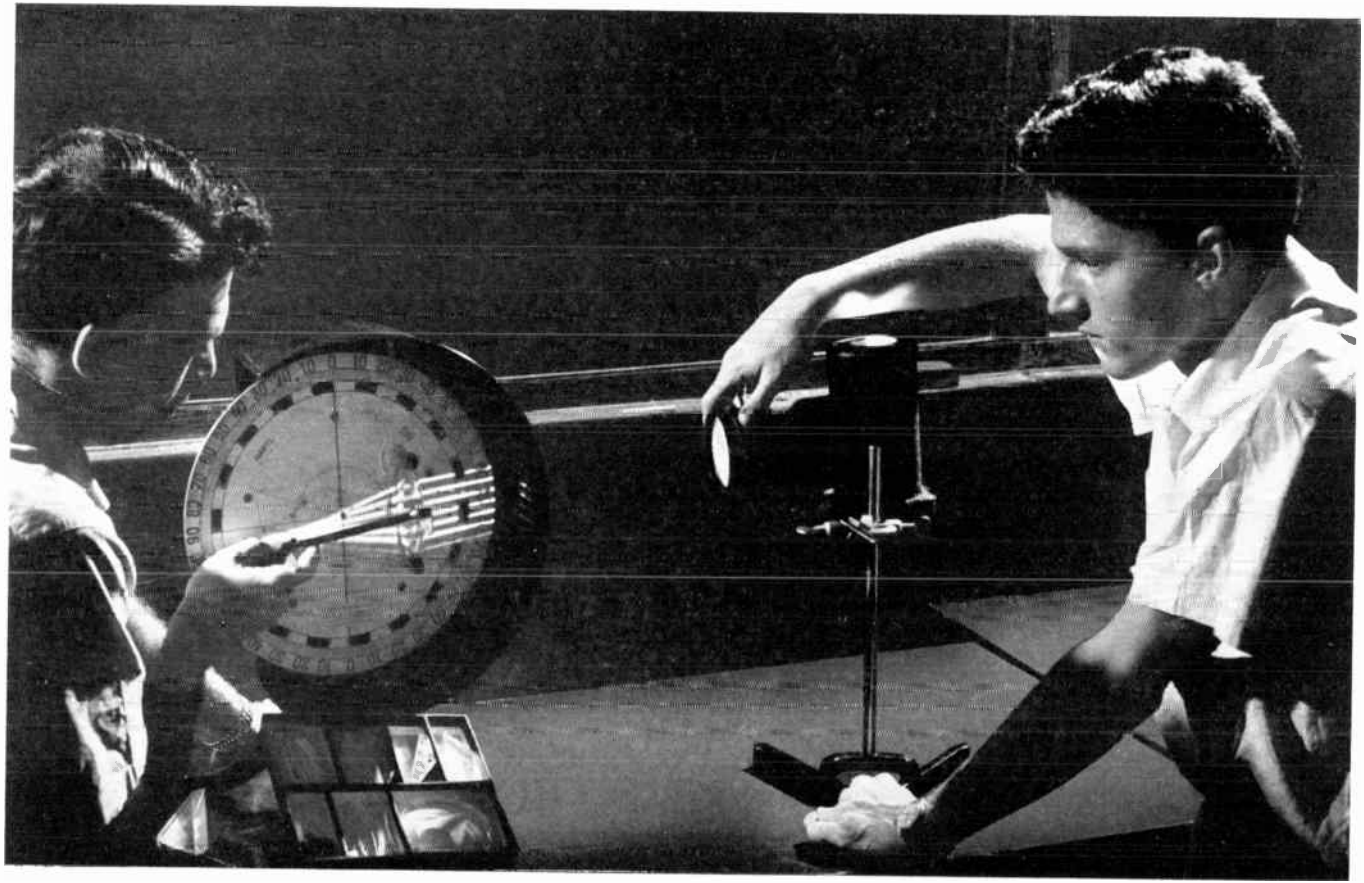
*Code hours extra, at no charge; see page 52 for further details.

ORGANIZATION OF COURSES

Symbol	Name	Day School Term								
		1	2	3	4	5	6	7	8	9
T3	Advanced Technology	1a	2a	3a	4a	5a	6a	7a	8a	9a
V7	Radio and Television Broadcasting	1v	2r	3r	4t	5t	6t			
V3	Radio and Television Servicing	1v	2r	3r						
V8	Advanced Television Servicing	4r								
V5	Radio Telegraph Operating	1v	2r	4t						
V4	Radio Code	c								

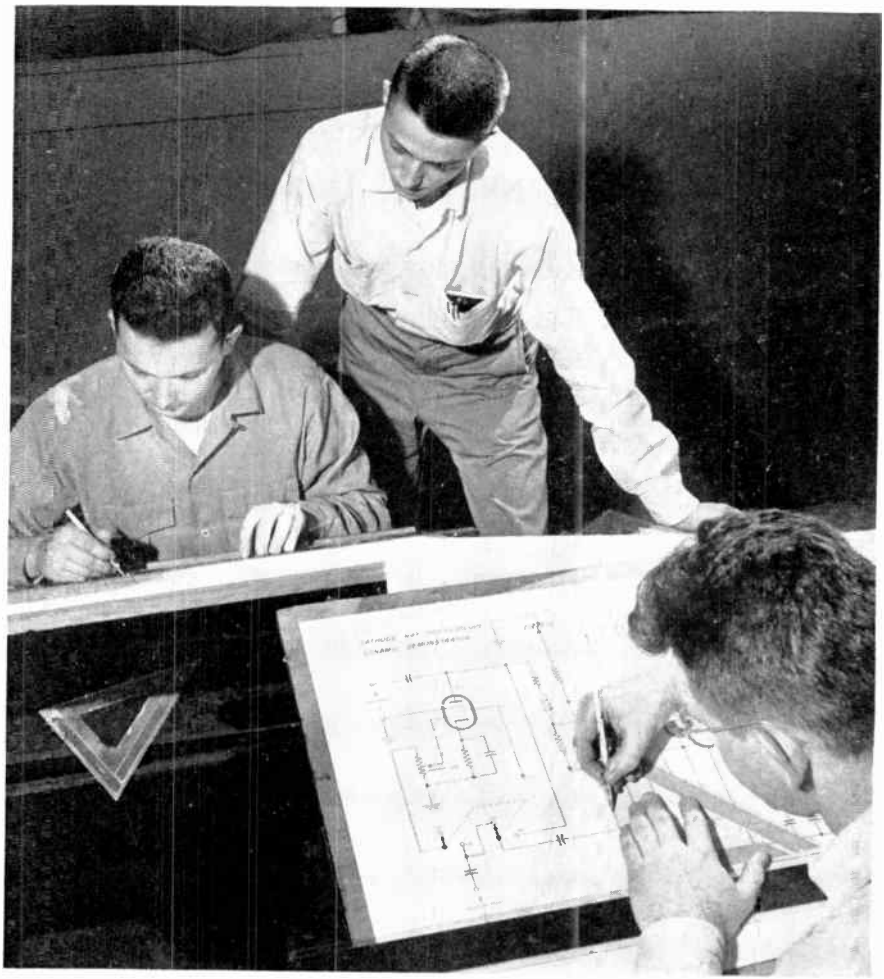
Explanation of Symbols

Term	58 school days (3 months). There are four terms per year.	1a	See Page 24
		2a to 9a	See Pages 24-35
T	Technology; four-year high-school curriculum required for admission.	1v	See Pages 43-44
		2r	See Pages 44-45
		3r	See Pages 45-46
V	Vocational; two-year high-school curriculum required for admission.	4t	See Pages 46-47
		5t	See Pages 47-48
		6t	See Page 48
c	Code: See Page 52	4r	See Pages 42 & 51

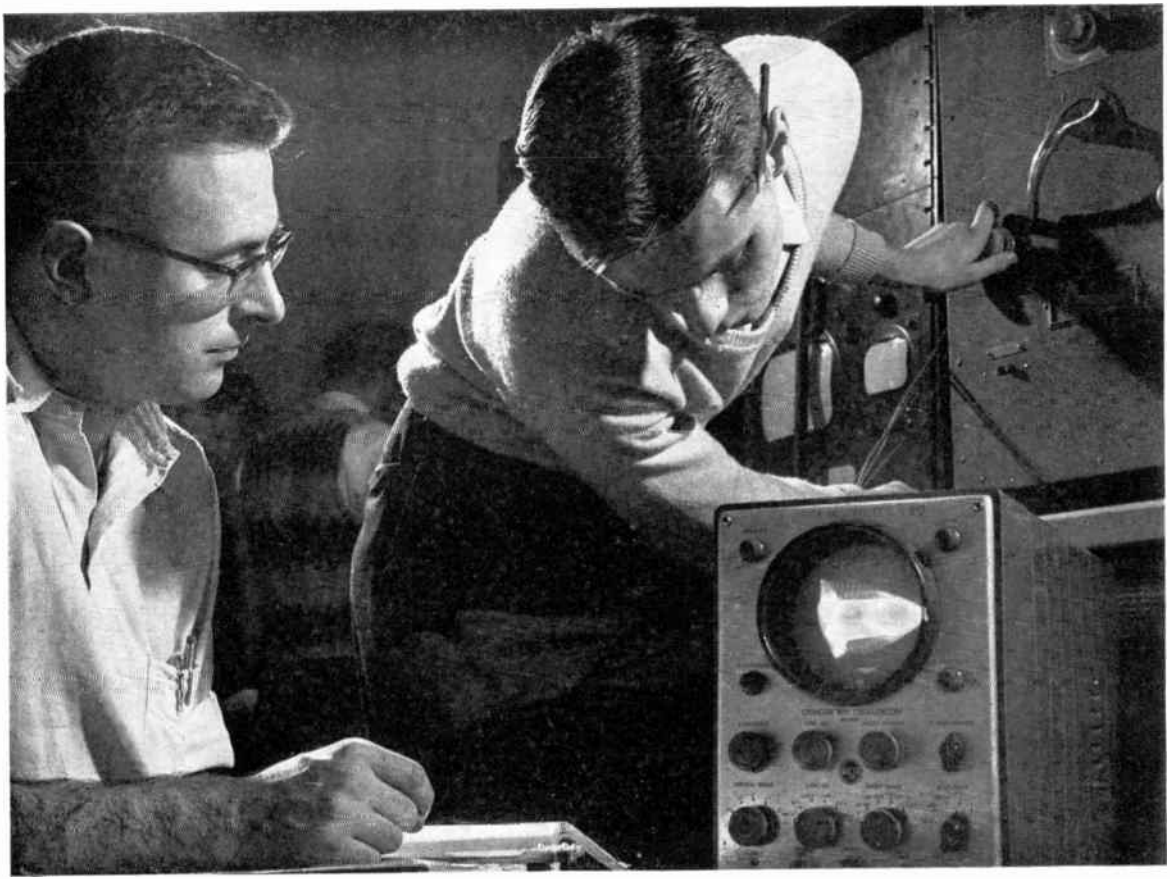


OPTICS EXPERIMENT

PHYSICS LABORATORY



DRAFTING PRACTICE



PERFORMANCE TEST USING OSCILLOSCOPE

PROGRAM OF EDUCATION OR TRAINING

IN THE

TECHNICAL INSTITUTE

Term	Symbol	Subject	Hours		Credit
			LEC.	LAB.	
1a	P-1	Physics Review	116	—	—
	M-1	Elementary Algebra (½ term)	29	—	—
	M-2	Geometry	58	—	—
	M-3	Technical Arithmetic	58	—	—
	M-4	Intermediate Algebra (½ term)	29	—	—
2a	P-2	Mechanics & Electrical Physics	104	35	8
	M-5	Trigonometry	35	—	2
	M-6	Advanced Algebra	58	—	4
	MT-1	Drafting I	—	35	1
	E-1	Study Methods	23	—	1½
3a	P-3	Heat and Sound	46	24	4
	ET-1	D-c Electricity	93	46	7½
	M-7	Calculus I	58	—	4
	E-2	Technical English	23	—	1½
4a	ET-5	Fundamentals of Receivers	11	23	—
	ET-2	A-c Circuits	70	46	6½
	P-4	Optics; Radiation; Atomic Struc.	46	24	4
	M-8	Calculus II	35	—	2
	MT-2	Drafting II	—	35	1
5a	ET-3	Advanced A-C Theory	58	46	5½
	ET-4	Vacuum Tubes	58	46	5½
	MT-3	Shop Tools	24	23	—
	M-9	Calculus III	35	—	2
6a	RF-1	Radio Transmitters	58	46	5½
	AVF-1	Audio Amplifier Design	58	46	5½
	M-10	Advanced Mathematics I (7 Weeks)	35	—	2
	M-11	Advanced Mathematics II (5 Weeks)	23	—	1½
	LE-1	Laboratory Equipment	24	—	—
7a	RF-2	Radio Receivers	58	58	6
	AVF-2	Audio Components and Systems	58	58	6
	AVF-6	Electro-Acoustics	35	—	2
	RF-5	Transmission Lines	23	—	1½
8a	RF-3	Television and F-m Transmitters	46	35	4
	AVF-3	Electronic Circuit Design	58	58	6
	RF-6	Theory of Modulation	35	—	2
	IE-1	Industrial Electronics	29	29	3
9a	RF-4	Television and F-m Receivers	58	46	5½
	AVF-4	Television Studio Equip. Design	58	46	5½
	AVF-7	Color Television	35	—	3
	RF-7	Radiation and Antennas	47	—	3

For unit charges see descriptions of the units on the following pages.

ADVANCED TECHNOLOGY COURSE (T-3)

The Advanced Technology Course (T-3) is recommended to those who desire to obtain a thorough, advanced knowledge of radio technology. In addition to the broad scope of the fundamental work, students receive training in theory and practice in each of the specialized branches of the art. The student is, therefore, not limited to one particular field of endeavor, but is in a position to choose the field he wishes to follow as a career. He also possesses the diversified training necessary to take immediate advantage of opportunities in related fields as they arise. This course stresses technical instruction at the collegiate level in electricity and radio and television; purely academic and cultural subjects and those related to associated engineering fields have been eliminated. This makes it possible to carry the student from high school completion to advanced technological work in radio in the relatively short period of two or two and one quarter calendar years.

The teaching staff is composed of graduates of major engineering schools —men who have a background of wide commercial experience in the communications field. The laboratory facilities, described in detail in this catalog, have been made possible because of RCA Institutes' connection with the radio industry.

This course is especially attractive to high school graduates who desire training in radio and television on an advanced level. The engineering school graduate wishing a more thorough knowledge of the communication field will find the specialized material of the last five terms advantageous.

The course is intended to prepare the student for entrance directly into any one of the many branches of Electrical Communications, such as studio or transmitter technician with radio broadcasting companies; research or laboratory work with manufacturing organizations; transmitter or receiver operating with radio communication companies; as well as many other positions in which a comprehensive knowledge of the science of electrical communication is required. The Advanced Technology Course is approved by the Engineers' Council for Professional Development.

OUTLINE OF COURSE

The table on page 22 shows the number of hours devoted to each unit in each term of Advanced Technology Course. The following pages give the contents of each of the units of the course.

The credit hours for each unit are computed on the basis of approximately 15 lecture hours or 30 laboratory hours per credit hour. No credit hours are assigned to P-1, M-1, M-2, M-3, M-4 because these units are preparatory (secondary school) units. No credit hours are assigned to ET-5, MT-3, LE-1 because these units are designed to develop manipulative skill rather than technological knowledge.

UNITS IN PREPARATORY TERM (1a)

The Preparatory Term, (1a) is intended for prospective students who lack the prerequisites for immediate entrance to the term 2a (see page 10 of this catalog). It is also required of the applicant who has previously completed the required high school subjects, but to whom a review of these subjects is necessary.

M-1—Elementary Algebra: Brief treatment of the Number System — Negative Numbers—Algebraic Expressions—Addition — Subtraction — Multiplication — Division — Simple Equations with one Unknown Quantity — Special Products and Quotients — Factors — Fractions — Simultaneous Simple Equations—Graphs —Powers and roots.

DAY: 6 weeks: $18
EVE.: 1 term: $24

M-2—Geometry: Plane Geometric Figures — Circles — Loci — Similar Figures — Areas — Measurement of the Circle — Construction — Axioms and Postulates — Solid Geometry — Formulas Used in Plane and Solid Geometry — Applications to Industrial Problems.

DAY: 1 term: $36
EVE.: 1 term: $36

M-3—Technical Arithmetic: Review of Addition, Subtraction, Multiplication, Division; Involution and Evolution— Order of Operations — Fractions — Decimals and Powers of Ten — Metric System — Engineering Problems — Precision of Measurements — Slide Rule — Use in Solution of Problems.

DAY: 1 term: $36
EVE.: 1 term: $36

M-4 — Intermediate Algebra: This course presents algebraic concepts of secondary school level, Simultaneous and Quadratic Equations through Ratio, Proportion and Variation. Representative engineering problems are introduced wherever possible to demonstrate the applications of algebra.

DAY: 6 weeks: $18
EVE.: 1 term: $24

P-1 — Physics Review: Mechanics: Physical Quantities and their Measurement—Simple Mechanics—Work—Power —Friction—Pressure in Liquids—Pressure of Air — Liquids and Gases in Motion — Elasticity — Forces Acting through a Point — Motion of Translation — Vectors and Scalars — Newton's Laws of Motion — Potential and Kinetic Energy. Heat: Calorimetry and Thermometry—Methods of Heat Transfer—Heat of Vaporization — Heat of Fusion — Change of State — Steam Engine — Internal Combustion Engine. Electricity: Magnetism — Static Electricity — Current Electricity — Electric Circuits — Ohm's Law — Magnetic and Chemical Effects of Electric Current — Heating Effects of Electric Current — Basic Principles of Electric Generators and Motors. Sound: Sound Waves — Musical Sounds — Properties of Sound Waves — Study of Wave Motion. Light: Light Waves — Illumination — Lamps and Reflectors — Lenses — Optical Instruments — Spectra and Color.

DAY: 1 term: $72
EVE.: 1 term: $60

UNITS IN ADVANCED TERMS (2a to 9a)
ENGLISH

For the technical student, who must read and *understand* texts of a very high order of difficulty, the importance of a well-rounded vocabulary cannot be overemphasized. The student who successfully grasps the exact meaning of the written word, must be equipped with the precise definition of the word. This is not only true of the technical terminology, it is also true of the more difficult English associated with technical and mathematical writing.

However, the student is not only concerned with the complete comprehension of complex text material; he must acquire the ability to employ effectively the same terminology which he encounters in his studies. In school, the ability to express himself in clear, concise, logical English, whether in his recitations, examinations or laboratory reports, will have direct bearing on the student's successful completion of his course. In his career, the graduate will find that a ready command of the language of his profession is an invaluable asset.

Whether we deem it fair or not, we are often judged on a broader basis than that of our technical knowledge alone. The ability to speak or write clearly and coherently in good English, is often given considerable weight by employers, in selecting successful candidates for employment or advancement.

Success in achieving a good command of technical English and in comprehending scientific writing starts with vocabulary building and efficient reading.

E-1—Study Methods:
Study Techniques: Note-taking and Preparation of Notebooks; Correlation of Notebooks and Reading Assignments; Preparing for Examinations; Problem-solving in Physics and Mathematics; Proper Study Environments; Use of Library; Study Time Evaluated. *Reading Improvement*: Development of a Technical Vocabulary; Speed Reading Practice via Instrumentation (Tachistoscope and Motion Picture Projector Used).
DAY: 1 term: $15
EVE.: 1 term: $12

E-2 — Technical English: Review of fundamentals of good usage — Further development of vocabulary of general and technical words — Use of the telephone and the telegraph in business. Practice in composing technical reports, stressing commercial aspects of the projects; the letter of application; the letter of introduction; the technical letter, the business letter. Practice in speaking extemporaneously on technical topics and in the reading of prepared papers. Practice in speaking before the microphone. The interview for employment—the short conference. (1½ credits)
DAY: 1 term: $15
EVE.: 1 term: $12

MATHEMATICS

It is the purpose of this course to provide the mathematical knowledge that will permit assimilation of the concurrent technical subjects, and to acquaint the student with the more common mathematical processes used in technical literature.

The mathematics units have been carefully outlined to eliminate non-essentials. Abstract presentation is avoided and, wherever possible, practical electrical and communication problems are introduced.

M-5 — Trigonometry: Foundations — Trigonometric Functions—Use of Tables of Functions—Applications of Functions — Pythagorean Theorem — The Right Triangle — Accuracy and Precision of Measurement — Decimals and Powers of Ten — Logarithms — Slide Rule — Involution and Evolution — Exponential

Equations — Applications of Trigonometric Principles to Radio Problems — Radian Measure for Angles — Functions of Obtuse Angles—Law of Sines—Law of Cosines — Law of Tangents — Solution of Triangles — Graphs of Trigonometric Functions — Graphs by Method of Addition of Ordinates and by Multiplicative Method—Voltage, Current, and Power Curves — Sums or Difference of Two Angles — Functions of Twice an Angle — Functions of Half an Angle — Sums and Differences of Functions—Inverse Trigonometric Functions — Applications to Electrical and Radio Problems. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $24

M-6—Advanced Algebra: Definitions of Algebraic Symbols — Formulas — Review of Secondary School Algebra—Applications to Engineering Problems—The Number System — Numbers and Quadratic Equation and its Solution—Graphs of First Degree Equations — Graphs of Functions Other than the First Degree — Ratio, Proportion and Variation—Determinants — Cramer's Rule for Linear Simultaneous Equations — Solution of Mesh Circuits — Application of Kirchhoff's Laws — Simultaneous Quadratic Equations — Binomial Theorem — Series —Limits—Derivation of Complex Quantities — Orthogonal, Trigonometric, Polar Forms of the Complex Quantity — De Moivre's Theorem — A-C Circuit Problems. (4 credits)

DAY: 1 term: $36
EVE.: 1 term: $36

M-7—Calculus I: Fundamental Relations and Loci — The Function Concept and Functionality — Notation — Locus of an Equation — The Straight Line — Distance — Slope — Family of Lines — Limits — Continuity — Derivatives — Maxima and Minima — Differentials and Integration of Algebraic and Some Transcendental Functions — The Integral Concept — Geometric and Physical Interpretations. (4 credits)

DAY: 1 term: $36
EVE.: 1 term: $36

M-8—Calculus II: Locus Analysis and Curve Tracing — Time Rates — Areas — Volumes — Engineering Applications — Coordinate Transformations — Simplifications of Second Degree Functions — The Conic Sections — The Circle — The Parabola — The Hyperbola — The Ellipse — Integration Processes — Method of Parts — Partial Fractions — Trigonometric Substitution — Applications to Engineering and Physics. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $24

M-9—Calculus III: Use of Integration Tables — Review of Methods of Integration — Differential Equations — Variables Separable — Homogenous Type — Linear Differential Equations of the First Order — Linear Differential Equations with Constant Coefficients — Transient and Steady State Phenomena in Electrical Circuits — Applications from Acoustics, Mechanics, Electricity and Thermodynamics. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $36

M-10—Advanced Mathematics I: Brief Review of Differential Equations including simultaneous differential equations — Selected Topics from Hyperbolic Functions, Convergence and Divergence Concepts of Infinite Series, Fourier Series, Partial Derivatives, and Operational Calculus. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $36

M-11 — Advanced Mathematics II: Picard's Approximation Method for Solutions of Differential Equations with Numerical Coefficients—A study of the basic concepts of the Laplace Transform and applications of Laplace Transforms to electric circuit equations (1½ credits)

DAY: 1 term: $15
EVE.: 1 term: $24

PHYSICS

Physics is the analytical and precise study of energy and matter. A thorough grounding in Physics is a prime requisite in all scientific fields.

During the second term the elements of Mechanics are studied. Practical problem solution, reasonable degree of precision, and engineering approach are stressed. The student is also given a rigorous course in the electron and atomic theories, the atomic structures of insulating materials and conductors, and electric conduction in solids, gases, and electrolytes. Third term Physics includes Heat and Sound. A knowledge of thermal phenomena facilitates an understanding of many devices to be found in a modern radio installation, such as constant temperature ovens, thermostats, and vacuum tubes. Increased knowledge of the character and behavior of Sound has made it possible for radio to reproduce music and speech with a fidelity unknown in earlier devices. Physics of Light is taught during the fourth term, including further study of atomic structure from the view-point of electromagnetic radiation. Lenses, photoelectric effects, and photographic factors are a few of the topics taught for their television applications to be presented in a later unit.

P-2—Mechanics and Electrical Physics: Mechanics: Fundamental Quantities — Measurement — Vectors — Motions of Translation — Uniform Motion — Uniformly Accelerated Motion — Path of a Projectile — Newton's Laws of Motion — Law of Universal Gravitation — Mass and Weight—Absolute and Gravitational Units — Resolution and Composition of Vector Quantities by Graphical and by Trigonometric Methods—Mechanical Energy — Potential Energy — Kinetic Energy—Wedges—Screw Threads—Wheel and Axle — Pulleys — States of Equilibrium — Conditions for Equilibrium — Work — Power — Elasticity and Impact — Motions of Rotation — Angular Velocity — Angular Acceleration — Torque — Rotary Inertia — Linear and Angular Momentum—Harmonic and Periodic Motions — Centripetal Forces.

Electricity: Magnetism — Natural and Artificial Magnets — Magnetic Materials —Unit Pole Concept — Magnetic Field — Intensity Calculations — Static Electricity — Electrostatic Fields — Electrostatic and Electromagnetic Systems of Units Defined — Ohm's Law — Kirchhoff's Law — Resistance and Current — Electric Cells and Batteries — Simple Magnetic Circuit Calculations — Lenz's Law — Electromagnetism — Electrochemistry — Inductance and Capacitance — Electrical Energy Concepts — Solution of Simple Electrical Circuits of Several Branches — Elements of Electrical Machines. (8 credits)

DAY: 1 term; $87
EVE.: 3 terms; $84

P-3 — Heat and Sound: Heat: Thermometry — Calorimetry — Instruments of Heat Detection and Measurement — Thermal Behavior of Gases — Mechanical Equivalent of Heat Energy — Electricity and Its Heating Effects — Change of State — Heat of Vaporization — Heat of Fusion — Specific Heat — Methods of Heat Transfer — The Carnot Engine — Thermodynamic Efficiency of Heat Engines — Steam Engine — Internal Combustion Engine — Steam Turbine — Thermoelectricity and Thermionics.

Sound: Wave Motion — Transverse Longitudinal and Compressional Waves defined and Studied — Production and Transmission of Sound Waves—Intensity and Energy of Sound Waves — Frequency, Velocity, and Wave Length Relations — Reflection — Refraction — Diffuson — Interference and Absorption — Standing Waves — Beat Phenomena — Resonance — Echo — Reverberation

— Vibration of Strings — Vibrations of Air in Open and Closed Pipes — Musical Sounds — Fundamental Frequencies and Harmonics. (4 credits)

DAY: 1 term: $44
EVE.: 1 term: $48

P-4—Physical and Geometrical Optics Radiation and Atomic Structure: Optics: Nature of Light — Velocity of Light — Wave Motion — Wave Front — Absorption — Reflection — Refraction. Illumination and Photometry: Photometric Units —Standard of Illumination. Reflection of Light: Reflection from Plane and Curved Surfaces — Spherical Aberration — Construction of Images. Refraction of Light: Refraction at Plane and Spherical Surfaces — Convention of Signs — Ray Tracing — Numerical Calculations — Thin Lens — Chromatic Aberration — Achromatic Lens Combination. Optical Instruments: Camera — Microscope — Telescope—Optical Pyrometer. The Eye: Anatomy of the Eye—Optical System of the Eye — Sensitivity of the Eye to Flicker. Spectra and Color: Bright-Line, Dark-Line, and Continuous Spectra — Young-Helmholtz Theory of Color Vision —Practical Applications of Color Science. Interference and Diffraction: Theory of Interference — Huygen's Principle — Measurement of Wave Length—Diffraction Grating. Polarization: Methods of producing Plane-Polarized Light —Rotation of the Plane of Polarization.

Modern Physics: Origin of Quantum Theory: Stefan's Law—Wien's Displacement Law — Intensity of Radiation as a Function of Frequency — Photoelectric Effect. Structure of the Atom: Thomson's Atomic Model—Rutherford-Bohr Atomic Model — Arrangement of Electrons in Shells. Nuclear Physics: Positron — Neutron — Proton — Cosmic Rays, X-Rays and Crystal Structure. (4 credits)

DAY: 1 term: $44
EVE.: 1 term: $36

ELECTRICAL TECHNOLOGY

The Electrical Technology units are designed to teach the student to apply fundamental concepts, as taught in physics, to commercial electrical circuits and devices.

ET-1, taught during the third term of the Advanced Technology Course, extends the electrical principles taught in Physics. The fundamental laws of the d-c circuit are delineated; later, practical circuit problems are introduced. Correct method and procedure are demonstrated and stressed early in this work so that solution of complex circuits is accomplished quite easily. Simple circuits, generators, motors, and measuring instruments are also studied at length.

The fourth term unit, ET-2 is devoted to alternating currents. Complex notation is employed to great advantage wherever possible. The application of Kirchoff's Laws to simple and complex impedance configurations is very thoroughly taught. The steady state conditions of lumped-constant circuits encountered in communications apparatus are treated at length.

ET-3, taught in the fifth term, is a continuation of ET-2. Since, by this time, the student's knowledge of mathematics has been greatly increased, more difficult circuit analyses, involving the analysis of non-sinusoidal waves, are treated. Particular attention is given in this section to the limitations and

frequency characteristics of practical circuit parameters. The theory of filters is carefully developed.

ET-4 is an intensive study of Vacuum Tubes. Thorough study of such basic points as thermionic emission, static and dynamic characteristics and interelement reactions renders quite simple the understanding of the scores of commercial tube models. High vacuum and mercury vapor tubes are studied in connection with their associated filters and voltage distribution networks.

ET-5 presents the specialized circuits and equipment of the radio field and relates them to the basic work in electricity. The immediate purpose of this unit is the orientation of the student's basic work with the specialized studies to follow. The laboratory assignment is the construction and study of a kit-type radio receiver.

ET-1—D-c Electricity: Application of Kirchhoff's Laws to the solution of multimesh circuits — Resistivity Constants — Electric Power and Energy — Primary Cells and Batteries — Measuring Instruments — D-c Ammeters and Voltmeters —Series and Shunt Ohmmeters—Design and Construction of D-c Multimeters — Wheatstone Bridges — Use of the Standard Cell and Potentiometer — Electric Field and Capacitance — Magnetic Field and Inductance — The Magnetic Circuit and the Magnetic Properties of Materials — Principles of Construction and Operation of D-c Generators and Motors. (7½ credits)

DAY: 1 term; $87
EVE.: 2 terms; $84

ET-2 — A-c Circuits: *Introduction to Alternating Currents*: A-c Measuring Instruments — Waveforms — Hypothetical Pure R, L, and C Circuits. *Series and Parallel Circuits*: Application of Kirchhoff's Laws to the Solution of A-c Circuits — Vector Notation — Application of Complex Numbers — Vector Diagrams — Voltage, Current, Power and Energy Relationships. *Resonance*: Series and Parallel Resonant Circuits — Bandwidth—Voltage and Current Loci—Analysis of Practical Network Parameters, *Mutual Inductance*: Coupled Circuits—Air-core and Iron-core Transformer — Transformer Equivalent Circuit. (6½ credits)

DAY: 1 term; $72
EVE.: 2 terms; $72

ET-3 — Advanced A-C Theory: *Network Theorems*: Thevenin's, Norton's, Superposition, Reciprocity, Compensation and Maximum Power Transfer Theorems —Four-terminal Networks and Equivalent T, Pi and Lattice Structures—*Circuit Analysis as Function of Q Value*: Universal Resonance Curves—Reactance and Susceptance Diagrams of Two-terminal Networks—Foster's Reactance Theorem. *Non-Sinusoidal Waves*: Graphical and Analytical Determination of the Coefficients of the Fourier Series — Wave Analyzer. *Filters*: T and Pi Structures—Prototype and "m" Derived Sections — Terminating Half-sections — Attenuation Constants. *Alternating-current Bridges*: Measurement of L, C, R, M and frequency. (5½ credits)

DAY: 1 term; $65
EVE.: 1 term; $60

ET-4—Vacuum Tubes: *Electron Emission Theory*: Dushman's Equation. *Diode Characteristics*: Space Charge and Temperature Control — Child's Law. *Construction of Vacuum Tubes. Static and Dynamic Characteristics of Triodes, Tetrodes and Pentodes*: Vacuum Tube Constants — Complete Analysis of the Vacuum-tube Amplifier by Means of the Equivalent Circuit Theory and the Graphical Method — Distortion — Input Admittance—Variable mu—Beam Power Tubes—Cathode Ray Tubes and Associated Circuits. (5½ credits)

DAY: 1 term; $65
EVE.: 1 term; $60

ET-5 — Fundamentals of Receivers: This is an introductory or survey unit on the theory of operation and construction of TRF and Superheterodyne Receivers. The laboratory work consists of the construction and alignment of a complete superheterodyne receiver. The lecture work includes a complete but non-mathematical discussion of the receiver being built in the laboratory. This discussion also includes the test equipment used to align and check the receiver.

DAY: 1 term: $22
EVE.: 1 term: $24

LE-1 — Laboratory Equipment: This unit trains the student in the use of all types of laboratory test equipment, their limitations and relationships.

DAY: 1 term: $15
EVE.: 1 term: $12

MECHANICAL TECHNOLOGY

The first units are two terms of Drafting. The ability to record or transmit ideas in accordance with accepted symbols and practices in the form of workmanlike drawings is one of the first steps in a well-balanced technical education. Careful attention is paid to lettering of professional caliber.

In MT-3, the students are instructed in the nature and use of hand tools and drill presses, etc., usually available to technicians. In the Laboratory, the students apply the lecture work in acquiring skill in the use of hand tools.

MT-1 — Drafting I: *Lettering*: Single Stroke Lettering — Proportions — Guide Lines — Stability — Composition. *Use of Instruments*: Proper Techniques in Penciling and Inking — Accuracy — T-square — Use of Triangles and Scale Rule — French Curve — Dividers — Preparations for Inking of Final Drawings. *Exercises*: Geometrical Constructions — Schematic Circuit Symbols — Curves and Graphs — Simple Schematic Circuit Drawings. (1 credit)

DAY: 1 term: $22
EVE.: 1 term: $24

MT-2—Drafting II: *Principles of Orthographic Projection*: Planes — Lines — Selection of Views — Auxiliary Views — True Length of Line. *Isometric Drawing*: Principles — Application to Freehand Illustration. *Sections and Conventions*: Half Section — Brokenout Section — Section Lining — Codes of Materials — Conventional Practices and Symbols. *Dimensions and Notes*: Principles — Methods Employed — Allowances and Tolerances. *Electronic Circuits*: Schematic Drawing of Complete Circuits—Copying — Layout — Labeling. *Exercises*: Inking Exercises — Orthographic Projection — Working Drawings — Isometric Views — Schematic Circuits. (1 credit)

DAY: 1 term: $22
EVE.: 1 term: $24

MT-3 — Shop Tools: Hand Tools — Soldering — Drilling — Punching — Thread Cutting — Measuring Tools. Mechanical Aspects of Radio Components — Tropicalization — Chassis Layout — Wiring — Shielding. Resume of Basic Machine Tool Types.

DAY: 1 term: $29
EVE.: 1 term: $24

RADIO FREQUENCY TECHNOLOGY

Radio Frequency Technology embraces primarily the radio frequency circuits of receivers and transmitters. The Receiver units show how the basic circuits, which were studied previously, are combined to form the several types of receivers commonly used, and give the analysis of such complete

receivers. The theory, operation and design of r-f stages, i-f stages, detectors, oscillators, and converters are taught. Commercial test equipment is used in the laboratory sections of the courses. The Transmitter units include the design, operation and maintenance of commercial and experimental transmitters. Long wave, ultra-high frequency and television transmitters are operated, adjusted and studied. Commercial and student-built transmitters, modulators, and amplifiers are used in the laboratory.

RF-1 — Radio Transmitters: Early methods of r-f power generation — spark and arc transmitters; Feedback type oscillators; Design of an unmodulated Class C R-F power amplifier; Practical aspects in commercial transmitter design and construction; Fundamentals of amplitude modulation; Uncompensated and compensated plate modulated r-f stages; Graphical analysis and design of linear r-f power amplifiers and grid modulated amplifiers with and without compensation; Analysis of high efficiency systems —the Doherty, Terman-Woodyard, Sarbacher, and Fischer systems; Neutralization; Frequency multipliers; Inter-stage coupling methods; Introductory considerations of antenna coupling methods, r-f transmission lines and antennas; Parasitic and harmonic suppression methods; Design of a complete broadcast transmitter —Radio Laws. (5½ credits)

DAY: 1 term; $65
EVE.: 1 term; $60

RF-2—Radio Receivers: General characteristics of receivers — classification according to function and operation — TRF, superheterodyne, aircraft, marine, regenerative, communications, etc. Operating requirements — sensitivity, selectivity, fidelity, other considerations. Constructional design of receivers, wiring, shielding, heat dissipation, etc. General theory of modulation as applied to detectors — concept of the non-linear network —mathematical analysis of demodulation by Talyor's series expansion—continuous and discontinuous functions. Envelope detection—concepts of angle of flow and detection efficiency — the diode detector — the triode detector — the infinite impedance detector—other types. Dynamic detection characteristic—design of a detector stage. Distortion due to detectors — curvature distortion — diagonal and horizontal negative peak clipping — the unmodulation effect. Theory of heterodyne detection — Converters and mixers for superheterodyne receivers—inner and outer grid injector — calculation of conversion transconductance and conversion gain. The superheterodyne tracking problem, mathematical development — calculation of the oscillator padder condenser. Tuned radio frequency amplifiers—single tuned, capacitively coupled — mutually coupled, tuned secondary—double-tuned mutually coupled—band-pass design for superheterodyne I-F amplifiers. Noise considerations — auxiliary circuits, AVC, AFC, etc. — signal tracing. Detailed study of complicated receiver circuits. (6 credits)

DAY: 1 term; $72
EVE.: 2 terms; $72

RF-3—Television and F-m Transmitters: *FCC Specifications on Television Transmission*: Scanning—Relationship of Scanning and Video Bandwidth — Vestigial Sideband Operation — Negative Modulation — D-c Modulation — Logarithmic Characteristic of Transmitter. *Problems of High-frequency Operation*: Circuit Problems — Tube Problems — Transit Time Effects. *Comparison of Present Transmitters*: Various Manufacturers. *Carrier-frequency Generator*: Frequency Multipliers — Grounded Grid Amplifiers — Grounded Plate Amplifier. *The Modulation Circuit*: Grid Modulation — Grid Modulation in Television — Plate Modulation in Television — Design of Transmission Line Resonant Circuit — Linear R-f Amplifiers. *Video Amplifier*

Stages: Amplifiers in Parallel — Direct Coupling — Use of Constant R Network — *Components of a Television System*: Vestigial Sideband Filters — Diplexers, Single-frequency and Wideband. *V-h-f Transmitters.* (4 credits)

DAY: 1 term: $51
EVE.: 1 term: $60

RF-4—Television and F-M Receivers: Fundamental discussion of the elements of a picture transmission system — the need for scanning, deflection, and synchronization — the standard television channel — the electrical factors affecting picture quality—contrast, definition, distortion due to variable time-delay, average picture brightness. The requirements of a television receiver — block diagram analysis — television receiving antennas and transmission lines. The preselector circuit — design of single and double tuned circuits — the R-F stage — the first detector. Considerations for design of the I-F system of a television receiver. Derivation of formulas for various types of I-F filters — the general equation for stage gain with ladder network coupling. Separation of sound and video carriers — trap circuits — the bridged-T network — stagger tuned I-F systems. The second detector of a television receiver — sync separation—D-C restoration—deflection generators — power supplies. The FM receiver — the R-F and I-F stages — the limiter stage — the discriminator — the de-emphasis network. Qualitative discussion of radar and other UHF receivers. (5½ credits)

DAY: 1 term: $65
EVE.: 1 term: $60

RF-5—Transmission Lines: Distributed and lumped constants — the long line — the equivalent circuit of a transmission line. Characteristic impedance and the infinite line. The differential equation of propagation of current and voltage waves along the transmission line. Propagation constant—the impedance-frequency function — phase shift due to propagation. Reflection on a transmission line. Case of the matched and mismatched line — reflection factor — transfer constant — reflection coefficient — study of propagation by means of vector diagrams. Use of hyperbolic functions in transmission line calculations — the distortionless line — the loss-less line — the loading coil. UHF applications of transmission lines — the first, second, and third approximations — the design of line elements to simulate any lumped constant circuit — double-branch sections. Use of a line for impedance matching by the quarter-wave line—by means of stub lines. Use of a line for impedance measurements—the Carter Chart. Transmission line filters. Introduction to the theory of wave guides and resonators. (1½ credits)

DAY: 1 term: $15
EVE.: 1 term: $24

RF-6—Theory of Modulation: Definition of modulation in terms of non-linear networks — Analysis of the modulation parameters by means of rotating vectors of pure sinusoids — Definition of amplitude, phase, and frequency modulation—Mathematical Analysis of the output signal of a perfect amplitude modulator—Instantaneous amplitude as the resultant of three rotating vectors — Theory of envelope analysis—Determination of envelopes following side-band filtration — Fundamental relations for phase modulation — Fundamental relations for frequency modulation — Relationship between PM and FM — Mathematical analysis of the output signal of a perfect time axis modulator — Bessel's functions and their application to the calculation of side-frequency distributions in time-axis modulation—Deviation vs. bandwidth — Effect of side-band filtration — Analysis by means of the resultant vector—Signal-to-noise ratio in FM and PM — Circuits for practical FM and PM modulators — The reactance tube modulator — The Armstrong system — The phasitron and other methods — Review of circuits for amplitude modulation; Plate, grid, cathode and suppressor modulation — Pulse-time and pulse-position modulation. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $24

RF-7—Radiation and Antennas: Fundamental discussion of field theory—Field theorems — Stokes' theorem — The divergence theorem — The electric field-displacement current — The magnetic field. Electrodynamics — Derivation and study of Maxwell's equations — The wave equation and its solution — Properties of a plane electromagnetic wave—Concomitance of the electric and magnetic field — Orientation of the field vectors — The impedance of free space — The transverseness of the wave — Linear, circular and elliptical polarization — The Poynting vector and the propagation of power—Application of boundary condtions to the wave equation. The field radiation from an infinitesimal linear antenna — Induction and radiation fields — Radiation pattern from a short antenna—Radiation resistance — The pattern from a finite linear antenna—input impedance of the linear antenna—Horizontal pattern from a two-element array—The unidirectional and bidirectional couplets — The complete spatial pattern—The broadside, end-fire, collinear, fishbone, rhombic and V arrays—Arrays for VHF: the turnstile and similar arrays—Propagation of waves in the earth's atmosphere. (3 credits)

DAY: 1 term: $29
EVE.: 1 term: $36

AUDIO AND VIDEO FREQUENCY TECHNOLOGY

Audio and Video Frequency Technology embraces such diverse subjects as loud speakers, audio amplifiers, sound recording, microphones, relays, broadcast studio practices, acoustics, audio oscillators, and television apparatus.

Audio circuits are treated in great detail, the selection of tubes and circuits for specific purposes receiving careful attention. The maintenance of commercial apparatus in the laboratory and emergency repairs in the field are both taught. Audio circuit theory and practice is extended to the intricate, wide-band circuits of television. New developments are discussed and evaluated.

Electronic Circuits includes the study of the operation and analysis of those specialized circuits necessary in the formation of the composite television broadcast signal, and in combining these special signals with the picture signal. The circuits are studied for their capabilities and limitations with regard to speed, linearity and stability. Their application to industrial work not directly classified as radio is treated.

Industrial Electronics applies the fundamentals taught in Engineering Technology to various important circuits and apparatus widely used in industry.

Electron Optics consists of specialized mathematical methods of analysis in electro-magnetic theory as related to applications in the field of commercial radio, especially in television. The study of the internal fields in picture tubes is given analytically and graphically. There is included a thorough analysis of the operation of the electron microscope.

AVF-1—Audio Amplifier Design: *Review of General Circuit Theorems. Voltage Amplification*: General Analysis — Resistance-Capacity Coupling — Design. *Theory of Transformer*: Impedance Matching — Equivalent Tee Network — Leakage Reactance—Distributed Capacity — Frequency Response — Types and Applications. *Feedback*: General Analysis —Voltage and Current Types—Reduction in Distortion, Noise, and Internal Impedance — Elimination of Regeneration in Multi-stage Amplifiers — Plate De-coupling. *Balanced Amplifiers*: General Graphical Analysis of Plate Circuit — Optimum Load Impedance—Power Output and Plate Dissipation Calculations—Grid Circuit Analysis — Driver Calculations. (5½ credits)

DAY: 1 term: $65
EVE.: 1 term: $60

AVF-2—Audio Components and Systems: *Design of Attenuators*: Review of DB Calculations — VU — Design of T, H, Pi, and Ladder Attenuators — DB Boxes. *Frequency Response and Overload Tests*: Theory and Practical Methods. *Mixer Design*: Series, Parallel, Series-Parallel, and Bridge Types. *Transmission Lines*: Fundamental Theory — Ideal and Distortionless Lines — Loading. *Equalizers*: Theory and Operation. *High Level Modulation Amplifiers. Multiple Speaker Connections. Relays and Switching*: Construction of Various Switching Devices—Applications to Circuits. (6 credits)

DAY: 1 term: $72
EVE.: 1 term: $60

AVF-3—Electronic Circuits: *Regulated Power Supplies*: Voltage and Current Regulators — Radio Frequency Power Supplies—*Kick-Back and Flip-Flop Circuits*: Eccles Jordan Circuit — Multivibrator — Blocking Oscillator. Step Counters—Binary Dividers. Differentiating and Integrating Circuits — Clampers — Clippers — Linear Sweep Circuits — Damping Tubes — Synchronizing Circuits. *Electrical Conduction in Gases*: Glow and Arc Discharge Tubes and Circuits — Thyratron Control Circuits — Photocells. *Servo mechanisms*: Theory and Industrial Applications. *Transistors*: Theory and Applications. (6 credits)

DAY: 1 term: $72
EVE.: 1 term: $60

AVF-4—Television Studio Equipment: *General Analysis*: Component Parts and their Functions. Analysis of the RMA Composite Video Signal. Fundamentals of Picture Transmission — Brightness — Contrast — Flicker — Resolution — Theory of Scanning — Hum Considerations — Frequency Band Width requirements. *Wideband Amplifiers*: Frequency and Phase Characteristics—Shunt, series and combination Peaking. Filter Theory as applied to Video Amplifiers. *Analysis of the Synchronizing Signal Generator. Test equipment*: Pulse Cross-Bar Signal Generator—Test Patterns. *Camera Tubes*: Image Dissector—Orthicon—Iconoscope. Picture shading—Brightness and Contrast Control. Projector Operation. *Kinescopes*: construction — Theory — Dynamic Characteristics — Fluorescent Screens — Associated Circuits. *AFC circuits. Color Television Systems.* (5½ credits)

DAY: 1 term: $65
EVE.: 1 term: $60

AVF-6 — Electro Acoustics: Electrical Analogues of Mechanical and Acoustical systems. Vibration Isolation. *Microphones*: Types — Theory — Frequency and Directional Characteristics. *Loud Speakers*: Flat Baffle and Horn Types—Theory and Characteristics. *Sound Recording and Reproduction*: Types — Theory — Commercial Practice. (2 credits)

DAY: 1 term: $22
EVE.: 1 term: $24

AVF-7—Color Television: The physical and psychological aspects of color related to the color television problem — Colorimetry and its problems in color television — Vector Analysis as an aid to the study of color—The ICI system of colorimetry Color reproduction processes — Additive and subtractive systems — Color television as a transmission problem — Classification of systems — Simultaneous color television systems — Three carrier — Two

carrier with two phase modulation — Frequency interlaced subcarrier systems — NTSC, FCC standards — Circuits and components for color television receivers — Demodulators — Matrix circuits — Kinescopes — Color synchronization — Color killer — Band pass amplifier — Convergence — Application of the foregoing to the detailed operation of a typical color television receiver.

DAY: 1 term; $22
EVE.: 1 term; $24

IE-1— Industrial Electronics: Servomechanisms; Amplidyne; Saturable Core Reactors; Magnetic Amplifiers; Phototubes; Process Control; Electronic Instruments; Electronic Motor Control; R.F. Heating. (3 credits)

DAY: 1 term; $36
EVE.: 1 term; $36

COURSE DESIGNATION AND HOURS

The Advanced Technology Course, T3, requires 9 terms (2¼ years) for completion in the day school. The evening course requires a minimum of 27 terms, covering a period of 6¾ years, subject to scheduling facilities.

Day classes meet 25 hours per week, an average of 5 hours per day; Evening classes meet 16⅔ hours (five evenings) in two weeks, three evenings one week and two the next.

FEES AND OTHER COSTS

A matriculation fee of $15.00 is required for registration and must accompany the Application for Enrollment. If the application is not accepted, the fee will be returned. Veteran trainees are referred to the data presented under the heading on Page 13.

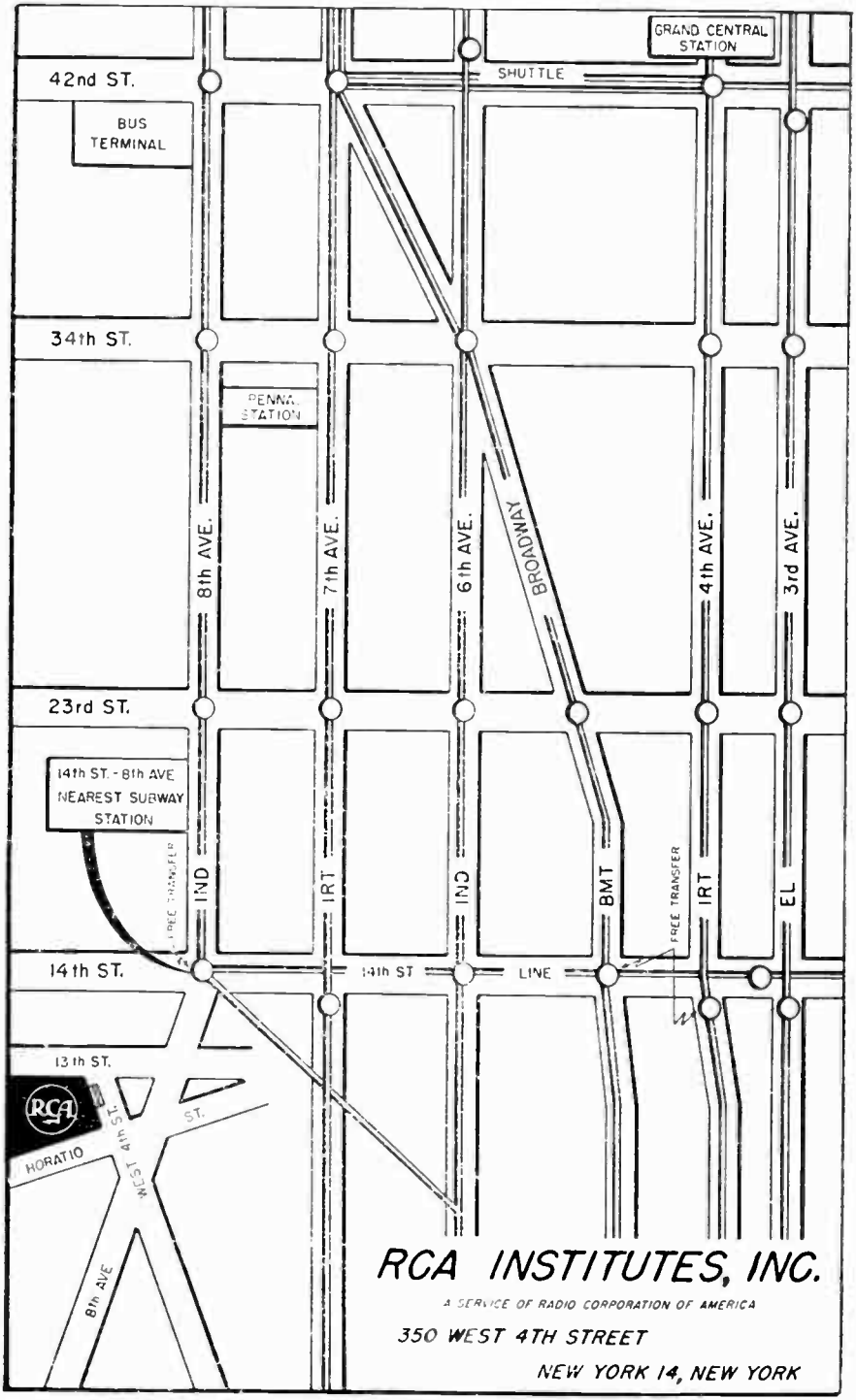
The tuition fee of $1440 is payable at the rate of $15 per week in the day school, or $5 per week in the evening school.

The tuition fee for those starting in term 2a is $1280 and is payable at the rate of $15 per week in the day school, or $5 per week in the evening school.

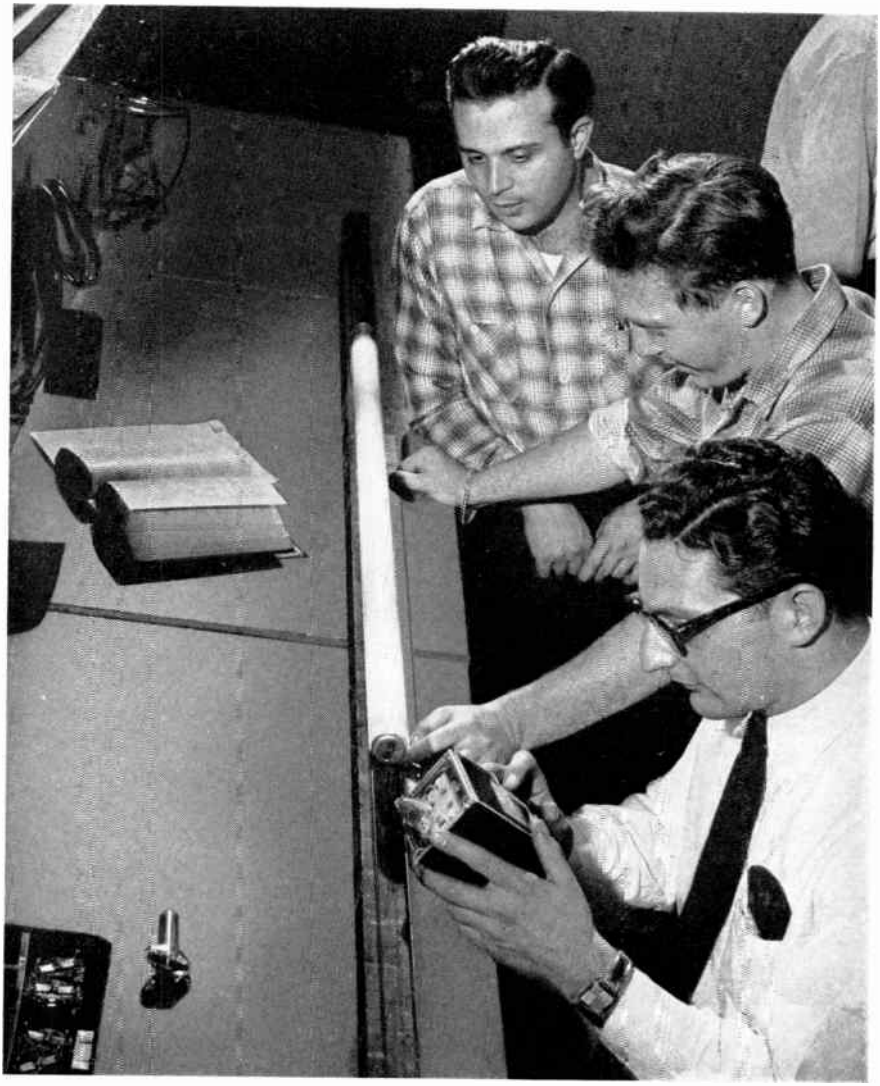
The total cost of textbooks, drafting kit, slide rule and supplies for entire course is approximately $210. The text books used are standard collegiate books published for engineering students. The laboratory manuals are prepared by RCA Institutes, Inc.

REQUIREMENTS FOR GRADUATION

In addition to maintaining at least passing grades (65%) throughout the Course, the student is required to obtain a first-class radio telephone operator's license to receive the certificate. Since non-citizens are not eligible for a license, such students are exempt from the license requirement.

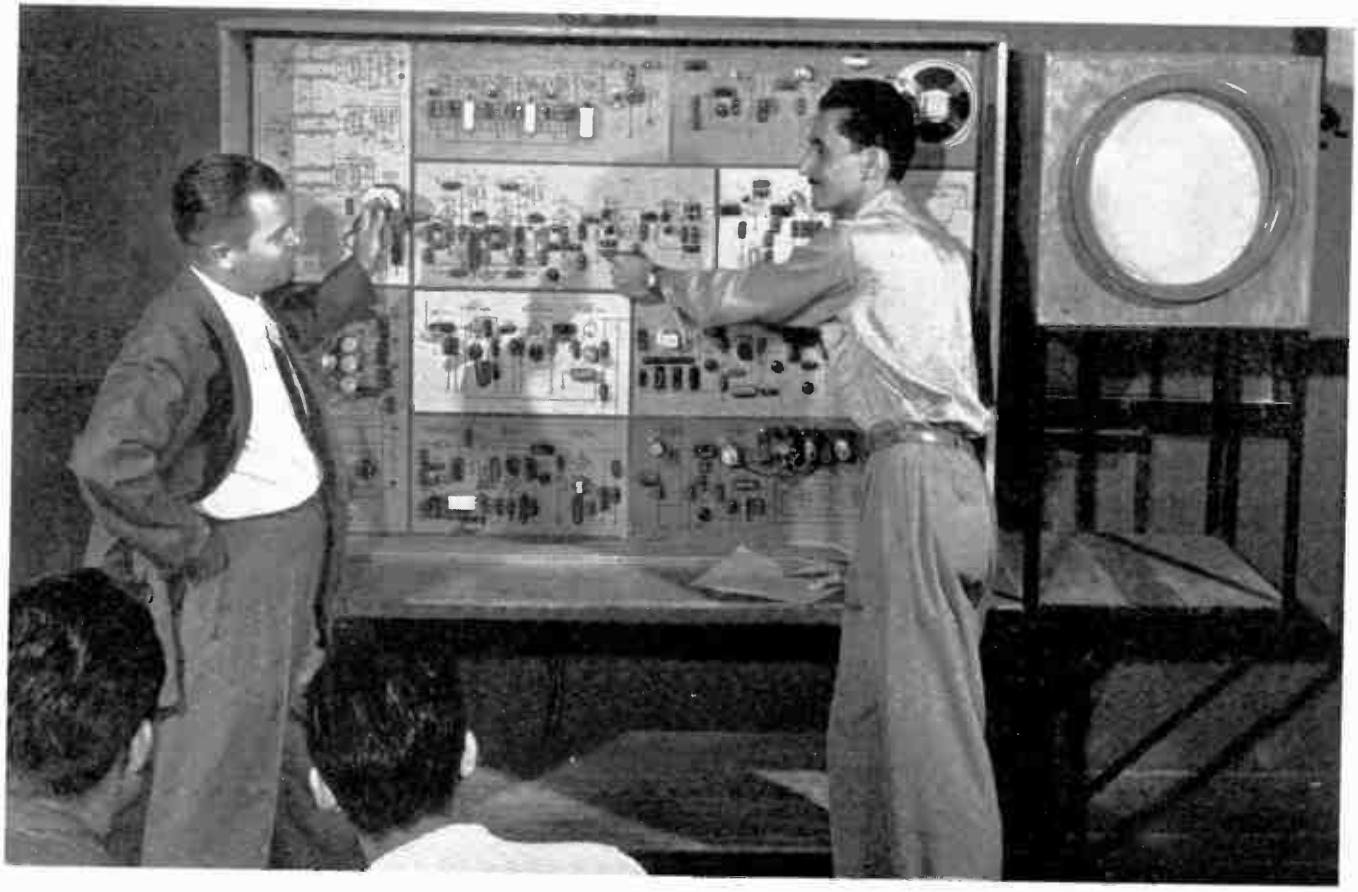


TRANSMITTER LABORATORY



HIGH FREQUENCY EXPERIMENT

AUDIO CONTROL ROOM PRACTICE



TELEVISION RECEIVER SERVICING

PROGRAMS OF EDUCATION OR TRAINING

IN THE

VOCATIONAL SCHOOL

The following table shows the total hours (day and evening) assigned to each unit of the Vocational Courses. Each unit is completed within one term in the day school; the number of terms required in the evening school is tabulated below. For unit tuition charges see descriptions of the units on the following pages.

Course V7 consists of terms 1v, 2r, 3r, 4t, 5t, 6t
Course V3 consists of terms 1v, 2r, 3r
Course V8 consists of term 4r
Course V5 consists of terms 1v, 2r, 4t
A "term" is 3 months.

Term	Symbol	Subject	Hours DAY	Hours EVE	Terms EVE
1v	RP-01	Radio Physics	104	100	3
	RPL-01	Radio Physics Laboratory	92	100	3
	M-01	Radio Mathematics	70	80	2
	E-01	Study Methods	24	20	1
2r	RC-02	Radio Receivers	87	100	2
	RCL-02	Radio Receiver Laboratory	145	140	3
	TvR-02	Introd. to Television Receivers (½ term)	29	30	1
	FM-02	Frequency Mod. Receivers (½ term)	29	30	1
3r	TvR-03	Television Receivers	170	180	3
	TvRL-03	Television Receiver Laboratory	120	120	3
4r	TvR-04	Advanced Television Servicing	See page 51		
	TvRL-04	Advanced Telev. Serv. Lab.	See page 51		
4t	TC-04	CW Radio Transmitters	140	140	3
	TCL-04	CW Transmitter Laboratory	68	80	3
	ASC-04	Audio & Studio Circuits	58	60	3
	E-04°	Announcer Techniques	24	20	1
	MP-04°	Marine Operating Procedure	24	20	1
5t	TC-05	Modulated Radio Transmitters	116	120	3
	ASL-05	Audio Laboratory	46	40	1
	TCL-05	Modulated Transmitter Laboratory	46	60	2
	IE-05	Industrial Electronics	29	30	1
	IEL-05	Industrial Electronics Laboratory	29	30	1
	E-05	Station Operation	24	20	1
6t	TvTC-06	Television Transmitters	175	180	3
	TvTL-06	Television Transmitter Laboratory	115	120	3

°V7 students take E-04; V5 students take MP-04.

For unit charges, see descriptions of the units on the following pages.

THE RADIO AND TELEVISION BROADCASTING COURSE (V-7)

The Radio and Television Broadcasting Course (V7) provides the type of training required for two large fields. The first is that of radio laboratory aid, and the second is that of operator or technician in one of the many communication services such as broadcasting, commercial and governmental aviation, point-to-point commercial message companies, police and railroad radio communication systems, and television broadcasting.

Increasing use of radio facilities has created a demand for many more laboratory technicians than ever before; for persons who have knowledge of all types of radio and electronic circuits. The lecture and laboratory work given in this Course prepare admirably for this type of work. The maintenance and uninterrupted operation of the transmitters and auxiliary circuits used in many of the communications services require a thorough technical background.

To provide the technical training needed to satisfy the demands of the fields indicated, the course has been designed to include radio physics, radio mathematics, receiver and transmitter circuits and equipment. The radio physics and mathematics are given in the first part of the course as the necessary prerequisites to the study of receiver and transmitter circuits. Throughout the course the student's day is divided into periods for lecture and for practical work with modern communications equipment. Close coordination between the two enables the student to apply the theory of the lecture room to the laboratory and to discover in the laboratory the essentiality of the theory work if he is to understand the methods used in the operation of laboratory and commercial equipment.

To provide the related training needed by station operator-announcers, units in Technical English, Announcing Techniques, and Operating Procedures have been included.

The Radio and Television Broadcasting Course (V7) is offered as the means of acquiring a general or inclusive knowledge of radio by those who may be unable to devote the study time demanded by the Advanced Technology Course and whose preliminary educational background is less than that demanded by the longer course.

OUTLINE OF COURSE

RP-01 and RPL-01 — Radio Physics: Presents the basic physical principles and concepts governing the behavior of electrical circuits, and indicates their application in components of radio and television systems. Laboratory work closely parellels the classroom study, and provides a first introduction to practical laboratory equipment and methods.

Nature of Electricity: Atomic Structure of Matter; Electrons; Charged Bodies, Electrostatic Fields, Potential Difference. Current as Electricity in Motion. *Dynamic Electricity*: Methods of Generating

Emf; Power and Energy; Units; Conductors and Insulators, Resistance and Conductance; Resistivity, Temperature Coefficient, Types of Resistors; Cells and Batteries, Types, Construction, Connections, *D-c Circuits*: Series, Parallel, and and Series-Parallel Combinations of Resistance; Ohm's Law, Kirschhoff's Laws, Voltage, Current and Power Distribution; Voltage Dividers. *Magnetism and Electromagnetism*: Permanent and Temporary Magnets; Magnetic Fields and Materials; Fields Around Current-Carrying Conductors, Coils; Units of Flux, Magnetizing Force; Permeability; Magnetic Circuits. *Electrical Measuring Instruments*: Types, Principles of Operation, Construction, Application. *Voltage Generation*: Electromagnetic Induction; Principle of Practical Generators; Construction of A-c and D-c Generators. *Alternating Voltage and Current*: Sine Waves; Maximum, Effective, Average and Instantaneous Values; Phase and Phase Difference; Instantaneous and Average Power; Transformers. *Inductance*: Induced Voltage; Self-Inductance; Time Constant; Mutual Inductance; Coefficient of Coupling; Inductive Reactance; Inductive Impedance; Phase Relations. *Capacitance*: Distribution of Charge; Charging and Discharging of a Condenser; Time Constant; Capacitive Reactance and Impedance; Phase Relations. *Alternating Current Circuits*: Series and Parallel A-c Circuits; Vector Relationships; Resonance, Anti-resonance; Tuned Circuits; Filter Circuits. *Vacuum Tubes*: Edison Effect; Diodes, Triodes; Electrical Characteristics; Rectifiers; Half-wave and Full-wave Power Supplies.

DAY: 1 term: $123
EVE.: 3 terms: $120

M-01 — Radio Mathematics: Furnishes the mathematical tools to enable the student to perform the calculations necessary to an understanding of basic d-c and a-c circuits, and introduces him to the methods of quantitative expression in common use in the radio industry.

Review of Arithmetic: Addition, Subtraction, Multiplication, Division; Square Roots, Cube Roots, Squares and Cubes; Order of Operations; Fractions, Simple and Complex; Decimals and Powers of Ten. *Algebra*: Axioms, Definitions and Symbols; Positive and Negative Numbers; Fundamental Operations with Algebraic Expressions, Addition, Subtraction, Multiplication, Division; Linear Equations; Fractions in Algebra; Radicals; Applications to Electrical Formulas. *Basic Trigonometric Concepts*: Functions of Angles; Solution of Right Triangles; Complex Numbers; Applications to A-c Circuits. *Logarithms*: Application to Decibels and Vu. *Use of Slide Rule*: Multiplication, Simple and Continuous; Division, Combined Multiplication and Division; Reciprocals, Proportions, Squares and Square Roots; Trigonometric Functions, Logarithms, Complex Numbers.

DAY: 1 term: $44
EVE.: 2 terms: $48

E-01 — Study Methods: This unit is designed to assist the student to make the most effective use of his study time.

Study Techniques: Note-taking and Preparation of Notebooks; Correlation of Notebooks and Reading Assignments; Preparing for Examinations; Problem-solving in Physics and Mathematics; Proper Study Environments; Use of Library; Study Time Evaluated. *Reading Improvement*: Development of a Technical Vocabulary; Speed Reading Practice via Instrumentation (Tachistoscope and Motion Picture Projector Used).

DAY: 1 term: $15
EVE.: 1 term: $12

RC-02 and RCL-02—Radio Receivers: Applies the physical principles of the first-term units to the major components of radio receivers, and develops a functional analysis of the receiver as a unit. Correlated laboratory work includes the construction of a six-tube superheterodyne receiver, experimental measurements on commercial receivers, and development of effective servicing procedures.

Power Supplies: Rectifiers, Filter Systems, Voltage Divider and Bias Supply Systems; Voltage Regulator Tubes, Voltage Doublers. *Amplitude-Modulation De-*

tectors: The A-m Signal; Diodes, Bias Detectors, Grid Leak Condenser Detection; Automatic Volume Control Circuits. *Audio Amplifiers*: Voltage Gain, Db Gain, Measurement; Frequency Response; R-C Coupling, Transformer Coupling, and Direct Coupling; Distortion; Negative Feedback; Equalizing Networks; Push-pull and Single-ended Power Stages; Phase Inverters, Tone Control; Loudspeakers; Impedance Matching. *Tuned Radio-frequency Amplifiers*: Selectivity and Sensitivity; R-f Coils and Transformers; Types of Tuning Condensers; Bias Methods; Bandwidth and Response Characteristics. *Super-Heterodyne Circuit*: The Heterodyne Principle; Oscillators, Mixers; Intermediate Frequency; Tuning and Alignment Procedures; Methods of Eliminating Super-heterodyne Interference. *Special Circuits*: Auto Radio Power Supply; Interference; Receiving Antennas; Tuning Indicators. *Servicing Procedures on Complete Receivers.*

As part of the laboratory unit, the student is taught the purpose and application of laboratory equipment used in radio servicing. *Meters*: Ammeters, Voltmeters, Ohmmeters, Vacuum Tube Voltmeters. *Signal Generators*: Unmodulated, Amplitude-modulated, Frequency-modulated, Applications, Frequency Response Measurements, Distortion Analysis. *Oscilloscopes*: Basic Principles and Circuits, Applications, A-C Voltmeter, Distortion Analyzer, Phase Shift Measurement, Frequency Comparison, Selectivity Curves. *Other Equipment*: Tube Testers, Signal Tracers, Capacitor Bridges, Grid Dip Meter, Q Meter Measurements of L and C.

DAY: 1 term; $144
EVE.: 3 terms; $144

TvR-02—Introduction to Television Receivers: Extends to television receivers the principles of basic circuits and radio receivers developed in the first two terms and introduces the application of those principles to the circuits unique to television.

The Television System: Block Diagram of System, Picture Structure, Picture Elements, Conversion of Light Image to Sequential Electrical Signal, Scanning, Camera Tubes, Electronic Scanning, Interlacing, Synchronization and Blanking, the Composite Video Signal, Picture Reproduction, Carrier Transmission of Picture and Sound Information, Vestigial Side-band Transmission, Block Diagram of Receiver, Major Functional Sections, Picture and Sound Channels, I-F Section, Deflection and Sync System. *Picture Tubes*: Magnetic and Electrostatic Deflection and Focusing, Ion Trap.

DAY: ½ term; $18
EVE.: 1 term; $18

FM-02 — Frequency-Modulation Receivers: Presents in a supplementary unit (one-half term in day school) the operating principles of the circuits peculiar to f-m receivers. Laboratory work is included in RCL-02.

Theory of Frequency Modulation: The F-m Signal; Bandwidth; Interference Suppression. *F-m Propagation and Reception*: High-frequency Propagation Characteristics; Antennas, Transmission Lines. *F-m Detectors*: Triple-Tuned, Phase Discriminator, Ratio Detector; Limiters; Tuning Procedures with Voltmeter or Oscilloscope. *High-frequency Considerations*: R-f Amplifiers, Tube Types, Tuning Methods; Oscillators, Pentagrid Converters; Control of Frequency Drift; Analysis of Commercial Receivers; Special Tuning Methods; Tuning Indicators; Elimination of Interference and Spurious Response; I-f Amplifiers; Combined F-m and A-m I-f Amplifiers. *Servicing Techniques.*

DAY: ½ term; $18
EVE.: 1 term; $18

TvR-03 and TvRL-03 — Television Receivers: Continues with the application of basic circuits and principles to circuits unique to television.

Video Amplifiers: Bandpass and Gain Requirements, Compensation Methods, Video Detection, Negative and Positive Detectors, Bandpass, D-C Level of Video

Signal, D-C Reinsertion, Automatic Gain Control Circuits. *Deflection and Synchronizing Circuits*: Sync Separators, Clippers, Sync Amplifiers, Deflection Generators, Blocking Oscillator, Multivibrator, Sync Circuits, Triggered Sync and A-F-C Systems, Deflection Amplifiers, Vertical and Horizontal, Resistor Damping, Diode Damping, Boosted B-plus. *High Voltage Power Supplies*: Flyback, R-F. *Picture I-F*: Bandpass Requirements, Stagger Tuning, Over-coupled Circuits, Split and Intercarrier Sound Systems. *R-F Tuning Section*: Continuous Drum Type and Switch Type Tuners, Low Voltage Power Supplies, Antennas and Transmission Lines. *Receiver Servicing Techniques. Color Television*: Introduction, Elementary Three Channel System, Compatibility Requirements, Bandwidth Limitations. *Colorimetry*: Primary Colors, Additive and Subtractive Processes, Hue, Saturation, Brightness, Chromaticity. *Characteristics of Human Vision*: Visual Acuity for Colors, Preferred Colors for Limited Color Combinations, Persistence, Spectral Sensitivity. *Two-Phase Modulation and Colorimetry*: Amplitude Two-Phase Modulation, Application to Colors, Chromaticity Diagrams. *Color TV System*: Camera, Transmission Coding, Color Subcarrier, Frequency Interlacing, Receiver Decoding. *Color Kinescopes*: *Color Receiver Principles*: Color Demodulation, Matrixing, Color Sync and AFC, Focus, Deflection, Color Purifying. *Commercial Receivers*: Adjustment, Set-up, Alignment, Servicing.

UHF Television: *UHF Propagation*: Free Space Field Strength, Effect on Terrain. *UHF Antennas*: Gain, Radiation Patterns, Installation of Stacked Dipoles, Cone, Turnstile, Bow-tie, Dish. *Impedance Matching*: Antenna to Transmission Line, Line to Receiver, Balun, Stub Match. *UHF Amplifiers*: Problems of Noise, Gain, Transit Time Loss, Stabilization. *UHF Oscillators and Converters*: *Commercial Converters*: Problems in Double Superheterodyning, Beat Suppression, Ground Shields. *Commercial UHF Tuners*.

Record Changers: A brief introduction to record changers. By demonstration, students are made familiar with their operation and adjustment.

DAY: 1 term: $180
EVE.: 1 term: $180

TC-04 and TCL-04—CW Radio Transmitters: Presents the basic principles of radio transmitters and their components, including transmitter power supplies. In the associated laboratory work, students work first with breadboard circuits of r-f oscillators and power amplifiers, then with commercial continuous-wave (radio telegraph) transmitters.

Motor and Generators: A-c and D-c Machines; Types; Commutation, Windings, Characteristics; Regulation and Control; Dynamotor; Rotary Converter; Maintenance, Trouble-Shooting, Repair, *Batteries*: Primary and Secondary Cells; Protective Maintenance. *Electronic Power Supplies*: Rectifier Units; Types of Gas Tube Rectifiers; High Vacuum Rectifiers; Selenium and Other Types; Rectifier Circuits, Single-phase and Three-phase, Half-wave and Full-wave, Voltage Doublers; Filters; Practical Design of Transmitter Power Supply. *Oscillators*: Basic Types; Crystal Controlled Oscillators; Special Types; Magnetrons and Klystrons as High-frequency Oscillators. *CW Transmitters*: Functional Analysis; Characteristics of Class C Amplifiers; Neutralization; Inter-stage Coupling Methods; Keying Circuits; Tank Circuit Analysis. *Transmission Lines*: Two-wire Coaxial, Wave Guide; Characteristic Impedance. *Antennas*: Hertz and Marconi Antennas, Long-wire Antennas, Directional Antennas. *Radar and Loran*: Principles, Components. *Radio Laws and Operating Procedures*.

DAY: 1 term: $130
EVE.: 3 terms: $132

ASC-04 — Audio and Studio Circuits: Presents the function and principles of operation of sound studio and control room equipment, together with practical design procedures for the studio technician. Laboratory work on actual equipment is incorporated in the fifth term as ASL-05 (see page 47).

Broadcast Studio Layout: Microphones and Other Pickup Devices; Sound Channels; Functions of the Control Room. *Sound Level Measurement*: Decibel and Volume Unit; Db and Vu Meters. *Audio Networks*: Resistance Attenuation Networks; Matching; Mixers; Multiple Bridging Networks; Crossover Networks; Attenuation Equalizers; Volume Expansion and Compression. *Audio Components*: Loudspeakers, Voice Coil Impedance, Multiple Speaker Matching; Microphones; Disc Recording; Audio Power Amplifier Design, Class A and B.

DAY: 1 term; $36
EVE.: 3 terms; $36

E-04—Announcer Techniques: Operating technicians in some broadcasting stations are expected to be able to handle limited announcing assignments. This unit aims to develop effective speech and microphone techniques. V7 students hear their own voices played back by the tape recorder used in the classroom.

Microphone Technique: Pronunciation, Diction. *Script Reading*: Commercials, Narrations, Spot Commercials; Concert Announcements; Public Service Announcements.

DAY: 1 term; $15
EVE.: 1 term; $12

MP-04—Marine Operating Procedure: Acquaints the V5 student with the standard practices prevailing in shipboard radio operating procedure. Practice is given in keeping proper records, standing watch, and similar duties.

Orientation: Duties of the Radio Operator; Checking Procedure; Legal Requirements. *Procedures*: the Radio Log; Setting Watch; Traffic Lists, Weather Reports, Navigation Warnings, Time Ticks; Standing Watch; Message Blanks; Word Count; Q Signals; Abstracting Messages.

DAY: 1 term; $15
EVE.: 1 term; $12

TC-05 and TCL-05—Modulated Radio Transmitters and Laboratory: A continuation of TC-04, extending the coverage of transmitter principles and practice to radio telephone transmitters, both amplitude-modulated and frequency-modulated. Correlated laboratory work includes basic modulation circuits by means of breadboard setups, but concentrates on the operation of commercial equipment for both communication and broadcasting service.

Class C Amplifier Design: Maximum Theoretical and Practical Efficiencies of Class A, AB, B, and C Amplifiers; Ladder Diagram of a Class C Amplifier; Analysis of Clipped Sine Wave Pulses; Conduction Angle; Relation of Power Output, Plate Dissipation, and Efficiency; Transmitting Tube Ratings; Class C Design Procedure, Single-ended and Push-pull; Tank Circuit Design; Grid Dissipation, Driving Power, and Driver Amplifier Considerations; Biasing; Tuning Techniques. *Amplitude Modulation*: Methods of Amplitude Modulation, Constant and Variable Efficiency; Plate Modulation, Analysis and Design; Modulation Measurements and Instruments; Compensation Systems; Grid Modulation, Analysis and Design; Compensation Methods for Grid-modulated Stage; Grounded-grid Amplifier; Doherty Amplifier; Broadcast Transmitter Layout and Control. *Frequency Modulation*: Methods of Phase and Frequency Modulation; Commercial F-m Transmitter Circuits; Frequency Monitoring and Control Systems.

DAY: 1 term; $101
EVE.: 3 terms; $108

ASL-05 — Audio Laboratory: This is the laboratory associated with ASC-04 (see description on page 46).

DAY: 1 term; $29
EVE.: 1 term; $24

IE-05 and IEL-05 — Industrial Electronics: Servomechanisms; Amplidyne; Saturable Core Reactors; Magnetic Amplifiers; Phototubes; Process Control; Electronic Instruments; Electronic Motor Control; R.F. Heating.

DAY: 1 term; $36
EVE.: 3 terms; $36

E-05—Station Operation: This course is designed to familiarize the student

with the equipment and techniques of the broadcasting studio control room, and to develop his facility in their use, as well as to provide a further application of the announcer techniques developed in E-04. Students acquire practice in the use of microphones, control console, recording and playback turntables, portable recording equipment.

Studio and Control Room Equipment and Layout: Function of each Component. *Studio Practice*: Cueing Records, Breaks, Time Signals, Reports, Disc Jockeying, Gain Control, Mixing; Tape Recording and Editing; Street Interviewing for a Transcribed Program; On-the-Spot Radio Reporting.

DAY: 1 term; $15
EVE.: 1 term; $12

TvTC-06 and TvTL-06 — Television Transmitters and Laboratory: Develops from the basic principles of transmitters and studio equipment the special circuits and devices used in television transmitters, including camera tubes and cameras. A brief survey of geometric optics, as applied to television cameras, is incorporated. In the associated laboratory unit, students work with v-h-f and u-h-f components of transmitters at television frequencies, including magnetron oscillators, complete and subsidiary circuits of the synchronizing signal generator, and with complete f-m and television transmitters.

Television Pick-up Devices: Monochrome Scanner; Orthicon; Image Dissector; Image Orthicon; Iconoscope; Image Iconoscope; Image Isocon; Vidicon. *Camera Circuits*: Focusing, Deflection, Shading; Amplifiers; Keystoning Correction; Televising Motion Pictures; Filming Television. *Camera Optics*: Light Units and Measurement; Studio Lighting Techniques; Reflection, Refraction; Plane and Curved Mirrors; Thin Lenses; Optical Systems; Choice of Lens and Aperture Settings of TV Cameras; Aberrations. *Synchronizing Signal Generator*: Pulse Generation, Shaping, Mixing, Gating; Delay Line; Systems; Standards. *TV Control Room Equipment*: Synchroscope, Bar Generator, Monitors; Shading Generators, Blanking Insertion; Corrections; Switching Systems, Fades, Lap-dissolves, Super-impositions, Other Effects; Terminal Amplifiers. *Transmission Lines for Video Signals*: Bandwidth, Attenuation, Time Delay; Use of Artificial Lines; Long-distance Carrier Transmission Systems. *Television Transmitters*: Low-level, Intermediate-level and High-level Modulation; Design for Wideband Modulation; Stabilization of V-h-f and U-h-f Amplifiers; Vestigial Sideband Transmission; Power Supply Regulation; Modulator Load Compensation. *Television Antennas*: Propagation at V-h-f and U-h-f; Polarization; Pylon, Turnstile, Superturnstile; Multiplexing; Reflectometer; Vestigial Sideband Filters; Use of Lines as Circuit Constants. *Link Relay Equipment*: U-h-f Generators; Klystron, Magnetron, Lighthouse Tube; Waveguides; Resonant Cavities. *Transistors*: Introduction to Theory and Applications. *Color Television*: Introduction to Modern Systems.

DAY: 1 term; $180
EVE.: 3 terms; $180

COURSE DESIGNATION AND HOURS

V7:—The Radio and Television Broadcasting Course, designated as V7, requires six terms (one and one-half years) for completion in the day school, and eighteen terms (four and one-half years) in the evening. Day classes meet 25 hours per week, averaging 5 hours per day. Evening classes meet 16⅔ hours (five evenings) in two weeks, three evenings in one week and two evenings the next.

FEES AND COSTS

A matriculation fee of $15 is required for registration and must accompany the enrollment application. This fee will be returned if the application is not accepted. Veteran trainees are referred to the data presented under that heading (Page 13).

The tuition fee for V7, the Radio and Television Broadcasting Course, is $960, payable at the rate of $15 per week for the day class, or $5 per week for the evening class.

The total cost of text books, slide rule, and other supplies for this course is approximately $95. The text books used are standard books published for vocational students. The laboratory manuals are prepared by RCA Institutes, Inc.

REQUIREMENT FOR GRADUATION

In addition to maintaining at least passing grades (65%) throughout the Course, the student is required to obtain a first-class radio telephone operator's license to receive the certificate. Since non-citizens are not eligible for a license, such students are exempt from the license requirement.

THE RADIO AND TELEVISION SERVICING COURSE (V-3)

The Radio and Television Servicing Course (V3) offers a carefully planned curriculum for those who desire to acquire the technique of servicing radio broadcast and television receivers, and record changers. A satisfactory course of training for this type of work should include thorough instruction in the fundamentals of electricity and radio-receiver theory. This is necessary to understand the more advanced sections of the Course as well as technical articles explaining developments in the field.

OUTLINE OF COURSE

This Course is the first half (Terms 1v, 2r, 3r) of the Radio and Television Broadcasting Course. The work of these terms is detailed on pages 43-46.

COURSE DESIGNATION AND HOURS

V3:—The Radio and Television Servicing Course, designated as V3, requires three terms (nine months) for completion in the day school, and nine terms (two years and three months) in the evening school. Day classes meet 25 hours per week, averaging 5 hours per day. Evening classes meet 16⅔ hours (five evenings) in two weeks, three evenings one week and two evenings the next.

FEES AND COSTS

A matriculation fee of $15 is required for registration and must accompany the Application for Enrollment. The fee will be returned if the Application is not accepted. Veteran trainees are referred to the data presented under that heading (Page 13).

The tuition fee is $480 payable at the rate of $15 per week for the day class, or $5 per week for the evening class.

The total cost of text books and tools required for this Course is approximately $65. The text books used are standard books published for vocational students. The laboratory manuals are prepared by RCA Institutes, Inc.

REQUIREMENTS FOR GRADUATION

The student is required to maintain at least passing grades (65%) throughout the course to receive the certificate.

THE ADVANCED TELEVISION SERVICING COURSE (V-8)

The Advanced Television Servicing Course (V8) offers special training in the circuits and repair of the latest types of television receivers. Admission requirements are knowledge of the work of the Radio and Television Servicing Course, V3, or the equivalent. Therefore, the lecture work consists of instruction on unique circuits and the special characteristics of current receiver models; the laboratory work consists of extensive practice in the location and correction of faults and failures.

OUTLINE OF COURSE

The student is provided with a working, latest type, television receiver, which has had an outlined change made in the receiver. With a suitable signal connected to the receiver, the student by observing the pattern is to locate the section or sections where the trouble may be located. Depending on the trouble, diagnosis, suitable equipment for further checking must be used. Such equipment as the sweep generator, marker generator, wide band cathode ray oscilloscope and Voltohmyst are provided on each bench for student use. Additional equipment such as small parts and tube checkers are also available for student use.

The student upon locating this trouble must then make a satisfactory repair before proceeding to another trouble. The repair must be checked by the instructor.

COURSE DESIGNATIONS AND HOURS

V8:—The Advanced Television Servicing Course, designated as V8, requires three terms (nine months) for completion in the evening school. However, the program is flexible and may be started at any time and continued as long as desired. The total time of attendance, therefore, is the student's choice depending on his needs for instruction.

FEES AND COSTS

A matriculation fee of $15 is required for registration and must accompany the application for enrollment. The fee will be returned if the application is not accepted. Only self-paying students or those specifically authorized for individual sponsorship are accepted.

The tuition fee for the complete course is $230 payable at the rate of $7 per week for the evening class.

The total cost of text books and tools required for this Course is approximately $25. However, it is expected that most students qualified for admission will have the books and tools and need not incur this expense. The text books used are standard books published for vocational students. The laboratory manuals are prepared by RCA Institutes, Inc.

REQUIREMENTS FOR GRADUATION

The student is required to maintain at least passing grades throughout the entire course (290 hours) to receive the certificate.

THE RADIO TELEGRAPH OPERATING COURSE AND RADIO CODE (V-5)

The Radio Telegraph Operating Course (V5) is the modern counterpart of our original "wireless operating course" in which many of today's leading radio engineers and executives began their successful careers.

The field of radio communication offers opportunities to qualified young men. Merchant ships and naval vessels all rely on radio. Shipboard installations today provide a greater degree of service than ever before.

Code instruction is offered to students in the Radio Telegraph Operating Course; it is part of the job objective of the course and is necessary to obtain the Radio Telegraph license. Code instruction is offered as a separate Unit (V4) for those who wish to take this training alone. This is a particularly attractive program to commercial operators and to amateur operators who wish to improve their code speed.

OUTLINE OF COURSE

The first term of the Radio Telegraph Operating Course (V-5) is devoted to the study of Radio Physics and Radio Mathematics and Technical English and code. This work is detailed on pages 35 and 36, and is the first term (1v) in the Radio and Television Broadcasting Course, V7.

The second term of the Course is devoted to the study of all-wave and frequency-modulation receivers, and code. This work is detailed on pages 36 and 37, and is the second term (2r) in the Radio and Television Broadcasting Course, V7.

The Third Term (4t) of the Course is devoted to transmitters, covering basic and continuous-wave transmitter circuits, and radio laws, and code. This work is detailed as the fourth term of the Radio Broadcasting Course, V7. V5 students devote two hours per week to Marine Operating Procedure, MP-04.

COURSE DESIGNATION AND HOURS

V5:—The Radio Telegraph Operating Course, designated as V5, requires three terms (nine months) for completion in the day school, and nine terms (two years and three months) in the evening.

V4:—International Morse Code, available to those who wish this work by itself, particularly for regaining lost code speed. Code instruction is offered ten hours per week; three evenings per week.

FEES AND COSTS

The tuition fee for V4, the code training, is $2 for each night or $5 for each week attended. No matriculation fee is required.

A matriculation fee of $15 is required for registration for Course V5, and must accompany the enrollment application. This fee will be returned if the

application is not accepted. Only self-paying students or those specifically authorized for individual sponsorship are accepted.

The tuition fee for V5, the Radio Telegraph Operating Course, is $480, payable at the rate of $15 per week for the day class, or $5 per week for the evening class. Attendance in code instruction classes while attending the course is optional; no tuition charge is made for attendance or tuition credit granted for non-attendance.

The total cost of textbooks, slide rule, and other supplies for these courses is approximately $2 for V4; approximately $70 for V5. The text books used are standard books published for vocational students. The laboratory manuals are prepared by RCA Institutes, Inc.

REQUIREMENT FOR GRADUATION

In addition to maintaining at least passing grades (65%) throughout the Course, V5, the student is required to obtain the second-class radio-telegraph operator's license to receive the certificate. Since non-citizens are not eligible for a license, such students are exempt from the license requirement.

EMPLOYMENT OF GRADUATES

TABLE I

Total Number of Graduates for Calendar Year January, 1954 to December, 1954, Available for Employment

		- *Terms* -				
Course:		*Winter*	*Spring*	*Summer*	*Fall*	*Total*
T-3	Advanced Technology . .	9	18	20	17	64
V-7	Radio & TV Broadcasting .	51	44	48	69	212
V-3	Radio & TV Servicing . . .	29	32	20	21	102
	TOTALS	89	94	88	107	378

NOTE: The balance of the graduates were non-citizens returning home or those entering military service.

TABLE II

Placement of Graduates: January, 1954 - December, 1954

Course:		*Available for Placement*	*Placed*
T-3	Advanced Technology	64	54
V-7	Radio & TV Broadcasting	212	162
V-3	Radio & TV Servicing	102	63

Those not reported as placed have not utilized our Placement Service

TABLE III

Placement by Principal Employment Objective

POSITION	COURSES			TOTAL
	T-3	V-7	V-3	
Engineer	5	1	0	6
Junior Engineer	12	10	0	22
Laboratory Technician	14	22	6	42
Tester	20	83	5	108
Transmitter Engineer	2	15	0	17
Instructor	1	1	0	2
Radio-TV Serviceman	0	12	52	64
Sales Representative	0	3	0	3
Technical Writer	0	3	0	3
Field Engineer	1	12	0	13

Typical duties under various titles

Engineer — Takes complete charge of his own project.
Junior Engineer — Assists engineer and takes charge in his absence.
Laboratory Technician — Works under direct supervision of Engineer.
Tester — Maintains and tests equipment.
Transmitter Engineer — Operates and maintains radio or television broadcast transmitter.
Instructor — Teaches electronics.
Radio and TV Serviceman — Installs and repairs radio and TV receivers.
Sales Representative — Acts as manufacturer's technical representative.
Technical Writer — Prepares specifications and descriptions of equipment produced by his company.
Field Engineer — Travels to various points to instruct others on company's equipment.

NOTE: The job terminology in the radio-television technician area is not standardized or uniform within the industry. The same job may therefore be designated by different titles, depending on the employer. The term "engineer" as used in this technical area, should not be confused with a professional engineer, licensed as such under state regulations.

Approximately ten percent of the graduates during this period were placed with the Radio Corporation of America. The remainder of those placed in employment were widely distributed among development laboratories, radio and television service organizations, broadcast stations, and many government agencies.

Application for Enrollment in

RCA INSTITUTES, INC.

A SERVICE OF RADIO CORPORATION OF AMERICA

350 West 4th Street **New York 14, N. Y.**

I hereby apply for enrollment in the course indicated below. My matriculation fee of $15 is enclosed herewith.

I understand this matriculation fee will be refunded upon my request at any time prior to my attendance at my first class. I further understand that such attendance obligates me for my matriculation fee and for my first weekly tuition payment.

I understand that I am not obligated to complete the course, nor to pay for the course in full if I do not complete it unless I discontinue the course subsequent to the time when my weekly tuition payments have equaled the amount of the full tuition specified for the course. I understand that I will be obligated to make the weekly tuition payments specified below (or such other weekly tuition payments as are prescribed by RCA Institutes, Inc.) until such time as these payments equal the full tuition specified for the course or I discontinue the course and notify RCA Institutes, Inc., to that effect, whichever of these two events occurs first.

I understand that RCA Institutes, Inc., reserves the right to alter or discontinue any course of instruction and to change the amount of tuition for any course at any time by posting notice to that effect on the school bulletin board.

I understand that RCA Institutes, Inc., is not obligated in any manner to obtain a position for me.

PLEASE SHOW DESIRED COURSE AND DAY OR EVENING ENTRANCE DATE.

COURSES		DAY		EVENING	
		Weekly Tuition	Entrance Date	Weekly Tuition	Entrance Date
☐ ADVANCED TECHNOLOGY COURSE	T3	$15		$5	
☐ RADIO AND TELEVISION BROADCASTING COURSE	V7	$15		$5	
☐ RADIO AND TELEVISION SERVICING COURSE	V3	$15		$5	
☐ ADVANCED TELEVISION SERVICING COURSE	V8	XX	XX	$7	
☐ RADIO TELEGRAPH OPERATING COURSE	V5	$15		$5	
☐ RADIO CODE	V4	XX	XX	$5	

.....

(Signature of Applicant)

Dated.....19....

Be sure to furnish the information requested on the other side.

INFORMATION FOR SCHOOL RECORDS

Applicant should answer all questions (both sides)

Name in Full.....
(Please print)

Home address .....
Street City Zone State

Local address .....
Street City Zone State

Telephone No. .....

Date of Birth.....Place of Birth.....Citizen of.....

Visa Classification if Alien.....

Present Occupation .....

Employed by .....

Name of Parent or Nearest Relative.....
Relationship

Address .....

PREVIOUS EDUCATION

NAME AND ADDRESS OF SCHOOL	When From	When To	Did You Graduate	Attend As A Veteran?
College				
Address				
Technical				
Address				
High School				
Address				

I have successfully completed the following subjects:

	Yes	No
ALGEBRA	.....	.....
INTERMEDIATE ALGEBRA	.....	.....
GEOMETRY	.....	.....
PHYSICS	.....	.....
GENERAL SCIENCE	.....	.....

From what source did you learn of RCA Institutes, Inc.?.....

.....

Did you attend RCA Institute before?.....**When**.....

RCA INSTITUTES, INC.

350 West 4th Street, New York 14, N. Y.

(Near 8th Avenue and W. 13th Street)

Offices: Third Floor—Telephone: WAtkins 4-7845

The principal products and services of the Radio Corporation of America are provided by the following divisions of its organization:

CONSUMER PRODUCTS

RCA Victor Home Appliance Division
RCA Estate Appliance Corporation
RCA Victor Home Instrument Division
RCA Victor Record Division

ELECTRONIC PRODUCTS

RCA Tube Division
RCA Engineering Products Division
Radiomarine Corporation of America

SALES AND SERVICE SUBSIDIARIES

RCA Service Company, Inc.
RCA Institutes, Inc.
RCA Victor Distributing Corporation

RESEARCH

RCA Laboratories

BROADCASTING

National Broadcasting Company, Inc.

RADIOTELEGRAPH AND RADIOPHOTO

RCA Communications, Inc.

FOREIGN TRADE

RCA International Division