

construction, wood-frame construction, light weight steel and prefabricated construction, wide-span designs, and various wall assemblies, but also a drafting competence in typical steel and concrete architectural engineering drawings and architectural wall section drawings.

**AD-262. LARGE BUILDINGS I.** Twenty-seven hours a week.

A 2 hour lecture and 25 hour laboratory course which leads the draftsman step by step through the complete architectural problem as is related to a large building beginning with the architect's sketch, and proceeding through the architectural working drawings.

**AD-263. LARGE BUILDINGS II.** Twenty-five hours a week.

A 2 hour lecture and 23 hour laboratory course designed to give the draftsman an understanding of the heating, plumbing, and electrical equipment of buildings and their relationship to the architectural portion of the building, and the structural and shop drawings necessary for such a work. Drafting experience in this area is gained in the laboratory work.

**AD-272. STRUCTURAL MATERIALS.** Two hours a week.

Fundamental principles of mechanics, statics, centers of gravity and moments of inertia. Fundamental stress and strain relationships. Calculation of wood and steel beams with shear and moment diagrams. Column, foundation design. Stresses in riveted and welded joints. Use of steel and timber handbooks.

### **AUTO BODY AND FENDER REPAIR AND PAINTING**

**B-161. BODY SHOP.** Twenty-five hours a week.

Topics covered in basic theory include such subjects as shrinking, stretching, leading, etc. The use of the different hand tools and power tools is demonstrated and practiced. Actual work experience begins on live cars on fender and panel jobs covering repair of minor damage. Shrinking, leading, and the application of basic hammer and dolly techniques are stressed.

**B-162. BODY SHOP.** Twenty-five hours a week.

The construction, operation, and repair of the spray gun and equipment are covered. The care and use of the spray gun are thoroughly discussed including adjustments and proper spray technique, by demonstration and practice on panels and live cars. Methods of mixing paints are taught with emphasis on tinting and matching. Both enamel and lacquer are used and their advantages and disadvantages regarding spot repair and overall refinishing are included.

**B-163. BODY SHOP.** Twenty-five hours a week.

Actual work experience is continued on live cars progressing into repair of a more serious nature. Advanced phases of body alignment and panel repairs and replacement are covered.

**B-262. BODY SHOP.** Twenty-five hours a week.

Setting up, equipping, and operating a body shop are covered in this

course. Estimating is stressed with regard to securing business from the insurance company and the car owner. Glass work is covered as well as all phases of body work and is done on a time basis. Work is on live cars.

**B-263. BODY SHOP.** Twenty-five hours a week.

In this course the student does major repair work which consists of restoring a complete wreck to original contour and finish including frame, front end, and all alignment procedures and glass work.

### **AUTO MACHINE SHOP**

**AM-161. AUTO MACHINE SHOP I.** Fifteen hours a week.

This course is designed to give the student adequate knowledge and skill in the following areas: fundamentals of machines, engine functions and component parts, specifications, grinding machine practice, honing and lathe operations. With this background, the student should be able to perform all necessary common machine operations on component parts of the engine.

**AM-162. AUTO MACHINE SHOP II.** Twenty-five hours a week.

This course is designed to cover the heavy machine operations or what could be called specialized machine operations. Crankshaft grinding, camshaft grinding, connecting rod reconditioning, piston turning and line boring are the featured operations for the course.

**AM-163. AUTO MACHINE SHOP III.** Twenty-five hours a week.

This course is designed to clarify precision rebuilding. This is accomplished by building an engine and performing all operations needed for precision work. The completed engine is tested for performance on the dynamometer. Mechanical operation such as guide work, lifter service, piston service, clutch repair, as well as flywheel and ring gear service are stressed.

**AM-261. AUTO MACHINE SHOP IV.** Twenty-five hours a week.

Any machinist must be able to repair or service minor ailments pertaining to the machinery he is working on. This becomes part of the student's training in this course. Auxiliary operations include tune-up, generator and starter service, regulator service, and additional time on engine rebuilding.

**AM-271. JOBBER MANAGEMENT.** Four hours a week.

All engine rebuilders are also involved in parts purchasing and stock control. This course is designed to explain parts control and merchandising, supply channels, proper methods of purchasing, display and advertising facilities and parts profits.

## AUTOMOTIVE SERVICE

### **A-153. BASIC ELECTRICITY.** Five hours a week.

This course offers instruction in basic electricity, instruments, theory, charging circuit theory, starting circuit theory, ignition theory, and electrical accessory theory.

### **A-161. BASIC AUTO.** Twenty-five hours a week.

This is an introductory course to auto mechanics designed to familiarize the student with the basic components of the automobile. Shop work on mockup units and light service jobs is closely controlled to give the student a variety of learning experiences.

### **A-162. ENGINE REBUILDING.** Twenty-five hours a week.

This course offers instruction in procedures and machine operations necessary to completely rebuild an engine. Operations, such as boring cylinders, grinding valves, fittings, pistons, and piston pins, are taught on practice units and customer cars. Prerequisite: A-161.

### **A-164. FRONT END ALIGNMENT AND BRAKES.** Twenty-two hours a week.

Students cover terminology, nomenclature, evolution and theory of front end alignment and wheel balancing. They perform wheel and steering diagnosis and repairs on live units using the latest, most modern equipment available.

Theory of operation and service procedures for the common brake operating systems is studied with practical application being made on live units.

### **A-261. TUNE-UP.** Twenty-five hours a week.

Tune-up and carburetion is covered in this course. Instruction on carburetors includes the theory of operation and service procedures for single, two, and four barrel units. The theory and service procedures for tune-up are covered with practical application being made through the use of assigned jobs on customer cars.

### **A-263. AUTOMATIC TRANSMISSIONS.** Twenty-five hours a week.

A study of the popular automatic transmissions based on theory of operation, tear down, re-assembly and adjustment procedures and troubleshooting of live units on the car. Practical experience is gained by servicing live units.

### **A-271. ALIGNMENT AND COLLISION.** Twenty-five hours a week.

Lecture and shop practices cover special alignment problems pertaining to late model automobiles and the use of modern up-to-date equipment and procedures. Both standard and power steering gear units are studied as to methods of adjustment and repair. Collision and frame service, and correction procedures are covered using live units for practical experience. The student has lecture material on shop management and sales promotion to enable him to become better prepared for this line of work.

**A-272. SERVICE MANAGEMENT.** Four hours a week.

This course is designed to give the student principles of production, types of service, costs and returns by department, general shop organization, and service records.

**AT-262. AUTO TESTING I.** Twenty-five hours a week.

This course is designed to develop a student so he may work as a diagnostician or high-class tune-up man. Diagnosis is stressed on actual problems and analyzing sheets are filled out for cost estimation and amount of work required for good engine performance. The core used in lecture is on Sun equipment and its application. Chassis dynamometer operation with regard to performance is stressed. Prerequisite: A-261.

**AT-263. AUTO TESTING II.** Twenty-five hours a week.

This course is designed to develop in the student an appreciation for engine performance. Course content includes advanced diagnosis and tune-up with practical work on customer's cars as well as experimental work on engine dynamometers. Typical problems of mileage, speed, and performance are worked out by students by modifying engines. A lecture series on how to run a diagnosis department is given. Prerequisite: AT-262.

**HEAVY EQUIPMENT AND DIESEL REPAIR****D-161. ENGINE AND CHASSIS THEORY.** Twenty-five hours a week.

This is an introductory course to heavy equipment used in fleet operation. Actual experience is provided on units controlled to give the student a variety of learning experience.

**D-162. POWER TRANSMISSION AND BRAKES.** Twenty-five hours a week.

This course is designed to cover multiple gear transmissions and differentials most commonly used on fleet equipment. Braking systems such as air and air over hydraulic are studied during this quarter.

**D-261. DIESEL ENGINE I.** Twenty-five hours a week.

Various types of diesel engines are worked on. The transition from gas to diesel in basic engine design and fundamentals is studied on diesel units.

**D-262. DIESEL ENGINE II.** Twenty-five hours a week.

Diesel engines are discussed by model and a study of component parts is made. Actual work on units by product is stressed.

**D-263. DIESEL ENGINE III.** Twenty-five hours a week.

A further study of various model diesels is made. Component parts are again stressed by types of diesel.

**MACHINE TOOL****MT-161. BASIC MACHINE TOOL I.** Twenty hours a week.

The basic machine tool course includes 5 hours per week of class room instruction and 15 hours per week of basic machine tool operation. Also included is the basic bench work such as hacksawing, filing, simple layout, hand reaming, hand tapping, sweating, lapping, and scraping. This course covers the construction, nomenclature, care and use of the basic machine tools of industry. These tools include: drill press, engine lathe, milling machine, and shaper. A major part of the shop time is devoted to the operations performed on the basic machine tools. During this basic course the various tools used for measurement are also studied and used.

**MT-162. MACHINE TOOL II.** Twenty hours a week.

This program is a continuation of work on the basic machine tools and includes advanced work on the shaper and milling machine. Shaper operations include methods of clamping work, various shaper operations such as "T" slots, angular work, vertical shaping, etc. The work progresses on the milling machine to include milling machine attachments, types of milling machine cutters, and work-holding devices. The course also includes the analysis of milling machine jobs, and safety precautions for milling operations. The construction and use of the dividing head receives considerable attention.

**MT-163. MACHINE TOOL III.** Twenty hours a week.

Advanced work in the tool room machine tool area is stressed and grinding is introduced. The area includes the tool post grinder for grinding operations on a lathe and basic cylindrical grinding, both straight and tapered. A study is made of abrasives, grits, binds, and grades of grinding wheels and their application.

**MT-171. ADVANCED SHOP MATH.** Five hours a week.

A program geared to the application of math to modern shop procedures. The use of the handbook and the practical solution of machine shop math problems—as apply to cutting helices, precision inspection, and the application of special formula such as thread formulas.

**MT-172. BASIC METAL SHOP.** Four hours a week.

A basic machine shop course for students in refrigeration and air conditioning, automotive service, and sheet metal. This course includes basic lathe work, drilling, tapping, and other basic bench work needed in these areas.

**MT-173. PRECISION MEASUREMENT.** Four hours a week.

A study of methods of precision measurement used in tooling and manufacturing processes. This course includes the principles of precision measurement as applied to production and quality control.

**MT-175. MACHINE SHOP METALLURGY.** Four hours a week.

A course which covers the application of metallurgical fundamentals as to the machinability of common metals, the changes that occur in metal during machining operations, and the behavior of cutting tool metals.

**MT-181. MACHINE OPERATIONS AND SET-UP.** Ten hours a week.

Lathe and grinder operation and set-up course which stresses turning, grinding, boring, and honing principles as applied to the automotive machinist trade. It includes a study of grinding wheels, cutting tools and precision measuring tools.

**MT-193. MACHINE SHOP PRACTICE I.** Five hours a week.

This is an elementary course in machine shop fundamentals which includes benchwork practice, principles of measurement, and use of small tools.

**MT-261. MACHINE TOOL IV.** Twenty hours a week.

This course includes advanced milling such as gear cutting, milling, helices, high speed milling, and milling with carbides. The operation of jig borer is studied and applications made on the boring machine and vertical mills. Special emphasis is placed on tool room milling and boring procedures.

**MT-262. MACHINE TOOL V.** Twenty hours a week.

This area of instruction stresses advanced tool processes and includes other grinding processes. The grinding area includes tool grinding, cutter grinding, single point carbide grinding, carbide milling cutter grinding, and other advanced grinding problems. At this time heat treatment is stressed because of the need for heat treating ground parts. Emphasis is also placed on advanced work on the surface grinder such as angular grinding, grinding slots, form grinding and for wheel grinding.

**MT-263. MACHINE TOOL VI.** Twenty hours a week.

The 6th quarter places emphasis on production machines and production methods and includes work in the setup and operation of machines tooled for production. This includes the turret lathe and hand screw machine and also production set-ups on such machines as grinders and mills. Turret lathe work includes turning, facing, drilling, forming, forging, knurling, reaming, and cut-off. Emphasis is placed upon multiple tool turning and combined turning, drilling, and reaming operations. Grinding of form cutters is also included.

**MT-271. HEAT TREATMENT PRACTICE.** Three hours a week.

This course is planned to give the student practice in operating temperature controlled hardening, tempering, and melting equipment.

**MT-272. MACHINE DEVELOPMENT.** Two to ten hours a week.

A special course for advanced students for the development of machine tool projects, special tools, and machine modifications.

Prerequisites: MT-161, MT-162, MD-191, MD-192. The number of

hours scheduled and the credit given is based upon the need of the student and the recommendation of the advisor, and is subject to the approval of the Dean.

**MT-276. MANUFACTURING PROCESSES.** Three hours a week.

The machining, forming, fabricating, fastening, finishing, and casting processes used in manufacturing today are studied in this course.

**MT-282. PRODUCTION TOOLING.** Five hours a week.

A course in methods and procedure for tooling-up basic production machines. Practice is given in planning machining sequences and types of cutting tools to be used.

**MT-291. MACHINE SHOP PRACTICE II.** Five hours a week.

This course is a continuation of Machine Shop Practice I and includes in addition, elementary lathe and milling machine operations. Prerequisite: Machine Shop Practice I.

**MT-292. MACHINE SHOP PRACTICE III.** Five hours a week.

This course is a continuation of Machine Shop Practice II and includes in addition, shaper, grinder, and contour saw operations. Prerequisite: Machine Shop Practice II.

**MT-293. PRODUCTION PRACTICES.** Five hours a week.

A course in fundamental production operations employing multiple tooling, jigs, and fixtures, in conjunction with basic production machines. Prerequisites: Machine Shop Practice I, II, III.

## MECHANICAL DRAFTING

**MD-142. TECHNICAL DRAFTING.** Two hours a week.

This course is designed to develop the basic concepts of lettering, free hand sketching, orthographic projection, use of instruments and conventional practice.

**MD-161. BASIC MECHANICAL DRAFTING.** Twenty hours a week.

This is a laboratory-lecture course and includes 17 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. It is designed to develop the manipulative skills needed for lettering, free-hand sketching, the use of drafting instruments and drafting room practices. The basic theory of orthographic projection is stressed. Models are frequently used in order that the student may visualize more clearly the projects being drawn.

**MD-162. ADVANCED MECHANICAL DRAFTING.** Twenty hours a week.

This is a laboratory-lecture course and includes 17 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. This course is primarily designed to further strengthen and enlarge upon the basic concepts thus far developed in basic drafting. Proper

methods of dimensioning, specifying notes and technical information relating to detail drawing, assembly drawing and machine parts are actuated.

**MD-163. BASIC JIG AND FIXTURE DETAILING.** Eighteen hours a week.

This is a laboratory-lecture course and includes 15 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. It is designed to bring out the fundamentals of tools, jigs, and fixtures. Standard parts such as clamps, washers, keys, locating pins, etc. are given their proper perspective in relation to tools, jigs, fixtures, and their detailing. It also broadens the student's background with the use of actual drill jigs, and milling fixtures which are drawn as assemblies and detailed into working drawings. Practice is given in incorporating engineering changes in existing tool drawings.

**MD-173. BASIC METALLURGY.** Two hours a week.

A lecture course covering steel classifications, designation of types, heat treatment, critical points, hardening, drawing, case hardening, and hardness testing of steel—Rockwell, Brinell, and Schleroscope.

**MD-174. WELDING DRAFTING.** Four hours a week.

This course is a practical mechanical drafting course which includes simple blueprint reading. Special emphasis is placed on pipe and angle layout, and template making of these structures.

**MD-181. TECHNICAL DRAFTING.** Four hours a week.

A course in sketching and plan reading based upon the needs of students enrolled in the Electronic Servicing curriculum. This course stresses drafting techniques as applied to drawing schematic diagrams. Also included is the reading of architectural plans to make it possible for the technicians to interpret these plans for the installation of sound systems in new construction.

**MD-182. SHEET METAL DRAFTING.** Six hours a week.

A basic sheet metal drafting course in lay-out. This course must precede the sheet metal shop course and is offered to refrigeration and air conditioning students. It includes the development of the many and varied cylindrical, square, and conical fittings and the many types of transitional fittings used in the refrigeration and air conditioning field.

**MD-191. MACHINE TOOL DRAFTING I.** Four hours a week.

This is a laboratory-lecture course which includes 3 hours of drafting practice and 1 hour of drafting theory. This course is intended primarily to survey the fundamentals of blueprint reading and their interpretation. A general orientation of working drawings as applied to the machine shop with emphasis on relationships of views and dimensioning, correct interpretation of scales measurement and tolerance, application and the interpretation of symbols and notes. Included is a study of pictorial representation for the machinist with emphasis on isometric and oblique drawings.

**MD-192. MACHINE TOOL DRAFTING II.** Four hours a week.

This is a laboratory-lecture course which includes 3 hours of drafting practice and 1 hour of drafting theory. This course covers the basics of elementary projection and dimensioning with emphasis on the proper and accurate use of drawing tools, geometrical construction, principles of drafting as applied to two-view and three-view drawings. The projection and dimensioning of cylindrical and complex shapes.

**MD-193. MACHINE TOOL DRAFTING III.** Four hours a week.

This is a laboratory-lecture course which includes 3 hours of drafting practice and 1 hour of drafting theory. Drafting mechanical standards with an industrial drawing application is included. Special consideration of dimensioning of precision measurements, tolerances, finishes, and standard notations, the proper practices of revolving out of position, line elimination, sectioning, and drawings of castings, forgings and machine stock.

**MD-194. MACHINE TOOL DRAFTING IV.** Four hours a week.

This is a laboratory-lecture course which includes 3 hours of drafting practice and 1 hour of drafting theory. Advance projection is designed to further strengthen and enlarge upon the basic concepts of basic drafting. This course deals with "identification" of (1) sub titles, (2) title blocks, and (3) bills of material, symmetrical opposite parts, auxiliary projection, and simple assembly drawings with standard post application.

**MD-261. JIG AND FIXTURE LAYOUT AND DESIGN.** Eighteen hours a week.

This is a laboratory-lecture course and includes 15 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. The layout of drill jigs and milling fixtures from actual shop sketches are formulated into assembly drawings. These assembly drawings in turn are transposed into working drawings with proper dimensions and notes.

**MD-262. DIE LAYOUT AND DESIGN.** Twenty hours a week.

This is a laboratory-lecture course and includes 17 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. The layout and design of simple blanking, forming, and piercing dies is actuated by the use of actual shop sketches and dies.

**MD-272. GEARING.** Three hours a week.

A basic lecture course on types of gears, calculating dimensions, methods of production and gear generating methods.

**MD-282. STRENGTH OF MATERIALS I.** Three hours a week.

A course dealing with the fundamentals of strength of materials. The following topics are covered: forces -- components, resultants, and equilibrants -- parallelogram of forces and force polygons -- freebody diagrams -- moments of force and reactions--laws of equilibrium--equilibrium of shafts

—stress and strain in compression, tension and shearing—centroids and moment of inertia of sections—shearing stress in beams. Prerequisites: General Math 131 and G-112 Mechanics and Heat, or equivalent.

**MD-283. STRENGTH OF MATERIALS II.** Three hours a week.

A course dealing with the fundamentals of strength of materials. The following topics are covered: bending moments in beams—deflection of beams—bending stresses and design of beams—columns—design of riveted, bolted, or welded joints—torsional stress in shafts—stresses in pipes and tanks. Prerequisite: Strength of Materials I.

**MDD-263. ADVANCED DIE DESIGN.** Nineteen hours a week.

This is a laboratory-lecture course including 16 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. This course covers the design of more complex dies such as draw, cam action and special purpose dies as well as a more advanced study of what actually happens to the metal itself in the die operations.

**MDJ-263. ADVANCED JIG AND FIXTURE DESIGN.** Nineteen hours a week.

This is a laboratory-lecture course and includes 16 hours of drafting practice and 3 hours of drafting theory directly related to the laboratory work. This course gives the student experience in designing various types of jigs and fixtures such as simple drill templates, simple angle plate milling fixtures and more complex tools of industry.

*Basic Printing*

**PRINTING**

**BP-161. HAND COMPOSITION.** Eighteen hours a week.

A 3 hour lecture and 15 hour per week shop course in the history of printing, type styles, type families, type metals, equipment, printing processes, printer's measure, proofreading, shop safety. Fundamentals of setting type by hand, operation of some of the composing room equipment, type identification, spacing materials, location and care.

**BP-171. IMPOSITION AND PRESSWORK.** Twenty to twenty-one hours a week.

A 3 hour per week lecture and 17-18 hour per week shop course which includes the principles of lock-up, single and multiple page forms, care of presses, rollers, ink, stock. Demonstrations of automatic presses. Lock-up of forms for presses, matching inks to proper paper, stock cutting, binding processes, press feeding on live jobs.

**BP-181. PHOTO-PROCESSES.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course which includes instruction in engraving, basic camera work and operation of the Davidson and Multilith Offset presses. Students are given laboratory practice which begins with copy and ends in a finished printed form.

**BP-191. LINOTYPE OPERATION.** Twenty hours a week.

A 2 hour per week lecture and 18 hour per week shop course which includes the care and operation of the linotype, keyboard layout, keyboard fingering, straight matter, simple job composition, elementary maintenance, word practice, word division, news composition, tabular work.

**P-171. TYPOGRAPHY.** Five hours a week.

*Printing*  
*General*  
An observation course in Typography which includes: principles of layout and design; use of margins and white space; make-up of dummies; single and multiple page lockup; copy fittings; and estimating time for composition and use of trade plants. Shop work consists of projects involving the use of hand-set type. This course is primarily designed for students majoring in Commercial Art and other related fields.

**P-181. PHOTO-PROCESSES AND OFFSET.** Five hours per week.

Observation of techniques used in photo-processes and offset. Photo-engraving and offset theory, camera work, negatives, positives, reducing and enlarging are included. This course is designed primarily for Commercial Art students and for students in other related fields.

**PG-262. HAND COMPOSITION.** Thirty hours a week.

*Printing*  
*General*  
A 3 hour per week lecture and 27 hour per week shop course which includes the principles of layout and design, use of margins and white space, make-up of dummies, single and multiple page lock-up, copy fitting, time estimating, use of trade plants, advanced news composition, office forms, brochures, and catalogs; additional work in layout of booklets, page make-up, stereotyping, perforated forms, padding, stitching, and planning of job details in advance of composition.

**PG-263. HAND COMPOSITION.** Thirty-five hours a week.

A 2 hour per week lecture and 33 hour per week shop course continuing PG-262.

**PG-272. IMPOSITION AND PRESSWORK.** Thirty hours a week.

A 3 hour per week lecture and 27 hour per week shop course which includes the principles and operation of hand fed and automatic presses, kinds, styles, speeds, advantages of one or another. Choosing correct press for job. Actual jobs on presses, use of two- and three-color plates; use of four-color process plates; half-tone makeready, underlays and overlays.

**PG-273. IMPOSITION AND PRESSWORK.** Thirty-five hours a week.

A 2 hour per week lecture and 33 hour per week shop course continuing PG-272. Also running on half-tones and line cuts made in shop; time checks for speed and accuracy; scheduling and estimating stocks, inks, speeds, control of "down-time" and production scheduling.

**PG-282. PHOTO-PROCESSES.** Thirty hours a week.

A 3 hour per week lecture and 27 hour per week shop course which is designed to partially qualify the student to meet vocational requirements in

the areas of cameraman, pressman, and platemaker. All work is done in black and white. Modern equipment is used throughout.

**PG-283. PHOTO-PROCESSES.** Thirty-five hours a week.

A 3 hour lecture per week and 32 hour per week shop course continuing PG-282. Also an introduction of color reproductions. Color instruction and practice in all phases of three- and four-color work.

**PG-292. LINOTYPE OPERATION AND MAINTENANCE.** Thirty hours a week.

A 3 hour per week lecture and 27 hour per week shop course which covers job composition on production forms and advertising for Ferris, booklets, laboratory manuals, programs. Installation of repair parts and general maintenance and repairs as needed for small shops where the operator must maintain his own machine.

**PG-293. LINOTYPE OPERATION AND MAINTENANCE.** Thirty-five hours a week.

A 2 hour per week lecture and 33 hour per week shop course continuing PG-292.

**PM-171. TYPOGRAPHY.** Three hours a week.

A 1 hour per week lecture and 2 hour per week shop course which includes the principles of layout and design, use of margins and white space, makeup of dummies, single and multiple page lock-up; copy fitting; estimating time for composition and use of trade plants. Shop work consists of projects involving the use of hand set type.

**PM-229. ESTIMATING.** Five hours a week.

This is a 5 hour per week lecture course which covers the function of estimating, detailed practice of estimating time, labor, and materials, supervision according to the PIA INSTRUCTION MANUAL and HOCH'S ESTIMATING STANDARDS FOR PRINTERS. Use of the FRANKLIN CATALOG.

**PM-230. PRODUCTION CONTROL.** Twenty-one hours a week.

A 3 hour per week lecture and 18 hour per week shop course which includes the discussion of shop problems, control production and quality in the shop, use of control boards, practice control in each area.

**PM-231. PROOFREADING.** Three hours a week.

A 1 hour per week lecture and 2 hour per week shop course in reading proofs for the TORCH, ALUMNI JOURNAL, and other college publications. One hour to be spent in discussion of the fundamentals and problems of proofreading.

**PM-232. PRINTING SELLING.** Three hours a week.

A lecture course to inform the advanced student about the procedures and practices of selling printing according to the PIA Manual.

*Brand Printing Management*

**PM-233. COST ANALYSIS.** Five hours a week.

A lecture and problem course to determine how to establish cost centers, and analysis of work stations and overhead and management costs.

**PM-234. MANAGEMENT AND SUPERVISION.** Twenty-four hours a week.

A 3 hour per week lecture and 21 hour per week shop course which includes the supervision of entire shop, practice pricing, scheduling, plant layout, purchase of materials and equipment. Study of records and inventory. Students become acquainted with supervisory responsibility.

**PM-235. SEMINAR AND PROJECTS.** Three hours a week.

A 1 hour per week lecture and 2 hour per week shop course which coordinates students' work so that all may benefit from work on a particular project, research or study in a chosen area.

**PM-236. INK AND COLOR.** Three hours a week.

A 1 hour per week lecture and 2 hour per week shop course to acquaint students with the psychology of color and to afford practice in mixing and matching inks. Correct ink, nomenclature, and composition.

**PM-262. HAND COMPOSITION.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course which includes the principles of layout and design, use of margins and white space, makeup of dummies, single and multiple page lock-up, copy fitting, time estimating, use of trade plants. Advanced news composition, office forms, brochures, and catalogs. Additional work in layout of booklets, page make-up, stereotyping, perforated forms, padding, stitching, and planning of job details in advance of composition.

**PM-263. HAND COMPOSITION.** Twenty hours a week.

A 2 hour per week lecture and 18 hour per week shop course continuing PM-262.

**PM-272. IMPOSITION AND PRESSWORK.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course which includes the principles and operation of hand fed and automatic presses, kinds, styles, speeds, advantages of one or another. Choosing correct press for job. Actual jobs on presses; use of two and three color plates; use of four color process plates; half-tone, makeready, underlays and overlays.

**PM-273. IMPOSITION AND PRESSWORK.** Twenty hours a week.

A 2 hour per week lecture and 18 hour per week shop course continuing PM-272. Also running half-tones and line cuts made in shop; time checks for speed and accuracy.

**PM-282. PHOTO-PROCESSES.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course designed to partially qualify the student to meet vocational requirements in the areas

of cameraman, pressman, and platemaker. All work is done in black and white. Modern equipment is used throughout.

**PM-283. PHOTO-PROCESSES.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course continuing PM-282. Also an introduction of color reproduction. Color instruction and practice in all phases of three- and four-color work.

**PM-292. LINOTYPE OPERATION AND MAINTENANCE.** Twenty hours a week.

A 3 hour per week lecture and 17 hour per week shop course which includes job composition on production forms and advertising for Ferris, booklets, laboratory manuals, programs, etc. Installation of repair parts and general maintenance and repairs as needed for small shops where the operator must maintain his own machine.

**PM-293. LINOTYPE OPERATION AND MAINTENANCE.** Twenty hours a week.

A 2 hour per week lecture and 18 hour per week shop course continuing PM-292.

Note: All hours expressed in the preceding course descriptions are minimum hours. Additional time may be required should such be found necessary.

Note: It is recommended that all printing students should continue one of the curricula outlined. It is possible for a student to take only one of the preceding courses if found to be to his advantage and can be done as availability of time and equipment dictates.

## RADIO-TELEVISION SERVICE

**ES-161. BASIC ELECTRONICS.** Nineteen hours a week.

The theory program devoted to five hours per week includes safety, theory of communications, radio waves, wave lengths and radiation characteristics, Ohm's law and the RETMA color code of resistor and capacitor value, component symbols and schematic diagram reading and the use of service manuals, the study of d-c circuits, resistance calculations, capacitive and inductive reactance, resonance response curves, r-c networks, transformers, vacuum tubes, impedance matching, the use of multimeters, and the design of rectifier and class A, B, and C amplifier circuits.

The shop program carried on for the period of 14 hours per week includes projects assigned to the student concerning the following: shop safety practices, fusing, care and use of tools, soldering techniques, wire splicing, component identification, batteries, radio dial mechanism, capacitance measurements, inductance measurements, transformer testing, circuit wiring and testing, vacuum tube characteristic curve development, testing and replacing vacuum tubes, construction analysis, and testing of rectifier and amplifier stages.

**ES-162. ELECTRONIC CIRCUITS.** Twenty-two hours a week.

Five hours per week devoted to a study of circuits and stages which will include the following: power supplies; audio-frequency amplifiers; detectors; radio-frequency amplifiers; oscillators; automatic volume control; discriminators; ratio detectors; intermediate-frequency amplifiers; limiters; converters; and auto radio circuits including signal seeker circuits. Seventeen hours of actual laboratory or practical experience includes the construction, analyzing and testing of radio stages. Also included are shop operations pertaining to the servicing of speakers, power amplifiers, detectors, converters, voltage amplifiers, intermediate-frequency amplifiers, radio-frequency amplifiers, and antennas.

**ES-163. RADIO SERVICE.** Twenty-four hours a week.

The theory program for 5 hours per week will include study of radio assemblies with class demonstrations; chassis layout of home, portable, auto and communication radio receivers; service instruments and application; point-to-point testing, voltage and resistance reading interpretation; alignment methods including visual alignment with an oscilloscope; preventive maintenance. Shop experience includes 19 hours per week on projects which include practical application of various types of test equipment used for trouble shooting radio receivers and allied electronic equipment. Common and special trouble shooting techniques are practiced with all types of equipment; such as, audio and r-f generators, oscilloscopes, multimeters, signal tracers, frequency meters, distortion meters, intermodulation analyzers. Resistor capacitor checkers, tube testers, selenium rectifier testers, and other types of equipment are also employed while trouble shooting.

**ES-173. RADIO MATHEMATICS.** Five hours a week.

This 5 hour a week course includes the use and application of logarithms in the solution of problems concerning sound, antennas, and transmission lines. Application is made of trigonometry for the solution of alternating current circuits, series and parallel resonance, impedance, reactance, and current-voltage phase angles.

**ES-261. BASIC TELEVISION.** Twenty-two hours a week.

The theory - 5 hours per week - covers fundamentals of the transmission of audio and video signals in the television system. Topics are: safety precautions, the audio portion of the television receiver, the composite video signal, picture carrier modulation, the picture tube, scanning and synchronization, television low and high voltage power supplies, and video amplifier stages.

Laboratory projects include picture tube handling, setting-up and basic adjustments of the television receiver, chassis and picture tube removal and installation, cabinet care, construction, analysis, testing, and simple trouble shooting in the audio section, power supply, picture tube circuits and video amplifier stages, sound IF alignment is practiced. The erection and installation of antennas including the use of rotors is practiced. Signal strength measurements are made using different types of antennas.

**ES-262. TELEVISION CIRCUITS.** Twenty-nine hours a week.

The theory aspect of this 5 hour course includes the study of the following: brightness control and d-c reinsertion circuits, video detector stages, automatic gain control circuits, synchronization separator and amplifier stages, deflection oscillator and amplifier stages, automatic frequency control circuits, picture IF amplifier stages, and RF tuner units. Sweep and marker generator applications in the alignment of the IF sections and VHF-UHF tuners are studied. Actual shop work for 24 hours per week is on projects which include construction, analysis, testing, and simple troubleshooting of the stages studied during the theory lecture time. Oscilloscope application for waveform testing and peak to peak measuring in the deflection and video section for troubleshooting purposes is performed. Visual alignment is practiced. Adjustments of horizontal automatic frequency control and automatic gain control circuits are also performed.

**ES-263. TELEVISION SERVICE.** Thirty hours a week.

Troubleshooting the complete television receiver is the major element in this course. The theory lecture is used to study methods of trouble locating and the application and function of the following test instruments: vacuum tube voltmeter, oscilloscope, sweep and marker generators, crosshatch generator, voltage calibrator, isolation transformer, et cetera.

Other subjects are receiver installation problems, picture interference analysis, VHF-UHF antenna and transmission line theory, antenna distribution systems, camera tubes, and studio setups, advanced circuit design in stages like the video amplifier, noise suppressors, remote control units, et cetera. Discussions of service problems are held.

Laboratory work is concentrated on performance checks. Diagnosis and repair of faulty receivers is undertaken on many makes of television receivers. Complete visual alignment procedures including AFC and AGC adjustments are performed. Home service calls are practiced.

**ES-361. COLOR TELEVISION.** Thirty hours a week.

This is an advanced theory course and is designed to introduce color television to the technician now working in black and white television service or to persons who have completed the six preceding quarters in the Radio-Television Servicing program.

The study is centered on the NTSC color television system. Study starts with the basic theory of color transmission followed by the practical chrominance circuit design and includes localizing troubles in the color receiver. Also included is a short section on the latest troubleshooting techniques specially designed for technicians with some experience in black and white television servicing. Twenty-five hours per week are devoted to installation and adjustment of the color receiver, troubleshooting of chrominance circuits such as: color sync circuits, chrominance bandpass amplifier stages and detector circuits, matrix network, etc. on live program and color generator. Also included is some troubleshooting in black and white television receivers using advanced techniques.

## TRANSMITTER SERVICE

### **TS-263. BASIC TRANSMITTER SERVICE.** Twenty-five hours a week.

Five hours per week of theory which includes safety procedures, theory and operation of transmitter circuits such as: oscillators, VFO's, frequency multipliers, buffer amplifiers, voltage amplifiers, power amplifiers, AM and FM modulator circuits, and antenna systems. The laboratory projects include testing, analyzing, and repair of transmitter circuits. Adjustment of stages using different indicating instruments and procedures, frequency measurement and modulation measurement are included.

### **TS-273. COMMERCIAL RADIO REGULATIONS.** Two hours a week.

This two hour per week course is concerned with the rules and regulations of the Federal Communications Commission pertaining to commercial radio and television operation. Various regulations are interpreted.

A knowledge of the commercial radio rules and regulations is necessary for FCC license preparation.

### **TS-361. ADVANCED TRANSMITTERS.** Twenty-five hours a week.

The theory class is five hours per week and includes: advanced transmitter circuit servicing techniques and stage adjustments. Radio broadcast transmitters, control boards, transcription turntables, pre-amplifiers, peak limiters, modulation monitors, frequency monitors, television transmitters and antenna systems are studied.

Laboratory projects include advanced techniques of analyzing, testing, servicing, and adjustment of transmitter circuits. Audio distortion tests are performed as well as the numerous operation checks using modern test equipment.

### **TS-371. ANNOUNCING.** Five hours a week.

This five hour per week course deals with the various aspects of radio announcing. Proper news delivery, expressive commercials delivery, and delivery of written script shows are some of the types of announcing that are undertaken. Off-hand delivery and ad-libbing techniques are included.

## REFRIGERATION-AIR CONDITIONING SERVICE

### **R-161. BASIC AND DOMESTIC REFRIGERATION.** Twenty hours a week.

The basic program includes 5 hours per week of theory and 15 hours per week of practical shop experience working on domestic refrigeration equipment. The theory program includes the basic principles of refrigeration, and the function and operating characteristics of the various parts of the refrigeration units. Study of the design and theory of condensers, receivers, and evaporators is included, as well as a study of the common refrigerants, use of testing equipment, and safety and protective devices. At this time various types of electric motors are included as well as their starting and protective devices. The lecture program is correlated with the practical problems presented in the shop.

**R-162. REFRIGERATION.** Twenty-one hours a week.

The second quarter devotes 5 hours per week to theory and 16 hours per week to shop experience in completing the work on domestic and introducing the work on commercial refrigeration. The theory includes the application of the refrigeration cycle, and pressure and thermostatic motor controls; construction of cabinets and various types of insulation; and methods of complete refrigeration overhauling and testing procedures. The shop work includes actual shop procedures as to operating low-side float, high-side float, capillary tube, and expansion valve system; removing, repairing and replacing these parts on refrigeration units; charging and discharging systems with refrigerants and oil; testing for refrigerant leaks; tearing down, repairing and testing the motors used on these units; testing hermetic motors overload and cut-out devices; overhauling refrigerators, finding trouble on actual field jobs, diagnosing troubles, and repairing and testing.

**R-163. COMMERCIAL REFRIGERATION.** Twenty-three hours a week.

This course is devoted to disassembling, assembling, adjusting, operating and testing compressors, valves and controls used in commercial refrigeration, as well as trouble shooting, repairing and servicing of commercial installations. The program includes 5 hours per week of theory, including the use of the slide rule and heat load calculations, study of the safety code; and the theory of multiple installations. The shop work includes operating and servicing multiple systems and unit systems; estimating and sizing cooling coils and condensing units; and advanced study of various types of low temperature units. The refrigeration shop work also includes the building of multiple installations and the use of hot gas, water, and electric defrost systems. At this time a study is made of the large commercial installations by field trips.

**R-181. AUTOMOTIVE AIR CONDITIONING.** Four hours a week.

A course planned to teach automotive service students the basic principles of refrigeration. On cars equipped with air-conditioning units it is often necessary to remove the air-conditioning unit in order to service other units of the automobile. Because the air-conditioning unit is under pressure, an understanding of these units is essential, and their servicing is included.

**AC-261. AIR CONDITIONING AND HEATING FUNDAMENTALS.**

Twenty-five hours a week.

This program offers basic training in the fundamentals of air conditioning and heating and includes the unification of both for year-round comfort. The course includes a study of oil burners, gas fired systems, and calculations for piping layout, ducts, fans, filters, and registers, as well as all electrical controls and wiring needed in installation of both air-conditioning and heating systems. The program includes 5 hours of theory and 20 hours of work on summer and winter air conditioners.

**AC-262. AIR CONDITIONING I.** Twenty-five hours a week.

Five hours per week of theory devoted to the use of air conditioning; properties of air; temperature and humidity control; circulation, air cleaning

and delivery; instruments and equipment necessary for the control of cooling, heating, cleaning, humidity and circulation of air; various types of systems, packaged and remote; ventilation systems, fans, filter, ducts, registers, noise control, coils and condensing units for each type of system; calculation of air-conditioning loads for winter and summer; special structures and individual projects; various types of heating equipment used in connection with winter air-conditioning; calculations of heat loads; and layout, planning and design of air-conditioning and heating systems. The shop program includes 20 hours per week devoted to the practical application of the theoretical aspects of air conditioning which are studied in refrigeration. Students study how to operate, service, and test air-conditioning equipment. This program includes training in troubleshooting commercial equipment and multi-temperature equipment. Various types of refrigerant metering devices and controls are applied and checked under operating conditions with variable load factors. Layout-planning and design of air-conditioning and heating systems is covered. Prerequisite: Commercial Refrigeration.

**AC-263. AIR CONDITIONING II.** Twenty-five hours a week.

Advanced study of subjects begun in Air Conditioning I. Continuation of layout and planning in theory; study of selection of equipment; installation and determination of cost involved in various types of installations for summer and winter air conditioning; commercial and industrial (process) types of air-conditioning installations together with elaborate control systems designed for accurate control of the psychrometric conditions of air and the effect of these conditions on industrial processes.

## SHEET METAL

**S-142. SHEET METAL.** Four hours a week.

A lecture-demonstration course in which the basic elements of sheet metal work are studied. Part of this time is used in the layout of sheet metal problems and a study of sheet metal drafting procedures.

**S-161. SHEET METAL I.** Twenty hours a week.

The 5 hours per week lecture-demonstration course includes the basic elements of sheet metal work. Part of this time is used in the layout of sheet metal problems and a study of sheet metal drafting procedures. Fifteen hours per week are devoted to sheet metal layout and the construction of various sheet metal jobs to give the student the basic experience in the use of hand tools, sheet metal machines and methods of fabrication.

**S-162. SHEET METAL II.** Twenty-two hours a week.

Problems of sheet metal design and layout are studied as pertains to heating, air conditioning and venting. Also the many types of fittings used in this area are developed. Theory of sheet metal fabrication is about 5 hours per week and 17 hours are devoted to actual experience on all types of cylindrical, conical and square fittings used in the sheet metal trade. The course

includes the practical experience on round, square, and rectangular transitional fittings.

**S-163. SHEET METAL III.** Twenty-two hours a week.

This course is for 5 hours of sheet metal theory and includes a study of architectural sheet metal components such as cornices, gable mountings, and other architectural designs. Seventeen hours per week are devoted to practical shop experience on all types of advanced sheet metal work of an increasingly complex nature.

## WELDING

**W-141. BASIC INERT GAS WELDING.** Ten hours a week.

This course teaches the fundamentals of inert gas welding with the argon shielded arc. The basic types of joints are covered on different types of metals. The theory of other types of shielded processes are also taught at this time. Two hours of theory and 8 hours of laboratory are given each week.

**W-161. BASIC OXY-ACETYLENE WELDING.** Twenty-two hours a week.

This course is designed to instruct the student in the procedures of oxy-acetylene welding and cutting. Fabrication of gas-welded structures, position welding, and care of gas-welding equipment are included in this phase of the welding course. Approximately 5 hours of lecture and 17 hours of laboratory work are given in this course.

**W-162. BASIC ARC WELDING.** Twenty-five hours a week.

This course enables the welding student to use the arc welding process in fabrication of steel structures. All types of welded joints are discussed and welded in all positions. Care and maintenance of the arc welder are applied in this course. The course will include 5 hours of lecture and 20 hours of laboratory work per week.

**W-163. COMBINED WELDING.** Fifteen hours a week.

This is a combined welding course which gives the student experience in varied welding shop projects with oxy-acetylene and arc welding. More time is applied to horizontal, vertical, and overhead welding positions. This course includes 5 hours of theory and 10 hours of laboratory work per week.

**W-183. COMBINED WELDING.** Four hours a week.

This is a combined course in gas and arc welding to provide the machinist or other tradesman with enough welding experience to make repairs and to fabricate simple assemblies. Emphasis is placed on the building up of worn parts and the repair of broken parts. The use of low temperature rods is included to make the repair of machine shop tools, such as milling cutters, possible.

**W-184. COMBINED WELDING.** Four hours a week.

This is a continuation of W-183 and is a combined gas-arc course. This program is especially for the students in heavy equipment repair, and emphasis is placed on welding as used in the field of heavy equipment, such as motor transport.

**W-191. BASIC METALLURGY.** Four hours a week.

This is a 4 hour per week lecture course. The effect of alloys on the weld and welding procedures are the main topics of discussion. Pre-heating, postheating, and other heat treatment procedures are also covered in this course.

**W-192. COMBINED WELDING.** Six hours a week.

A combined welding course covering gas and arc theory and practice for students needing more than the offering of W-183, particularly for the auto body and fender students.

**W-193. COMBINED WELDING.** Nine hours a week.

A continuation of W-192 with both theory and welding practice for the advanced auto body and fender student.

**W-261. ADVANCED WELDING.** Fifteen hours a week.

This course is designed to produce a more experienced welder, for more rapid advancement in the field. It includes non-ferrous welding, tool welding, alloy castings and the more intricate welding procedures and application. Welding of pressures, vessels, and pipe fabrication also is included in this course. This course is 5 hours of theory and 10 hours of laboratory work per week.

**W-271. ADVANCED INERT GAS WELDING.** Ten hours a week.

This course gives the student practical work in the fundamentals studied in the former quarter. It includes position welding of non-ferrous alloys, and hard surfacing with inert gas. Two hours of theory and 8 hours of welding laboratory are given in this course.

## **SPECIALIZED EDUCATION DIVISION**

### **COSMETOLOGY DEPARTMENT COURSES**

**Cosmetology 101.** Five hours a week.

Theory in elementary bleaching and tinting of hair, personal hygiene, bacteriology, sanitation, chemistry of solutions, shampooing, hairdressing, permanent waving, safety measures, vocabulary, manicuring.

**Cosmetology 102.** Twenty-one hours a week.

Laboratory work in manicuring, shampooing, pin curls, finger waving, sculpture curls, brushing, towel drying, maintenance of dryer, regulating temperature of water, demonstration work in permanent waving on block-head, tinting and bleaching, and sanitation.

**Cosmetology 103.** Five hours a week.

Introduction to scalp treatment, different types of shampoos and rinses, continuation of hairdressing and shapering, permanent waving, tinting and bleaching, facials, manicuring, and office records.

**Cosmetology 104.** Nineteen hours a week.

Laboratory work in scalp treatments, brushing and massaging, shampooing and rinses, elementary hairdressing, tinting and bleaching, permanent waving, facials, manicuring, and sanitation.

**Cosmetology 105.** Five hours a week.

Introduction to skin, hair, nails, disorders of the skin, scalp and hair, light therapy, and theory of massage.

**Cosmetology 106.** Nineteen hours a week.

Laboratory work in permanents, manicuring, shampoos and rinses, hairdressing and shapering, tinting and bleaching, scalp treatments, facials and finger waving.

**Cosmetology 107.** Five hours a week.

Study of hair and hair shapering, cosmetics, hair tinting and bleaching, finger waving, permanents, use of specialized electrical equipment used by cosmetologists, and maintenance of dryer.

**Cosmetology 108.** Twenty hours a week.

Laboratory work in facial treatments, advanced work in permanents, finger waving, hair shapering, tinting and bleaching, cosmetics, and use of specialized electrical equipment used by cosmetologists.

**Cosmetology 109.** Five hours a week.

Review of hair tinting and bleaching, massage, manicuring, hairdressing, permanent waving, hair shapering, and office records.

**Cosmetology 110.** Twenty-one hours a week.

Laboratory work in advanced tinting and bleaching, permanent waving, hairdressing and finger waving, massaging, manicuring, and use of specialized electrical equipment used by cosmetologists.

**Cosmetology 111.** Ten hours a week.

Professional ethics, advertising, salesmanship, beauty salon management, and State Board review.

**Cosmetology 112.** Twenty-nine hours a week.

Practice in model shop of all branches taught, practice preparatory to taking the State Board Examination.

### HIGH SCHOOL DEPARTMENT COURSES

The Roman numerals with the subjects listed below indicate the courses or terms in which the subjects are offered. For instance, Algebra II indi-

cates second term of first year Algebra; Algebra III indicates first term of second year Algebra. It will be noted that English I is not offered. It has been found that adult students obtain sufficient rhetoric, composition, and grammar in English II, III, IV. Each of the courses listed here allows one-half unit of credit, with the exception of Music, Dramatics, and Physical Education.

**English II**

Basic grammar and punctuation.

**English III**

Grammar and composition.

**English IV**

Advanced writing.

**English V**

The pageant of American life. (The growth of a nation.)

**English VI**

The pageant of American Literature. (Men and books.)

**English VII**

A study of English Literature and the influences that acted upon it from before Chaucer to the impact of scientific thinking in the 18th century.

**English VIII**

A study of English Literature and the influences that acted upon it from the 18th century impact of science to the present day and the future outlook.

**Contemporary Literature**

A study of selected modern writings from around the world.

**Journalism I**

Introductory exercises in news writing, editing and composing.

**Journalism II**

Work on the Ferris Torch in copyreading, rewriting, and headline writing. Prerequisite: Journalism I.

**Speech I**

The conveying of ideas orally in an effective manner. Fundamentals of parliamentary law.

**Speech II**

Group discussion and debate.

**American Government**

Form and functions of our federal and state governments and of counties, cities and villages. Throughout the course the rights and responsibilities of citizens will be stressed.

**Economics**

Economic problems and theories of the present day. Economic concepts and institutions both domestic and abroad.

**Geography**

A study of the principles of geography, and man's relationship to his physical environment. Lecture, recitation, reports, map study.

**Current History**

Current national and international problems in history.

**History of England I**

Prehistoric period to 1660: Prehistoric Britain, Roman Britain, Saxon England, Danish and Norman invasions, national unity and formation of the English nation, Hundred Years' War, the Tudors, Elizabeth, Stuarts, Great Rebellion and the Commonwealth.

**History of England II**

Period 1660 to the present: The Restoration, rise of naval power, foundation of the Empire, Industrial Revolution, American Revolution, 19th century reforms, World War I, postwar depression, causes of World War II, United Nations, decline of the Empire.

**Problems of Democracy**

Problems of education, labor unions, marriage and divorce, etc., based on government, economics and sociology.

**Sociology**

Man's relation to society and the evolution of group life and culture. Marriage, family, education. Social control.

**United States History I**

Period 1400 to 1870, from early period of exploration, including English settlements, American Revolution, Jeffersonian Democracy. War of 1812, Jacksonian Period, Mexican War, Civil War.

**United States History II**

Reconstruction to the present: Rise of business, Roosevelt and his Square Deal, reform movement 1870 - 1914, World War I, the great depression, Roosevelt and his New Deal, World War II, United Nations, the conflicts in Asia and the "Cold war."

**Biology I**

A study of the development of biology.

**Biology II**

A study of the life functions common to all living things.

**Chemistry I**

A beginning course covering fundamental principles: A study of some of the most important and most common elements and their compounds;

problems. Laboratory. Prerequisite: One unit of algebra satisfactorily completed.

#### ✓ **Chemistry II**

A continuation of Chemistry I. Laboratory. Prerequisite: Chemistry I.

#### ✓ **General Science I**

A non-technical course covering integrated aspects of elementary physical and biological sciences: air; water; heat; weather; light; outer space; the changing earth. Discussions, demonstrations, reports.

#### ✓ **General Science II**

A non-technical course covering integrated aspects of elementary physical and biological sciences: work and energy; electricity; communications; transportation; plants; animals; conservation. Discussions, demonstrations, reports.

#### ✓ **Physiology and Health**

A study of the fundamental principles of the building and maintaining of health, both personal and public, physical and mental.

#### ✓ **Physics I**

Mechanics; properties of matter; heat. Prerequisite: Two terms of algebra and one term of geometry satisfactorily completed. The second term of geometry may be taken with the first-term of physics.

#### ✓ **Physics II**

Magnetism; electricity; sound; light; electronics; nuclear study. Prerequisites: Two terms of algebra and one term of geometry satisfactorily completed. The second term of geometry may be taken with the first term of physics.

#### ✓ **High School Arithmetic**

A complete review of arithmetic for students who have not completed the eighth grade or who need review before starting Algebra I.

#### ✓ **Algebra I**

Beginning algebra including fundamental operations, equations, algebraic expressions and verbal problems. Prerequisite: Satisfactory performance in arithmetic.

#### ✓ **Algebra II**

Simultaneous linear equations, graphing, special products and factoring, fractions, ratio and proportion, powers and roots, and quadratic equations. Prerequisite: Algebra I.

#### ✓ **Algebra III**

Review of fundamentals; exponents and radicals; properties of the quadratic equation; systems of equations, determinants, graphs. Prerequisite: Algebra I and II (one unit).

**Algebra IV**

Continuation of Algebra III. Binomial theorem, logarithms, series, permutations, combinations, complex numbers.

**Plane Geometry I**

Theorems, exercises, construction involving angles and rectilinear figures, introduction to circles. Prerequisite: Elementary algebra.

**Plane Geometry II**

Circles, perimeters and areas of irregular and regular plane figures, similar figures, ratio and proportion, constructions. Prerequisite: Plane Geometry I.

**Solid Geometry**

Three-Dimensional figures, theorems and formulæ. Prerequisite: Plane Geometry.

**Trigonometry**

Plane trigonometry, graphs of functions, elementary spherical trigonometry. Prerequisite: Plane Geometry.

**German I**

Pronunciation, grammar, and composition of elementary German.

**German II**

Continuation of German I. Extended practice in reading, speaking, and writing German.

**German III**

Contemporary readings in German short stories, stress on idiomatic expression.

**Spanish I**

Fundamentals of grammar, pronunciation, conversation, selected readings.

**Spanish II**

Grammar, translation, reading and conversation.

**Spanish III**

Grammar, reading, composition.

**Spanish IV**

Composition, oral drill; history and geography of Latin-American countries and Spain.

**Mechanical Drawing I**

Care and use of instruments, lettering, geometric figures.

**Mechanical Drawing II**

Two and three-view drawings; isometric and orthographic projections.

**Mechanical Drawing III**

Advanced orthographic projection; drawings of bolts, nuts, helices.

**Advanced Mechanical Drawing**

Three quarters leading to engineering drawing proficiency.

**Advertising**

Newspaper, magazine, outdoor, direct mail, specialty; writing of copy, layout, campaigns, appropriations, etc.

**Bookkeeping I**

Debit and credit, assets, liabilities, profit and loss, cash book, journal, sales and purchase book, ledger and trial balances, sample statements.

**Bookkeeping II**

Working sheets, accrued items, deferred charges, reserves for depreciation and restoration entries, trading profit and loss statements, statements of financial position, comparative balance sheets.

**Business Arithmetic**

Fundamental principles, percentage, profit and loss, interest, etc.

**Business English**

Practical application, grammar and punctuation, correspondence exercises, original letters.

**Commercial Law**

Fundamental principles, contracts, negotiable instruments, sale of goods, agency, partnership, real estate, personal property.

**Marketing**

The merchandizing of products; pricing and competition.

**Office Management**

Duties of the office manager of personnel, equipment and supplies.

**Retail Selling**

Retailing from the point of view of the customer and the store manager.

**Salesmanship**

Preparation, approach, personality; arousing interest, creating desire, obtaining action.

**Shorthand I**

First 18 units, brief forms, vocabulary, dictation.

**Shorthand II**

Last 18 units, more brief forms, vocabulary, dictation.

**Typewriting I**

The keyboard, manual exercises, drills. 25 words per minute.

**Typewriting II**

Letters and forms; fifty to sixty words per minute.

**Penmanship and Spelling**

Drill in simple legibility in writing, and the spelling of words in frequent use.

**Dramatics—Music—Physical Education****SPECIALIZED EDUCATION DIVISION****RELATED EDUCATION COURSES**

**Commercial Studies 51. OWNERSHIP PROBLEMS.** Five hours a week.

Ownership vs. working for others, advantages and disadvantages; types of ownership; capital requirements, selecting a location, physical layout, equipment and utilities; legal considerations, taxes and insurance; types of service, purchasing of supplies and resale merchandise, selling, advertising, and display.

**Commercial Studies 52. OFFICE PROCEDURES.** Five hours a week.

Financial records, appointment and service records, expense control, business letter writing, personal typing, personnel problems.

**Communication Skills 51. COMMUNICATIONS I.** Three hours a week.

This course aims to help the student in four areas: listening, talking, reading, and writing.

**Communication Skills 52. COMMUNICATIONS II.** Three hours a week.

Work in vocabulary development, good English usage, and correct sentence structure and paragraph writing. Prerequisite: Communication Skills 51.

**Communication Skills 53. COMMUNICATIONS III.** Three hours a week.

A continuation of Communication Skills 52 with additional literary types to help the student develop sound judgments and thought processes.

**G-101. BASIC MATH.** Five hours a week.

A basic course in mathematics which includes a review of the fundamentals. The mathematics involved in various trade and industrial fields is presented to blend theory and practice so that the student may understand the mathematics covered.

As the student progresses in his shop work the need for mathematics becomes more apparent. Actual shop problems are used to make it possible for the average student to gain enough experience for a good foundation in this field.

**G-102. TECHNICAL MATH (ALGEBRA).** Five hours a week.

The language of algebra, formulas and applications, positive and negative

numbers, simple arithmetic with algebraic notation, equations, factoring, fractions, exponents, powers, roots and graphs.

**G-103. TECHNICAL MATH (GEOMETRY).** Three hours a week.

Uses, definitions, constructions, axioms, proofs, rectilinear figures, the circle, measurement and elementary space relations.

**G-104. TECHNICAL MATH (TRIGONOMETRY).** Five hours a week.

Functions, logarithms, solution of triangles and graph functions.

**G-105. TECHNICAL MATH (SLIDE RULE).** Two hours a week.

A course for students in Trade and Industrial programs in which the use of the slide rule is a decided advantage, as in drafting, refrigeration, etc. Included in the course are problems in: Multiplication, division, combined multiplication and division, square root, areas of circular sections, cubing and cube root.

**G-111. ELECTRICITY, SOUND AND LIGHT.** Seven hours a week.

This is a course in physics intended for Trade and Industrial students. These three areas are combined because it meets the needs of certain areas of the Trade and Industrial program. It deals with the laws of electricity, sound and light and is carried on by lectures, lecture-demonstrations and by laboratory work. The course is for 3 lecture hours and 2 two-hour laboratory periods.

**G-112. MECHANICS AND HEAT.** Seven hours a week.

This course follows the same pattern as G-111 in the field of mechanics and heat. By combining these two areas, it makes it possible for students, such as automotive students, who receive their training in electricity in their own program, to secure this vital area of physics. It deals with the laws of mechanics and heat and their practical applications.

**G-121. ADVERTISING.** Five hours a week.

A course for Trade and Industrial students covering forms of advertising as newspaper, magazine, outdoor, direct mail, specialty, etc.: Writing of copy, layout, campaigns, appropriations, etc.

**G-122. BUSINESS CORRESPONDENCE.** Five hours a week.

After a brief review of fundamentals, a complete study is made of letter forms and letter mechanics. A study is made of various types of business letters and report writing with adequate practice in writing applications, sales, adjustment, inquiry, and credit letters.

**G-124. SPECIALIZED SELLING.** Five hours a week.

To improve and develop more effective methods of selling specific items of merchandise, for example radios, television sets and automotive accessories. Each student will study and practice as his needs and interests dictate.

**G-126. TYPING.** Five hours a week.

Manual of the keyboard through the use of manual exercises and drills. An introduction to business letter forms.

**G-130. FOREMANSHIP TRAINING.** Three hours a week.

This course is intended to teach the Trade and Industrial students the duties and responsibilities of foremen and the techniques which successful foremen use. The student learns what the typical foreman does, what problems he is confronted with and how he handles them so as to accomplish the task of getting the work out. He learns why the human-relations aspect of the foreman's job is so important. The students are given an opportunity to acquire some foremanship skills through the technique of "role-playing."

**G-134. EVERYDAY LAW.** Four hours a week.

A survey course aimed at giving the technicians and tradesmen a functional knowledge of the basic legal problems that confront them in everyday law.

Special attention is given to court system, commercial paper, bankruptcy, partnership and corporations, contracts, wills, real estate, insurance, and installment buying.

**G-136. SMALL BUSINESS MANAGEMENT.** Three hours a week.

The problems of small business operation forms, records, record keeping, tax problems, ordering and inventory.

**G-138. MANAGEMENT AND LABOR PROBLEMS.** Three hours a week.

This course is more advanced than G-130 Foremanship Training. It is intended for the student who wishes to learn about the functions of all levels of supervision and the problems that confront them and to acquire additional training in leadership skills. The human-relations aspect of supervision and the techniques used to produce beneficial human-relations is dealt with more fully. Included are a study of labor unions, their history, functions, and reasons for existence.

The classes are held on a conference-type basis, as nearly as possible, in order to secure maximum student participation. Prerequisite: G-130 or equivalent.

**Humanities 51. PERSONAL AND CULTURAL APPRECIATION.** Five hours a week.

A course designed to help students to greater appreciation and understanding of themselves and of their culture as a result of systematic study of the great ideas of each period of western civilization and the influence on the artistic, dramatic, literary, and musical expressions of these periods.

**Political Science 61. POLITICAL SCIENCE.** Five hours a week.

A study of the form and functions of our federal, state, county, city and village governments.

**Social Science 51. MAN AND SOCIETY I.** Five hours a week.

An analytical study of selected problems of man in his social surroundings, drawing from all of the social science fields and designed to give the student the background necessary for understanding and interpreting the

major aspects of his social and cultural environment. Emphasis is placed on the inter-relations which exist between all aspects of man's culture and social institutions.

**Speech 51. SPEECH.** Four hours a week.

The introduction of the fundamentals of public speaking. Emphasis is placed on the practice of speaking and speech construction.

## **SPECIALIZED EDUCATION DIVISION**

### **SPECIAL BUSINESS SKILLS COURSES**

**Special Business 111. WORD STUDY AND SPELLING.** Two hours a week.

A course designed for the purpose of improving spelling ability and vocabulary. Extensive use of dictionary.

**Special Business 112. PERSONALITY DEVELOPMENT.** Three hours a week.

A course dealing with the importance of business etiquette, health, poise, good grooming, correct speech and manners, and the development of a right attitude toward work.

**Special Business 121. OFFICE TYPEWRITING I.** Five hours a week.

A course for beginners in typewriting. Covering the learning of the keyboard, knowledge of machine parts, centering, tabulation, and speed development.

**Special Business 122. OFFICE TYPEWRITING II.** Five hours a week.

A continuation of Office Typewriting I. It includes the typing of business letters, manuscripts, business forms, reports, minutes of meetings, and production and accuracy tests. Prerequisite: Special Business 121.

**Special Business 123. OFFICE TYPEWRITING III.** Five hours a week.

Continued speed building techniques, complex tabulation, rough draft, legal documents, application letters and data sheets, production techniques and problem typing. Prerequisite: Special Business 122.

**Special Business 133. BUSINESS ENGLISH.** Five hours a week.

This course is designed to meet the practical English needs of students in the business field. It includes a review of grammar, sentence structure, punctuation, paragraph construction, use of the dictionary, and letter writing.

**Special Business 141. COMMERCIAL MATHEMATICS.** Four hours a week.

A review of fundamental arithmetical processes and their business application.

**Special Business 142. SECRETARIAL ACCOUNTING.** Four hours a week.

The aim of this course is to provide students with an understanding of the principles and practices of business accounting from the secretarial standpoint. Prerequisite: Special Business 141.

**Special Business 143. PAYROLL ACCOUNTING AND PROCEDURES.** Five hours a week.

A study of the payroll laws and procedures in modern bookkeeping practices. The acquisition of a basic knowledge of payroll records and reports essential in business operations. Prerequisite: Special Business 141.

**Special Business 151. OFFICE MACHINES I.** Three hours a week.

Introduces the theory of the four basic operations of addition, subtraction, multiplication, and division on the comptometer, calculator, and adding-listing machines.

**Special Business 152. OFFICE MACHINES II.** Three hours a week.

Concentrates on the speed development in the use of the comptometer, calculator, and adding-listing machines. Emphasis is placed on the handling and figuring of business forms. Prerequisite: Special Business 151.

**Special Business 161. DUPLICATING MACHINES I.** Three hours a week.

Mimeograph and liquid duplication. Instruction in the cutting and correcting of stencils and masters, use of the mimeoscope, running of copies, operation and care of the machine, and the filing of stencils for future use. Prerequisite: Special Business 121.

**Special Business 162. DUPLICATING MACHINES II.** Three hours a week.

A continuation of Duplicating Machines I with extensive laboratory work requiring practice on matter for actual office use. Prerequisite: Special Business 161.

**Special Business 171. TRANSCRIBING MACHINES.** Three hours a week.

Emphasis is placed on the development of speed and accuracy in the transcribing of material from the voice transcription machines. Prerequisites: Special Business 111, 122, and 133.

**Special Business 181. BUSINESS FILING I.** Three hours a week.

Filing rules in common use are studied in this course. Practice is given in alphabetic, geographic, numeric and subject filing systems.

**Special Business 182. BUSINESS FILING II.** Three hours a week.

Advanced training in filing with emphasis on speed in finding materials, preparing cross reference cards, and other procedures of filing. Prerequisite: Special Business 181.

**Special Business 191. PBX TRAINING.** Five hours a week.

The principles and practices in the use of the office switchboard and proper telephone usage. Theory plus laboratory.

**Special Business 221. CLERICAL OFFICE PRACTICE.** Four hours a week.

In this course the student will be expected to do the various jobs found in a regular office. Prerequisite: Special Business 121.

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