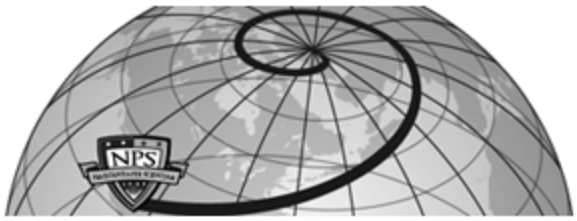

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POSTGRADUATE SCHOOL REGULATIONS.

Attention is invited to U.S. Naval Regulations, 1920, Article 130.

MISSION:

Postgraduate courses of instruction shall be maintained for the advanced education and training of commissioned officers in (a) general professional and allied subject; and (b) technical subjects pertaining to ordnance, mechanical, electrical, radio, marine and aeronautical engineering. In addition such other subjects as the Secretary of the Navy May prescribe in order to meet the requirements of the naval service.

The Naval Postgraduate School shall conduct and direct all such postgraduate education and instruction. Its headquarters and such of its activities as practicable will be located at the Naval Academy.

ADMINISTRATIVE STATUS.

The Postgraduate School shall be administered as a department of the Academy separate from the undergraduate departments and independent of the Academic Board.

SUPERVISORY COUNCIL.

The Naval Postgraduate School shall be under the supervisory control of the Postgraduate Council, whose membership shall be composed of the Superintendent of the Naval Academy, who shall preside, the Head of the Postgraduate School, and of one member each from the Bureau of Ordnance, the Bureau of Engineering, the Bureau of Construction and Repair, the Bureau of Yards and Docks and the Bureau of Aeronautics. The Postgraduate Council shall meet upon the special call of the Superintendent of the Naval Academy. An officer detailed to duty in the Postgraduate School shall be appointed by the Superintendent of the Naval Academy as Secretary of the Council.

ORGANIZATION.

HEAD OF SCHOOL.

The Head of the Postgraduate School will be detailed by the Navy Department.

He shall, under the supervision of the Superintendent of the Naval Academy, direct and conduct the executive and administrative work connected with the prescribed postgraduate

courses in conformity with such recommendations of the Post-graduate Council as may have been duly approved.

He will assign the duties of the Officer and Civilian assistants in such a manner as will further the best interest of the school as a whole. He shall exercise direct supervision over the procurement and expenditure of all funds.

EXECUTIVE OFFICER.

Shall be the direct representative of the Head of the School. All officer and civil personnel shall be under his control and supervision. He is responsible for the execution of the plans and policies of the Head of the School. He shall perform such other duties as may be assigned.

INSTRUCTORS - OFFICER and CIVILIAN.

Such commissioned officers as may be necessary will be detailed to the School as instructors.

A commissioned officer is in charge of each of the following educational sections:

Navigation
Marine Engineering
Radio Engineering
Ordnance and Gunnery
Aeronautical Engineering

Chiefs of Section are chosen for the special training which they have had for their duties. They shall supervise the courses and instruction in their sections. Collateral courses contained in sectional study arrangement are supervised by the officers having these courses through the Chiefs of Section and the Head of the Postgraduate School.

One or more instructors are detailed to teach the following courses:

Organization and Administration
Military Character and Leadership Psychology
Military Law
Naval Intelligence
Navigation
Tactics
Communications
Damage Control
Ordnance and Gunnery
Engineering
Electricity

Radio Engineering
Mathematics and Mechanics
Metallurgy and Chemistry
Physics
Thermodynamics
Engineering Materials
Hydraulics
Optics

Officers shall be responsible for the accounting for all material and equipment as follows:

Chief of Ordnance & Gunnery Section:
Metallurgy, Chemistry, Mathematics and Mechanics.

Chief of Marine Eng. Section:
Mechanical and Electrical Engineering, Physics and Optics, Aeronautical equipment.
Engineer Officer of School building.

Chief of Radio Engrg. Section:
Library, Confidential Library, Radio and Communications.

Senior Instructor, Navigation Course:
Navigational equipment and building equipment.

Inventories shall be taken and discrepancies rectified during the Spring Term.

A complete list and description of equipment and a running inventory of equipment, tools, and special material shall be kept in Central Office.

The instructor in charge of each course shall prepare tentative outlines of the course and submit same to Executive Officer, through the Chief of Section concerned.

Chiefs of Section shall attend the recitations and laboratory exercises of their respective sections frequently enough to be thoroughly familiar with all the details of the instruction of their sections. They shall keep in touch with the wishes of and advise the Head of the School in regard to courses, exercises and progress of the students. They shall submit memorandum fitness reports on student officers of their Sections, in accordance with instructions of the Head of the School. They shall make such recommendations for changes in scope of courses, methods of instruction, laboratory exercises, etc. as seem desirable to develop a constant improving post-graduate instruction.

Chiefs of Sections shall, acting in the name of the Head of School, make all arrangements of routine character with the Academic Departments of the Naval Academy for the use of equipment in conducting the practical instruction of their respective sections.

STAFF OF POSTGRADUATE SCHOOL.

Head of Postgraduate School - - - - - Captain F.H.Sadler,USN
Executive Officer --- - - - - - - - - Comdr. T.E.VanMetre,USN

Navigation - Chief of Section - Lt.Comdr. G.L.Woodruff,USN
Marine Eng. - " " " - Lt.Comdr. H. H. Little,USN
Radio Engrg. - " " " - Lt.Comdr. L.P. Lovette,USN
Ordnance & Gunnery- " " " - Lt.Comdr. O. Nimitz, USN
Aeronautical Eng. - " " " - Lt.Comdr. H.H. Little, USN

Instructor	Studies
Lt. Comdr. Woodruff	Organization & Administration
Lt. Comdr. Woodruff	Military Character & Leadership Psychology.
Lt. Comdr. Woodruff	Military Law.
Lt. Comdr. H. H. Little	Engineering
Lt. Comdr. H.G.Eldredge	Tactics
Lt. Comdr. O. Nimitz	Ordnance & Gunnery
Lt. Comdr. F.G. Richards	Navigation
Lt. Comdr. N.M. Pigman	Damage Control
Lt. Comdr. N.M. Pigman	Naval Intelligence
Lt. Comdr. L.P. Lovette	Communications
Lieutenant E.A. Poehlman	Navigation
Lieutenant H.D. Lyttle	Damage Control
" H.D. Lyttle	Naval Intelligence
" H.B. Brumbaugh	Ordnance & Gunnery
" T.F. Wellings	Organization & Administration
" T.F. Wellings	Military Character & Leadership Psychology.
" T.F. Wellings	Military Law
" E.A. Taylor	Communications
" T.M. Stokes	Engineering
" R.C. Strong	Communications.
Professor Root	Mathematics & Mechanics
" Bramble	" " "
Assoc.Prof. Rawlins	" " "
Asst. " Coates	Mathematics, Mechanics, Aerodynamics
Professor Kiefer	Engineering
Assoc.Prof. Kavanaugh	"
" " Wilbur	"
Professor Wagner	Physics
Assoc. Prof. Giet	Radio

Assoc.Prof. Terwilliger	Electricity
Asst. Prof. LaCauza	Electricity
Asst. Prof. Wheeler	Electricity
Asst. Prof. Dornblatt	Metallurgy
Asst. Prof. Coonan	Chemistry
Professor Hill	Naval Intelligence

GENERAL INSTRUCTIONS.

Students are assigned upon the commencement of and during their course of instruction to the following groups:

1st Year.

A - School of the Line - Navigation.
B - School of the Line - Marine Engineering
C - School of the Line - Radio Engineering.
D - School of the Line - Ordnance & Gunnery
E - School of the Line - Aeronautical Engineering.

G - Engineering (Technical)
H - Engineering (Technical) Gas
I - Engineering (Technical) Aero
J - Engineering (Technical) Radio
K - Engineering (Technical) Ordnance
- KG - General
- KM - Metallurgy
- KE - Explosive
- KT - Torpedoes.

2nd Year.

M - School of the Line - Engineering, 2nd year. B 2
N - School of the Line - Radio Engrg. 2nd year. C 2
O - School of the Line - Ordnance & Gunnery, 2nd year. D 2
P - School of the Line - Aeronautical Eng., 2nd year. E 2
Q - Applied Communications (QR - Radio A 2R
(QV - Visual. A 2V

R - Engineering (Technical) 2nd year.
S - Engineering (Technical) Gas, 2nd year.
T - Engineering (Technical) Radio - 2nd year.
U - Engineering (Technical) Ordnance & Gunnery, 2nd yr.
- UG - General
- UM - Metallurgy
- UE - Explosive
- UA - Aero.

Student officers shall be encouraged to confer freely with the school staff with regard to their problems. The Head of the School particularly will welcome constructive suggestions.

The classroom period shall be a combined instruction and recitation period during which the lesson for the day shall be gone over.

Laboratory periods shall be used to make the object of the experiment - the principle or law or phenomena - evident to the observation, perception and senses of the Student Officer. Laboratory periods may be used for problem work under the direction of the instructor when he considers problem work desirable.

An intelligent question, well formulated and defined, on any subject, indicates thought and study on that subject. It is considered therefore desirable, for the student in studying, to get in the habit of formulating questions on the assigned lesson or exercise, and trying to answer them from the text. The experimental method in science is really a method of putting a question to nature and getting an answer.

All examination questions shall be referred to the Head of Postgraduate School for approval before the examination.

Two papers submitted by Student Officers for all written exercises and examinations of any class shall be referred to the Head of Postgraduate School for information. They shall be one of the best and one of the poorest papers submitted. They shall be marked for return to Student Officers. Only two papers shall be so referred.

The assigning of a fixed period for the conduct of an examination is to indicate in a measure the scope and thoroughness of the examination. The questions will be set up so that the average student will without undue haste complete his paper in the time indicated.

Method of Grading Work

E - Excellent. Indicating a thorough, accurate understanding of the problem, exercise, lesson assignments, or examination questions.

G - Good - Indicating a creditable understanding.

P - Passing, but not too thorough.

X - Unsatisfactory. Incorrect or inaccurate understanding indicated.

Marks as above shall be entered by instructor on:-

(1) All problem work
(2) All written exercises
(3) All examinations, before return to student officer.

For students enrolled in the School of the Line, the number of "Es" available for assignment to the students of a given group will be determined by the final number to be selected from that group for continued instruction in the technical school. At least one P or lower will be assigned to a student or students in each group.

Marks for term daily work, term examinations and a combined or final term mark shall be submitted to the Head of the School by each instructor on each student officer at the end of each term. A monthly report will also be made to the Head of the School of any student officer whose work in any subject is unsatisfactory.

Marks of proficiency in studies will not be entered on a Student Officer's Report of Fitness, although they will be given consideration in completing such Report of Fitness.

After all term marks are approved by the Head of the School the marks for each student officer will be entered on an appropriate form and given to him.

All marks as above shall be kept on record in the office of the Postgraduate School.

Certificates will be issued to the students who complete the first year of the School of the Line with credit. It is hoped that the possessors of these certificates will be excused from examination for promotion in the subjects covered at the Postgraduate School.

LABORATORY REPORTS.

Reports shall be submitted at the next recitation in that subject after completion of the work in the laboratory. Additional time may be allowed at discretion of professor.

LECTURES

All officers of the School Staff, civilian instructors and all student Officers shall attend all lectures unless excused.

CLASSROOM AND LABORATORY RULES.

The senior officer in each group shall report lates and absentees via messenger, to the Executive Officer.

When using laboratories or apparatus belonging to Academic Departments of the Naval Academy or to the Engineering Experiment Station, the member of the Postgraduate Staff in charge shall always report to a responsible representative of the Head of the Department or Experiment Station. They should inspect the laboratory and equipment together prior to the exercise or experiment and again upon its completion. The Postgraduate School representative shall always request such inspection and he shall be the last to leave except in special circumstances.

No officer, professor, laboratory assistant or civilian employee will smoke in any classroom or laboratory during instruction or exercises.

CLASSROOM AND LABORATORY JOURNAL

Separate journals shall be kept for all subjects taught at the Postgraduate School. These journals shall be carefully prepared by the instructor giving the course under the supervision of the Chief of his Section. These journals shall begin with a synopsis of the course and a statement of the object to be accomplished and shall contain a list of text and reference books used, the lesson assignments, copies of all examinations and other matter included in the course. These journals will be kept in the offices of the Chiefs of Sections. They are not to be removed from the Postgraduate School Building.

All journals will be promptly submitted to the Head of Postgraduate School at the end of each term by the proper Chief of Section.

In order that journals may not become unnecessarily bulky, their contents will be removed annually and placed in an appropriate file in the office of the Chief of Section.

Those Journals shall be titled on the outside page as follows:

POSTGRADUATE SCHOOL
Annapolis, Md.

TERM JOURNAL.

Course In _____ for _____ Class

_____ TERM

_____ 193 to _____ 193

Submitted by _____ in Charge of Course.

Instruction by _____ and _____

Checked by _____ Chief of Section.

Approved by _____
Head of Postgraduate School.

SUPPLIES

Books and stationery supplies will be issued by the Librarian; all other supplies will be received and issued at the general storeroom in the basement.

COMMUNICATIONS

All communications with Departments of the Naval Academy shall be official and shall be carried on through the Head of the Postgraduate School.

All official communications beyond the Naval Academy shall be through the Head of the School.

The substance of official telephone conversarions, except aviation flight arrangements by student aviators, shall be reduced to writing and referred to Head of School. Necessary copies shall be made to send the party communicated with. For purposes of record the Chief Clerk must be notified when official calls are made. No calls will be made without the authority of the Head of School in each case.

FITNESS REPORTS OF POSTGRADUATE STUDENT OFFICERS.

All officers taking Postgraduate work shall submit their fitness reports to the Head of the Postgraduate School.

Fitness reports will be supplied all student officers undergoing postgraduate instruction for the necessary entries on the first page.

The fitness reports of student officers undergoing practical instruction at Government or private plants will be mailed to them direct for necessary entries on first page.

When student officers away from the Postgraduate School at Annapolis are immediately under a Commandant, Inspector or other senior officer, they should forward their reports of fitness to the Head of Postgraduate School via such senior. The latter will make a special report when desirable in accordance with U. S. Naval Regulations, Article 137, subparagraph 11 (E).

OFFICERS' ADDRESSES AND AUTOMOBILE LICENSES.

Officers will keep on file in the office at all times their correct addresses, telephone numbers, whether under instruction at Annapolis, civilian universities, industrial plants or elsewhere.

Officers will keep on file as above, their automobile license numbers while in Annapolis.

BULLETIN BOARDS

Every information notice and order will be posted in the Bulletin Board designated for that purpose.

All new orders and information notices will appear for 48 hours when first published in the Bulletin Board marked "NEW".

INSTRUCTORS' CONFERENCE HOURS

Necessary individual assistance will be given by instructors in their offices during the periods assigned for "study" on the Master Schedule.

ATHLETICS.

It is necessary for student officers to have regular exercise. Three hours a week have been set aside for this purpose and it is mandatory that these athletic periods be employed in some form of strenuous exercise. Walking is not considered exercise.

During the summer the form of exercise will be of the student's choosing, such as tennis, baseball, basket ball, golf, soccer, swimming, etc.

When bad weather sets in arrangements will be made for organized exercise under a physical instructor in the gymnasium. The date of commencing the indoor exercise will be promulgated by special notice.

Some small articles of athletic equipment are available for issue on custody receipts from leading mechanic.

TRAVEL ORDERS

Orders involving travel and transfer of officers incident to duly authorized courses of study and training are issued by the Bureau of Navigation upon application by the Head of the Postgraduate School.

TEXT BOOKS

Text and reference books shall be purchased on requisition by the Head of the Postgraduate School from authorized allotment of funds. A library is maintained at the Postgraduate School from which the books shall be issued to the Student Officers on individual receipt. Any book issued and not returned on completion of Postgraduate Instruction shall be replaced by the responsible officer. Student officers are permitted to retain any book desired provided they replace it with a new one.

UNIFORM

The uniform regulations of the Naval Academy will be complied with.

Attention is called to an order which prohibits officers from wearing articles of midshipmen's uniform - such as, for example, white hats and reefers.

SMOKING ON STREETS OF ANNAPOLIS

The Superintendent desires that officers in uniform do not smoke on the streets of Annapolis.

ABSENCE FROM SCHEDULED EXERCISES

Student officers are expected to carry out the schedule of exercises. In an emergency they will apply to Executive Officer to be excused after first obtaining permission from the Assistant in Charge of Groups. Officers so excused will post the record of absence provided for this purpose.

LEAVING LIMITS OF ANNAPOLIS

Student officers wishing to leave limits of Annapolis over the week end will obtain permission from the Executive Officer and during the week from the Head of the School. In both cases they will before leaving, post the record of absence provided for the purpose.

CONFIDENTIAL PUBLICATIONS

Upon the completion of the first year's work at the Postgraduate School, and again upon final completion of instruction under the Postgraduate School student officers shall report in writing whether or not they have any secret or confidential publications in their custody for which they are responsible.

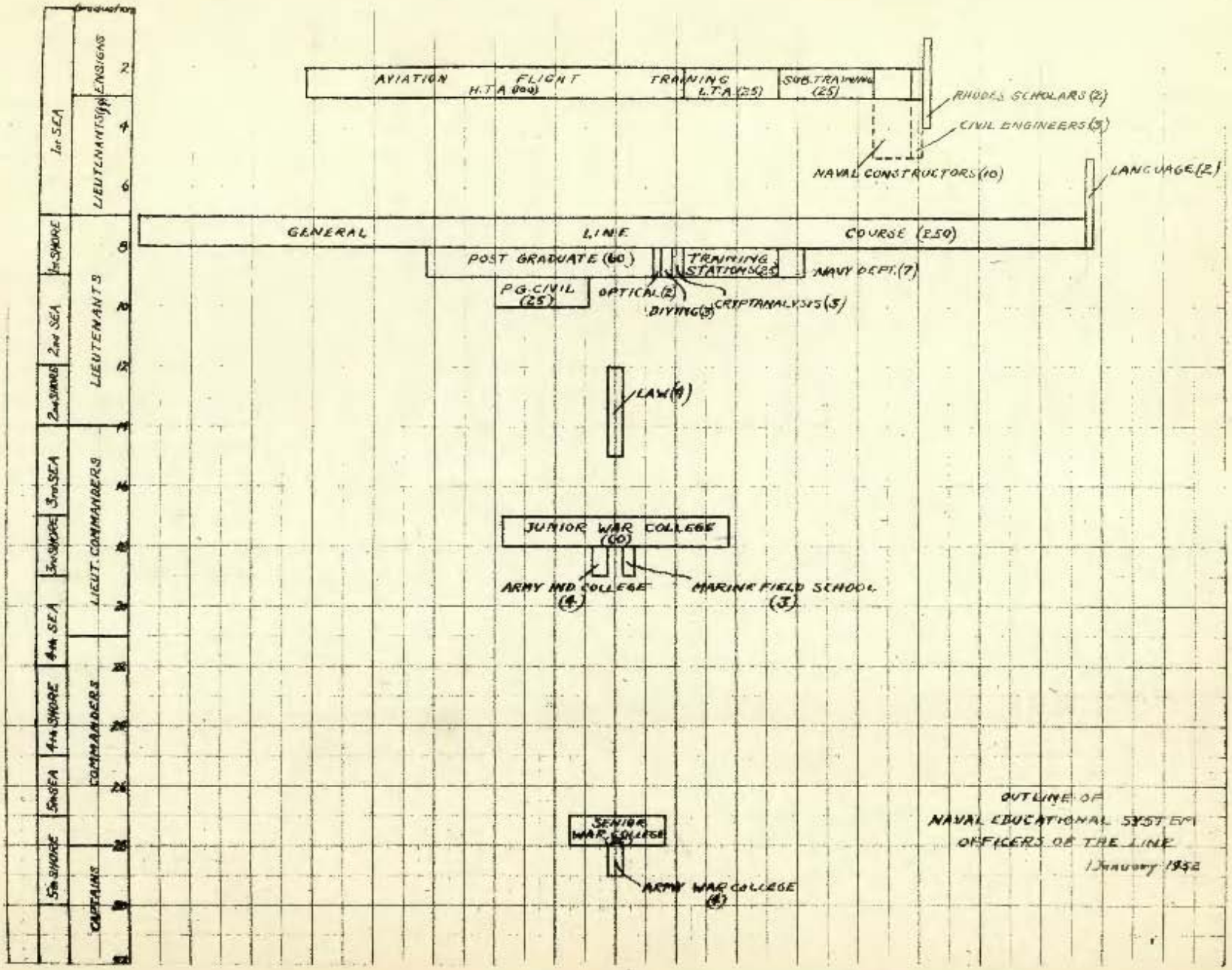
(8127 - 4/4/32)(2)-200

UNITED STATES NAVAL ACADEMY — POSTGRADUATE SCHOOL.

TERM WEEKLY CALENDAR - 1932 - 1933

WEEK	SUMMER TERM Begins	SUMMER TERM Ends	FALL TERM Begins	FALL TERM Ends	WINTER TERM Begins	WINTER TERM Ends	SPRING TERM Begins	SPRING TERM Ends
1st Week	4 July	9 July	26 Sept.	1 Oct.	12 Dec.	17 Dec.	20 March	25 March
2nd "	11 "	16 "	3 Oct.	8 "	2 Jan.	7 Jan.	27 "	1 April
3rd "	18 "	23 "	10 "	15 "	9 "	14 "	3 April	8 "
4th "	25 "	30 "	17 "	22 "	16 "	21 "	10 "	15 "
5th* "	1 Aug.	6 Aug.	24 "	29 "	23 "	28 "	17 "	22 "
6th "	8 "	13 "	31 "	5 Nov.	30 "	4 Feb.	24 "	29 "
7th "	15 "	20 "	7 Nov.	12 "	6 Feb.	11 "	1 May	6 May
8th "	22 "	27 "	14 "	19 "	13 "	18 "	8 "	13 "
9th "	29 "	3 Sept.	21 "	26 "	20 "	25 "	15 "	20 "
10th "	5 Sept.	10 "	28 "	3 Dec.	27 "	4 March	22 "	27 "
EXAM. "	12 "	17 "	5 Dec.	10 "	6 March	11 "	29 "	3 June
HOLIDAYS	4 July 5 September Registration 1 & 2 July (For Tech) 29 & 30 " (GenLine) *Gen.Line Term begins:		18 Sept. - 25 Sept. 24 November		19 Dec. - 31 Dec. 2 January 22 February		12 March - 19 March 30 May	

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.


Graduation
ENSIGNS
LIEUTENANTS
1st SEA
2
4
6
AVIATION
FLIGHT
H.T.A (80)
TRAINING
L.T.A (25)
SUB. TRAINING (25)
RHODES SCHOLARS (2)
CIVIL ENGINEERS (3)
NAVAL CONSTRUCTORS (10)
LANGUAGE (2)
GENERAL
LINE
COURSE (250)
1st SHORE
LIEUTENANTS
8
2nd SEA
10
2nd SHORE
12
POST GRADUATE (60)
TRAINING STATIONS (25)
NAVY DEPT. (7)
P.G. CIVIL (25)
OPTICAL (2)
DIVING (3)
CRYPTANALYSIS (3)
LAW (4)
3rd SEA
14
3rd SHORE
16
LIEUT. COMMANDERS
JUNIOR WAR COLLEGE (60)
ARMY IND COLLEGE (4)
MARINE FIELD SCHOOL (3)
4th SEA
18
4th SHORE
20
COMMANDERS
5th SEA
22
5th SHORE
24
CAPTAINS
SENIOR WAR COLLEGE (25)
ARMY WAR COLLEGE (4)
26
28
OUTLINE OF
NAVAL EDUCATIONAL SYSTEM
OFFICERS OF THE LINE
1 January 1952

(8312-7/25/32) (3d) 50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

POLICY OF INSTRUCTION
SCHOOL OF THE LINE

The following is quoted from Bureau of Navigation Circular Letter No. 86-31 of 27 December 1931:

"The plan for officer education contemplates that eventually all line officers shall take the General Line course at the Postgraduate School, when ordered to their first tour of shore duty.

The basis of this plan is that every line officer, while maintaining a thorough general knowledge of the Naval profession, shall have special knowledge of at least one branch of that profession.

From the officers who complete the one year General Line course, there will be selected a limited number of officers for a year's postgraduate training at the Postgraduate School, in a prescribed specialty, with the idea of developing them as operating specialists. Either from this group or from the original group, there will be chosen a small number of design and production specialists in each branch who will have, in addition to the second year of postgraduate work, a third year of instruction at a civil university."

Pursuant to the foregoing, basic plans call for a class of 250 entering the School of the Line annually. At the end of the first and second years further selections are made depending upon ability of students and service requirements.

However, on account of the housing situation existing at this time in Annapolis and the size of the Postgraduate School building, the number of first year students is at present restricted to something less than two hundred and fifty. In order to cope with this it has been proposed and recommended:

(1) That one hundred officers, or a number to be specified by the Chief of the Bureau of Navigation, be selected in a manner specified by the Chief of the Bureau of Navigation, from a specified Naval Academy Class to be made eligible for a course of instruction at the School of the Line.

(2) That the School of the Line course be made a prerequisite to all Postgraduate School technical courses except for Naval Constructors and Civil Engineers.

Policy of Instruction

Schedule ----- Technical Groups

Period	BuOrd. ENGINEERING (Ordnance)							BuAero. ENGINEERING (AERONAUTICAL)		BuAero. ENGINEERING (Gas)	BuEng. ENGINEERING	BuEng. ENGINEERING (RATIO)		U.S.C.G. Naval Cadet	U.S.C.G. Civil Engineer
1	All groups are at Postgraduate School for a general and fundamental Engineering course during periods 1, 2 and 3.													Three year course at M.I.T. Supervision remains with P.G. School	Three year course at Rensselaer Polytech. Int. Supervision remains with P.G. School
2															
3															
4	Aviation	Design	Fire Control	Ballistics	Explosives	Metallurgy	Torpedo Design	Power Plants	Structures				California	Harvard	
	All groups are at Postgraduate School. The specializing courses are inaugurated. ⟶														
5	Navy Yard Wash. D.C. Aircraft Factory Phila.	Practical Instruction at Washington Navy Yard.			Special summer Course at Post-graduate School.		Practical Instruction at Newport.	Summer Course at M.I.T.	Summer Course at M.I.T.	Special Summer Course at Postgraduate School.	Naval Boiler Laboratory—Industrial plants as conditions permit.	At Postgraduate School.			
6	At Postgraduate School Continue Specializing Courses	At Postgraduate School Continue Specializing Courses.			Two Semesters at Univ of Michigan	Two Semesters at Carnegie Inst of Technology.	Two Semesters at M.I.T.	Two Semesters at M.I.T.	Two Semesters at M.I.T.	Two Semesters at M.I.T.	Two Semesters at Univ. of California	Two Semesters at Univ. of Calif.	Two Semesters at Harvard.		
7															
8	Practical Instruction at Army and Navy Shore Activities.														
9					Practical Army and Navy Shore Activities.	Instruction	Research work at Newport Torpedo Station	To duty directly under Bureau of Aeronautics for further practical instruction.		Practical Instruction in Lighter than Aircraft	Practical Instruction as conditions permit	Practical Instruction at Industrial Plants Navy Dept. and Shipyard as conditions permit			
10							Research work at M.I.T. Completes Course.								
11															
12		Courses Completed.													

(8254 - 6/29/32)(3d)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

POLICY OF INSTRUCTION.

TECHNICAL STUDENTS

These officers are chosen from those students of the School of the Line who have demonstrated special fitness and aptitude for further instruction and training.

The mission of the course is to give a fundamental grounding in engineering and then to train the individual officers as specialists in their particular brahches of engineering.

The courses are drawn up at the Postgraduate School and approved by the Bureaus concerned. The following courses are at present formulated:

Ordnance Engineers - Aviation Ordnance
Ordnance Engineers - Design; Fire Control; and Ballistics
Ordnance Engineers - Metallurgy
Ordnance Engineers - Explosive
Ordnance Engineers - Torpedo Design
Aeronautical Engineers (Power Plants) - Structures
Gas Engineers
Marine Engineers
Radio Engineers.
Communications.

Supervision continues with respect to the courses taken by Naval Constructors and Civil Engineers.

The courses are divided into terms of approximately three months.

Each course is outlined below by terms.

Ordnance Engineers - Aviation Ordnance.

1st, 2nd and 3rd Terms.

At Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are - mathematics, physics, mechanics, engineering measurements, chemistry, metallurgy, engineering materials, electricity, thermodynamics.

4th Term.

Commencement of the specializing course at Postgraduate School. Special applications of the above subjects and in addition optics, kinematics and mechanisms of machines.

5th Term.

Practical instruction at Naval Gun Factory, Washington, D.C. and Naval Aircraft Factory, Phila., Pa.

6th and 7th Terms.

The specializing course is continued at the Postgraduate School with addition of structures and materials, aerodynamics, ordnance and gunnery, and mechanisms and machine design.

This completes the scholastic course of this group.

8th, 9th, 10th, 11th and 12th Terms.

Practical instruction at Army and Navy shore activities. Plants visited include - Naval Proving Ground, Naval Powder Factory, Bureau of Ordnance, Bureau of Aeronautics, Air Corps Engineering School, Wright Field, Air Corps Technical School, Chanute Field, Ordnance Specialists' School, Raritan Arsenal, Torpedo Station Newport, Hartford Inspection District, Ford Instrument Co., Army Proving Ground, and Edgewood Arsenal. This schedule of practical instruction is prepared at the Postgraduate School and approved by the Bureau of Ordnance and the Bureau of Navigation.

Ordnance Engineers - Design, Fire Control and Ballistic.

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are mathematics, physics, mechanics, engineering measurements, chemistry, metallurgy, engineering materials, electricity and thermodynamics.

4th Term.

Commencement of the specializing course at Postgraduate School. Special applications of the above subjects and in addition optics, kinematics and mechanisms of machines are given.

5th Term.

Practical instruction at Naval Gun Factory, Washington, D.C.

6th and 7th Terms.

The specializing course is continued at the Postgraduate School with the addition of structures and materials, ordnance and gunnery, and mechanisms and machine design. This completes the scholastic course for this group.

8th, 9th, 10th, 11th and 12th Terms.

Practical instruction at Army and Navy shore activities. Places visited include - Naval Proving Ground, Naval Powder Factory, Bureau of Ordnance, Ammunition Depot, Iona Island, Ford Instrument Co., Army Proving Ground, Edgewood Arsenal, Midvale Steel Co. and the General Electric Co. A special schedule for each student is prepared by the Postgraduate School and approved by the Bureau of Ordnance and Bureau of Navigation. The course is completed.

Ordnance Engineers - Metallurgy.

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are - mathematics, physics, mechanics, engineering measurements, chemistry, metallurgy, engineering materials, electricity and thermodynamics.

4th Term.

Commencement of the specializing course at the Postgraduate School. Special applications of the above subjects and in addition physical chemistry, inorganic chemistry and metallurgy.

5th Term.

A special summer course is given at the Postgraduate School in physical chemistry, quantitative chemistry, ferrous metallurgy, metallurgical practice and non-ferrous metallurgy.

6th, 7th and 8th Terms.

Attends Carnegie Institute of Technology for two semesters continuing the specialization in chemistry and metallurgy. This course leads to the degree of Master of Science in Metallurgical Engineering. This completes the scholastic course for this group.

9th, 10th, 11th and 12th Terms.

Practical instruction at Army and Navy shore activities. Places visited include - Ford Instrument Co., Naval Powder Factory, Naval Proving Ground, Naval Ammunition Depot, Iona Island, Mine Depot Yorktown, Naval Ammunition, St. Julien's Creek, Picatinny Arsenal, Aberdeen Proving Ground, Edgewood Arsenal and the Bureau of Ordnance. A special schedule is prepared for each student by the Postgraduate School and approved by the Bureau of Ordnance and the Bureau of Navigation. The course is completed.

Ordnance Engineering - Explosive

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are:- mathematics, physics, mechanics, engineering measurements, chemistry, metallurgy, engineering materials, electricity and thermodynamics.

4th Term.

Commencement of the specializing course at the Postgraduate School. Special applications of the above subjects and in addition physical, inorganic and qualitative chemistry are given.

5th Term.

A special summer course is given at the Postgraduate School in physical and quantitative chemistry.

6th, 7th and 8th Terms.

The specializing course is continued at the University of Michigan. The course is given in P.G. Stencil 8253 - 6/29/32. This course leads to the degree of Master of Science in Engineering. This completes the scholastic course.

9th, 10th, 11th and 12th Terms.

Practical instruction at Army and Navy shore activities. Places visited include - Ford Instrument Co., Naval Powder Factory, Naval Proving Ground, Naval Ammunition Depot, Iona Island, Mine Depot, Yorktown, Ammunition Depot, St. Julien's Creek, Picatinny Arsenal, Aberdeen Proving Ground, Edgewood Arsenal and the Bureau of Ordnance. A special schedule is prepared for each student by the Postgraduate School and approved by the Bureau of Ordnance and the Bureau of Navigation. The course is completed.

Ordnance Engineers - Torpedo Design

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are - mathematics, physics, mechanics, engineering measurements, chemistry, metallurgy, engineering materials, electricity and thermodynamics.

4th Term.

Commencement of the specializing course. Special applications of the above subjects and in addition kinematics and mechanisms of machines.

5th Term.

A special summer course in Torpedoes at Torpedo Station, Newport.

6th, 7th and 8th Terms.

The specializing course is continued at the Mass. Institute of Technology as outlined in P. G. Stencil 7058 - 8/20/30. This course leads to a Master of Science Degree in Mechanical Engineering.

9th Term.

Research work at the Naval Torpedo Station, Newport.

10th, 11th and 12th Terms.

Research work in Torpedo Research Laboratory, Mass. Institute of Technology on projects assigned by the Bureau of Ordnance. This course leads to a degree of Doctor of Scieme in Mechanical Engineering. The course is completed.

Aeronautical Engineers (Power Plants) (Structures)

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are:- mathematics, mechanics, physics, engineering measurements, hydraulics, chemistry, thermodynamics, electricity, engineering materials and metallurgy.

4th Term.

Commencement of specializing course at Postgraduate School. Subject covered in addition to above is airplane stresses. At the close of this period the group is divided. One group specializes on power plants, the other on structures.

5th Term.

Both groups take summer course at Mass. Institute of Technology.

6th, 7th and 8th Terms.

Continue specializing courses at Mass. Institute of Technology as outlined in P. G. Stencils 7725-7/11/31 and 7726-7/11/31. This completes the scholastic course. These student officers are then ordered to duty directly under the Bureau of Aeronautics for another year of practical instruction in accordance with Bureau of Aeronautics letter Aer-F-#-HD, NC4, NC1(4), of March 26, 1931.

Gas Engineers.

1st, 2nd and 3rd Terms.

At Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are - mathematics, mechanics, physics, engineering measurements, hydraulics, chemistry, thermodynamics, electricity, engineering materials and metallurgy.

4th Term.

Commencement of the specializing course at the Postgraduate School. Subjects covered in addition to above are physical, qualitative and inorganic chemistry.

5th Term.

A special summer course is given at the Postgraduate School in Chemistry.

6th, 7th and 8th Terms.

Continue specializing course at Mass. Institute of Technology as outlined in P. G. Stencil. This completes the scholastic course.

9th Term.

Practical instruction given if authorized. This year they were ordered direct to duty.

Engineers

1st, 2nd, 3rd and 4th Terms.

At Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are mathematics, mechanics, physics, engineering measurements, hydraulics, chemistry, thermodynamics, electricity, engineering materials and metallurgy.

5th Term.

Practical instruction usually arranged for Naval Boiler Laboratory and other activities of a commercial nature. This later curtailed for the present year due to economies.

6th, 7th and 8th Terms.

Groups which have finished terms 1, 2, 3, 4, 5 above continue instruction at University of California for two semesters.

9th Term.

Practical instruction usually arranged. Cancelled this year by direction Bureau Engineering and Bureau of Navigation.

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Radio Engineers - Group J.T.

1st, 2nd and 3rd Terms.

At the Postgraduate School for instruction in general and fundamental engineering principles. Subjects covered are - mathematics, physics, mechanics, engineering measurements, chemistry, thermodynamics, electricity, engineering materials and metallurgy.

4th Term.

Commencement of specializing course at Postgraduate School. Additional subjects are radio and sound. At the close of this term the group is divided. One section takes the university course at Harvard, the other at the University of California.

5th Term.

Both sections take a special summer course at the Postgraduate School. The subjects covered are: radio operating, radio engineering, tactics, communication instructions, communication security and mathematics.

6th, 7th and 8th Terms.

The sections take specializing courses at Harvard University and University of California as outlined in P.G.Stencils 6821-5/5/30 and 8242-6/3/32. This complete the scholastic course.

9th Term.

Practical instruction for the present year at RCA, General Electric Company, Westinghouse Elec. & Mfg. Co., and Radio Frequency Laboratories. The course is completed.

Communications, Group Q.

1st, 2nd 3rd and 4th Term.

School of the Line. Upon completion of the year's work students who have shown particular aptitude are are selected for a year's course in Communications.

5th Term.

Specialization begins. Subjects taken are radio operating, radio engineering, communication security, tactics, typewriting, War College Correspondence Course, and Naval Intelligence Seminar.

6th, 7th and 8th Terms.

The group is divided into visual and radio sections. Additional subjects taken are cryptanalysis (radio section only), direction finding (radio section only), Navy filing system (visual section only), visual operating, communication instruction, operating procedure, communication organizations, communication development, naval etiquette and Naval Intelligence Seminar.

The course is completed.

(8230 - 6/23/32)

UNITED STATES NAVAL ACADEMY — POSTGRADUATE SCHOOL.

LIST OF COURSES.

Department	Course		Term	Group
Mathematics	A-1	1-0	1st	A, B, C, D, E.
	A-2	4-0	1st	B, C, D, E.
	A-3	3-0	2nd	B, C, D, E.
	A-4	3-0	3rd	B, C, D, E.
	A-5	3-0	4th	B, C, D, E.
	A-6	5-0	1st	G, H, I, J, K.
	A-7	3-2	2nd	G, H, I, J, K.
	A-8	4-0	3rd	G, H, I, J, K.
	A-9a	3-0	4th	G.
	A-9b	4-0	4th	K.
	A-9c	5-0	4th	J.
	A-9d	4-1	4th	I.
	A-10	3-2	5th	T.
	A-11	3-2	5th	M, N, O, P.
	A-12	3-0	7th	M.
	A-13	3-0	8th	M.
	A-14	3-0	7th	P.
	A-15	3-1	8th	P.
	A-16	4-0	7th	N.
	A-17	5-0	8th	N.
	A-18	3-0	7th	O.
	A-19	3-0	8th	O.
	A-20	3-0	6th	U.
	A-21	3-0	7th	U.
Mechanics	B-1	2-0	2nd	B, C, D, E.
	B-2	2-0	3rd	B, C, D, E.
	B-3	2-0	4th	B, C, D, E.
	B-4	2-0	1st	G, H, I, J, K.
	B-5	2-0	2nd	G, H, I, J, K.
	B-6	3-0	3rd	G, H, I, J, K.
	B-7	2-2	4th & 8th	I, P.
	B-8	3-0	4th	K M
	B-10	2-0	6th	M, N, O, P.
	B-11	4-0	4th	G, I.
	B-11	4-0	7th	M, P.
	B-12	4-0	8th	M, P, O.
	B-13	3-2	8th	P.
	B-14	4-0	7th	O.
	B-20	3-0	6th	U, UG, UM, UE, UA.
	B-21	3-0	7th	U.
	B-23	3-2	6th	U, UG, UM, UE, UA.
	B-24	3-2	7th	U.
	B-25	3-4	7th	UA.

Department	Course		Term	Group
Chemistry	C-1	2-2	1st	G, H, I, J, K.
	C-2	1-2	3rd	G, H, I, J, K.
	C-3	2-2	4th	KE, H.
	C-4	4-8	4th	KE, H.
	C-5	4-0	4th	KE, KM, H.
	C-6	4-16	5th	S, UE.
	C-7	3-5	5th	UM.
	C-8	6-6	5th	UM, UE, S.
	C-4a	4-4	4th	KM.
Metallurgy	D-1	2-0	2nd	G, H, I, J, K.
	D-2	3-2	3rd	G, H, I, J, K.
	D-3	2-2		
	D-4	2-2	4th	I, KM, G.
	D-5	3-4	5th	UM.
	D-6	0-2	5th	UM.
	D-7	0-2	5th	UM.
	D-8	4-4	6th	U.
	D-9	2-0	4th	B, E, BA.
Physics	E-1	3-4	1st	G, H, I, J, K.
	E-2	0-2a	2nd	G, H, I, J, K.
	E-5	3-2	4th	J.
	E-6	3-4		
	E-7a	3-4	3rd	BA.
	E-9	3-4	3rd	B.
Optics	F-1	2-2	4th	K.
	F-2	2-2	7th	U, UG, UM, UE.
Electricity	G-1	3-4	2nd	G, H, I, J, K.
	G-2	3-4	3rd	G, H, I, J, K.
	G-3	4-2	3rd	J.
	G-4	3-4	4th	G, J, KG, KT.
	G-9	3-4	6th	U.
	G-10	3-4	7th	UG, UM, UE.
	G-1a	2-0	1st	B.
	G-2a	2-4	2nd	B.
	G-3a	2-2	3rd	B, BA.
	G-4a	2-2	4th	B, BA.
	G-1aa	1-2	1st	A, D, E.
	G-2aa	1-2	2nd	A, D, E.
	G-3aa	1-2	3rd	A, D, E.
	G-4aa	1-2	4th	A, D, E.
	G-16	2b-2b	4b	A and [illegible].

Department	Course		Term	Group
Thermodynamics	H-1	3-2b	2nd	G, H, I, K.
	H-2	3-2b	2nd	J.
	H-3	2-2	3rd	G, H, I.
	H-4	2-2	3rd	K.
	H-6	4-4	4th	G.
	H-7	4-2	4th	I, KT.
	H-8	4-4	4th	H.
Engineering	I-1	1-0	1st	A, C, D, E.
	I-2	1-0	2nd	A, C, D, E.
	I-3	1-2	3rd	A, C, D, E.
	I-4	1-2	4th	A, C, D, E.
	I-3a	2-2	3rd	BA.
	I-4a	3-2	4th	BA.
	J-3	3-4	1st	G, H, I, J, K.
	J-4	3-2	2nd	G, H, I, J, K.
	J-5	3-2	4th	KG, KT, KM.
	J-6	2-2	7th	UG, UM, UE, UA.
Damage Control	K-2	1-0	1st&2nd	A, B, C, D.
	K-3	1-0	4th	A, B, C, D, BA.
	K-4	0-2	4th	A, B, C, D, BA.
Communications	L-1	2-2	2nd	A, B, D.
	L-2	1-2	3rd	A, B, C, D, BA.
	L-3	1-0	4th	A, B, D, BA.
	L-4a	3-2	1st	C.
	L-4b	3-2	2nd	C.
	L-4c	3-4	3rd	C.
	L-4d	3-4	4th	C.
	L-5a	0-10	5th	QR, QV.
	L-5b	6-0	6th	QR.
	L-5b	2-0	6th	QV.
	L-5c	3-0	7th	QR.
	L-5c	1-0	7th	QV.
	L-5d	3-0	8th	QR.
	L-5d	1-0	8th	QV.
	L-6a	2-0	6th	QR.
	L-6a	6-0	6th	QV.
	L-6b	3-0	7th	QR.
	L-6b	6-0	7th	QV.
	L-6c	3-0	8th	QR.
	L-6c	6-0	8th	QV.
	L-7	3-0	5th	Q.
	L-8	4-2	6th	Q.

Department	Course	Term	Group
Communications Continued	L-9 3-2	7th	QR
	L-9 1-2	7th	QV
	L-10 3-2	8th	QR
	L-10 1-2	8th	QV
	L-11 2-4	6th	Q
	L-12 3-4	7th	Q
	L-13 2-0	5th	T
	L-14 2-0	7th	Q
	L-15 0-2	7th	Q
	L-15 0-4	8th	Q
	L-16 1-2	5th	T
	L-17a 2-2	5th	Q
	L-17b 2-2	6th	QR
	L-18 3-2	5th	T
	L-19 3-2	5th	Q
	L-20 3-2	8th	Q
	L-21 3-2	5th	T
	L-22 1-0	7th	QR
	L-22 2-0	7th	QV
	L-22 2-0	8th	QV
	L-23 1-2	8th	QR
	L-24 2-0	8th	QV
	L-25 3-4	4th	J KF
Navigation	P-1 2-2	1st	A, E
	P-2 0-2	1st	B, C, D
	P-3 2-0	2nd	A, E
	P-4 1-2	2nd	B, C, D
	P-5 2-2	3rd	A, E
	P-6 0-2	3rd	B, C, D, BA
	P-7 2-2	4th	A, E
	P-8 0-2	4th	B, C, D, BA
Ordnance and Gunnery	Q-1 1-2	1st	A, B, C, E
	Q-2 1-2	2nd	A, B, C, E
	Q-3 1-0	3rd	A, B, C, E, BA
	Q-4 1-0	4th	A, B, C, E, BA
	Q-5 4-4	1st	D
	Q-6 1-2	2nd	D
	Q-7 2-2	3rd	D
	Q-8 2-4	4th	D
	Q-9 1-0	6th	UG
	*Q-12 1-0	3rd	D
	*Q-13 2-0	4th	D

*Elective.

Department	Course		Term	Group
Naval Intelligence	R-1	2-0	2nd	A, B, C, D, E, BA.
	R-2	2-0	3rd	A, B, C, D, E, BA.
	S-1	2-0	1st	A.
	S-2	2-0	2nd	A.
	U-1	2-0	4th	A, B, C, D, E, BA.
	U-2		1,2,3,4	
			5,6,7,8	A, B, C, D, E, Q, BA.
Military Law	W-1	3-0	1st	A, B, C, D, E.
Psychology	X-1	2-0	1st	A.
	X-2	1-0	2nd	A.
Leadership Psychology.	X-3	1-0	3rd	A, B, C, D, E, BA.
Military Character	X-5	1-0	2nd	A, C.
	X-6	1-0	3rd	A.
	X-7	1-0	4th	A.
	X-5	1-0	2nd	A, B, C, D, E.
	Y-5	1-0	4th	A, B, BA, C, D, E.
Organization and Administration	Y-1	1-0	1st	A, B, C, D, E.
	Y-2	1-0	2nd	A, B, C, D, E.
	Y-3	1-0	3rd	A, B, C, D, E, BA.
	Y-4	1-0	4th	A.
Tactics	AA-1	1-2	1st	A, E.
	AA-1	0-2	1st	B, C, D.
	AA-2	1-2	2nd	A, E.
	AA-2	0-2	4th	B, C, D, BA.
	AA-3	1-2	3rd	A, E.
	AA-4	1-0	4th	A, E.
	AA-1,2 3,4	3-2	5th	T.
	AA-5	1-2	5th	Q.
	AA-6	1-2	6th	Q.
	AA-7	1-2	7th	Q.
	AA-8	1-2	8th	Q.
War College Course	AA-10	0-2	5th	QR.
	AA-10	0-2	5th	QV.
	AA-10	0-2	6th	QR.
	AA-10	0-4	6th	QV.
	AA-10	0-4	7th	QR.
	AA-10	0-4	7th	QV.
	AA-10	0-2	8th	QR.
	AA-10	0-2	8th	QV.

SUMMARY OF COURSES BY GROUPS

(8230 - 7/21/32)(

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

SYNOPSIS OF COURSES - 1st TERM.

	Class Hrs.	Lab(Hrs) Per.
SCHOOL OF THE LINE		
Group A - Navigation		
Organization & Administration Y-1 ------	1	0
Psychology - X-1 ----------	2	0
Military Law - W-1 ----------	3	0
Tactics - AA-1 ----------	1	2
Gunnery & Fire Control - Q-1 ----------	1	2
Engineering (Manual) - I-1 ----------	1	0
Electricity - G-1aa ----------	1	2
Economics - S-1 ----------	2	0
Mathematics - A-1 ----------	1	0
Navigation - P-1 ----------	2	2
Naval Intelligence Siminar - U-2 (Int.Rel)	-	-
SCHOOL OF THE LINE		
Group B - Marine Engineering.		
Organization & Administration - Y-1 ------	1	0
Navigation - P-2 ----------	0	2
Military Law - W-1 ----------	3	0
Tactics - AA-1 ----------	0	2
Damage Control - K-2 ----------	1	0
Gunnery & Fire Control - Q-1 ----------	1	2
Electricity - G-1a ----------	2	0
Mathematics - A-1 ----------	1	0
Mathematics - A-2 ----------	4	0
Naval Intelligence Seminar U-2 (Int.Rel).-	-	-

1st Term Cont'd.	Class Hrs.	Lab(Hrs) Per

SCHOOL OF THE LINE
Group C - Radio Engineering.

Organization & Administration - Y-1	1	0
Navigation - P-2	0	2
Military Law - W-1	3	0
Tactics - AA-1	0	2
Damage Control - K-2	1	0
Gunnery & Fire Control - Q-1	1	2
Engineering (Manual)- I-1	1	0
Radio Theory - L-4a	3	2
Mathematics - A-1	4	0
Mathematics - A-2	4	0
Naval Intelligence Seminar - U-2 (Int.Rel)--	-	-

SCHOOL OF THE LINE
Group D - Ordnance & Gunnery

Organization & Administration - Y-1	1	0
Navigation - P-2	0	2
Military Law- W-1	3	0
Tactics - AA-1	0	2
Damage Control - K-2	1	0
Gunnery & Fire Control - Q-5	4	4
Engineering (Manual) - I-1	1	0
Electricity - G-1aa	1	2
Mathematics - A-1	1	0
Mathematics - A-2	4	0
Naval Intelligence Seminar U-2 (Int. Rel.)	-	-

1st Term Cont'd.	Class Hrs.	Lab(Hrs) Per

SCHOOL OF THE LINE
Group E - Aeronautical Engineering

Organization & Administration - Y-1 ----------	1	-	0
Navigation - P-1 ----------	2	-	2
Military Law - W-1 ----------	3	-	0
Tactics - AA-1 ----------	1	-	2
Gunnery & Fire Control - Q-1 ----------	1	-	2
Engineering (Manual) - I-1 ----------	1	-	0
Electricity - G-1aa ----------	1	-	2
Mathematics - A-1 ----------	1	-	0
Mathematics - A-2 ----------	4	-	0
Naval Intelligence Seminar - U-2 (Int. Rel.)--	-	-	-

TECHNICAL GROUPS

10 weeks

Group G - Engineers, Tech. 1st yr.
" H - " , " Gas, 1st Yr.
" I - " , " Aero, " "
" J - " , " Radio," " -10
" K - " , " Ord. " "

Mathematics - A-6 ----------	5	-	0
Mechanics - B-4 ----------	2	-	0
Physics - E-1 ----------	3	-	4
Engrg. Measurements-Hydraulics - J-3 ----------	3	-	4
Chemistry - C-1 ----------	2	-	2

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SYNOPSIS OF COURSES - 2nd TERM.

	Class Hrs.	Lab(Hrs) Per.
SCHOOL OF THE LINE		
Group A - Navigation		
Organization & Administration - Y-2	1	0
Military Character - X-5	1	0
Psychology - X-2	1	0
Navigation - P-3	2	0
Tactics - AA-2	1	2
Damage Control - K-2	1	0
Gunnery & Fire Control - Q-2	1	2
Engineering (Manual) - I-2	1	0
Electricity - G-2aa	1	2
Communication Security - L-1	1	2
Economic For. Policy of U.S. - S-2 (Economics) -	2	0
American Diplomatic Policy - R-1 (Policy)	2	0
Naval Intelligence Seminar - U-2 (Int. Rel.) -	-	-

2nd Term Cont'd.	Class Hrs.	Lab(Hrs) Per.

SCHOOL OF THE LINE
Group B - Marine Engineering.

Organization & Administration - Y-2	1	-	0
Military Character - X-5	1	-	0
Navigation - P-4	1	-	2
Gunnery & Fire Control - Q-2	1	-	2
Electricity - G-2a	2	-	4
Communication Security - L-1	1	-	2
American Diplomatic Policy - R-1 (Policy)	2	-	0
Mathematics - A-3	3	-	0
Mechanics - B-1	2	-	0
Naval Intelligence Seminar - U-2(Int. Rel.)	-	-	-

SCHOOL OF THE LINE
Group C - Radio Engineering.

Organization & Administration - Y-2	1	-	0
Military Character - X-5	1	-	0
Navigation - P-4	1	-	2
Gunnery & Fire Control - Q-2	1	-	2
Engineering (Manual) - I-2	1	-	0
Radio Theory - L-4b	3	-	2
American Diplomatic Policy - R-1 (Policy)	2	-	0
Mathematics - A-3	3	-	0
Mechanics - B-1	2	-	0
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-	-

2nd Term - Cont'd.	Class Hrs.	Lab(Hrs) Per.

SCHOOL OF THE LINE
Group D - Ordnance & Gunnery

Organization & Administration - Y-2 ---------	1	-	0
Military Character - X-5 ----------	1	-	0
Navigation - P-4 ----------	1	-	2
Gunnery & Fire Control - Q-6 ----------	1	-	2 *
Engineering (Manual) - I-2 ----------	1	-	0
Electricity - G-2aa ----------	1	-	2
Communication Security - L-1 ----------	1	-	2
American Diplomatic Policy - R-1 (Policy) ---	2	-	0
Mathematics - A-3 ----------	3	-	0
Mechanics - B-1 ----------	2	-	0
Naval Intelligence Seminar- U-2 (Int.Rel.) --	-	-	-

SCHOOL OF THE LINE
Group E - Aeronautical Engineering

Organization & Administration - Y-2 ---------	1	-	0
Military Character - X-5 ----------	1	-	0
Navigation - P-3 ----------	2	-	0
Tactics - AA-2 ----------	1	-	2
Gunnery & Fire Control - Q-2 ----------	1	-	2
Engineering (Manual) - I-2 ----------	1	-	0
Electricity - G-2aa ----------	1	-	2
American Diplomatic Policy - R-1 (Policy) ---	2	-	0
Mathematics - A-3 ----------	3	-	0
Mechanics - B-1 ----------	2	-	0
Naval Intelligence Seminar - U-2(Int.Rel.)---	-	-	-

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2nd Term - Cont'd.

	Class Hrs.	Lab(Hrs) Per.
TECHNICAL GROUPS.		
Group G - Engineers (Tech) 1st yr.		
" H - " " Gas. 1st yr.		
" I - " " Aero. " "		
" K - " " Ord. " "		
Mathematics - A-7	3	2
Mechanics - B-5	2	0
Physics - E-2	0	2a
Thermodynamics - H-1	3	2b
Electricity - G-1	3	4
Engineering Materials - J-4	3	2
Metallurgy - D-1	2	0
Lecture	1	0
RADIO ENGINEERS		
Group "J" Engrg. Tech. Radio 1st Yr.		
Mathematics - A-7	3	2
Mechanics - B-5	2	0
Physics - E-2	0	2a
Thermodynamics - H-2	3	2b
Electricity - G-1	3	4
Engineering Materials - J-4	3	2
Metallurgy - D-1	2	0
Lecture	1	0

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SYNOPSIS OF COURSES - 3rd TERM.

	Class Hrs.	Lab(Hrs) Per.
SCHOOL OF THE LINE **Group A - Navigation**		
Organization & Administration - Y-3 --------	1	- 0
Military Character - X-6 ----------	1	- 0
Leadership Psychology - X-3 ----------	1	- 0
Navigation - P-5 ----------	2	- 2
Tactics - AA-3 ----------	1	- 2
Gunnery & Fire Control - Q-3 ----------	1	- 0
Engineering (Manual) - I-3 ----------	1	- 2
Electricity - G-3àa ----------	1	- 2
Communication Instructions & Procedure-L-2 -	1	- 2
Policy American Dip.Int.Rel. - R-2 ----------	2	- 0
Naval Intelligence Seminar - U-2 (Int.Rel.)-	-	- -
SCHOOL OF THE LINE **Group B - Marine Engineering.**		
Organization & Administration - Y-3 --------	1	- 0
Leadership Psychology - X-3 ----------	1	- 0
Navigation - P-6 ----------	0	- 2
Gunnery & Fire Control - Q-3 ----------	1	- 0
Physics - E-9 ----------	3	- 4
Electricity - G-3a ----------	2	- 2
Communication Instructions & Procedure-L-2 -	1	- 2
Policy American Dip.Int.Rel. - R-2 --------	2	- 0
Mathematics - A-4 ----------	3	- 0
Mechanics - B-2 ----------	2	- 0
Naval Intelligence - Seminar -U-2 (Int.Rel.)	-	- -

3rd Term - Cont'd.

	Class Hrs.	Lab(Hrs) Per.
SCHOOL OF THE LINE		
Group Ba - Marine Engrg. (Practical		
Organization and Administration - Y-3 --------	1	0
Leadership Psychology - X-3 ----------	1	0
Navigation - P-6 ----------	0	2
Gunnery and Fire Control---Q-3 ----------	1	0
Physics - E-7a ----------	3	4
Electricity - G-3a ----------	2	2
Comm. Instructions & Procedure - L-2 ---------	1	2
Policy American Dip.Int.Rel. - R-2 ----------	2	0
Engrg. Manual - I-3a ----------	2	2
Naval Intelligence Seminar U-2 (Int.Rel.) ----	-	-

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3rd Term - Cont'd.

	Class Hrs.		Lab(Hrs) Per.
SCHOOL OF THE LINE.			
Group C - Radio Engineering.			
Organization & Administration- Y-3 ----------	1	-	0
Leadership Psychology - X-3 ----------	1	-	0
Navigation - P-6 ----------	0	-	2
Gunnery & Fire Control - Q-3 ----------	1	-	0
Engineering (Manual) - I-3 ----------	1	-	2
Communication Instructions & Procedure - L-2-	1	-	2
Radio Theory - L-4c ----------	3	-	4
Policy American Dip.Int. Rel. - R-2 ----------	2	-	0
Mathematics - A-4 ----------	3	-	0
Mechanics - B-2 ----------	2	-	0
Naval Intelligence Seminar - U-2 (Int.Rel.)--	-	-	-
SCHOOL OF THE LINE.			
Group D - Ordnance & Gunnery			
Organization & Administration - Y-3 ----------	1	-	0
Leadership Psychology - X-3 ----------	1	-	0
Navigation - P-6 ----------	0	--	2
Gunnery & Fire Control - Q-7 ----------	2	-	2
Engineering (Manual) - I-3 ----------	1	-	2
Electricity - G-3aa ----------	1	-	2
Communication Instructions & Procedure - L-2-	1	-	2
Policy American Dip.Int. Rel. - R-2 ----------	2	-	0
Mathematics - A-4 ----------	3	-	0
Mechanics - B-2 ----------	2	-	0
Naval Intelligence Seminar - U-2 (Int.Rel.) -	-	-	-
Gunnery Seminar - Q-12 ----------	1	-	0*

*Elective

3rd Term - Cont'd.	Class Hrs.	Lab(Hrs) Per.

SCHOOL OF THE LINE
Group E - Aeronautical Engineering

Organization & Administration - Y-3	1	-	0
Leadership Psychology - X-3	1	-	0
Navigation - P-5	2	-	2
Tactics - AA-3	1	-	2
Gunnery & Fire Control - Q-3	1	-	0
Engineering Manual - I-3	1	-	2
Electricity - G-3aa	1	-	2
Policy, American Dip. Int. Rel. - R-2	2	-	0
Mathematics - A-4	3	-	0
Mechanics - B-2	2	-	0
Naval Intelligence Seminar U-2 (Int.Rel.)	-	-	-

TECHNICAL GROUPS.
Group "G" - Engineers Tech. 1st yr.
" "H" - " " Gas" "

Mathematics - A-8	4	-	0
Mechanics - B-6	3	-	0
Electricity - G-2	3	-	4
Thermodynamics - H-3	2	-	2
Metallography - D-2	3	-	2
Chemistry - C-2	1	-	2
Lecture	1	-	0

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3rd Term - Contd.	Class Hrs.	Lab(Hrs) Per.
TECHNICAL GROUPS		
Group "K" - Eng.Tech. Grd. 1st yr.		
Mathematics - A-8	4	- 0
Mechanics - B-6	3	- 0
Electricity - G-2	3	- 4
Thermodynamics - H-4	2	- 2
Metallography - D-2	3	- 2
Chemistry - C-2	1	- 2
Lecture	1	- 0

Dropped H-4 and takes G-3

TECHNICAL GROUPS Group "J" - Engrg.Tech. Radio 1st yr.		
Mathematics - A-8	4	- 0
Mechanics - B-6	3	- 0
Electricity - G-2	3	- 4
Electricity - G-3	4	- 2
Metallography - D-2	3	- 2
Lecture	1	- 0

TECHNICAL GROUPS Group "I" - Engrg. Tech. Aero. 1st yr.		
Mathematics - A-8	4	- 0
Mechanics - B-6	3	- 0
Electricity - G-2	3	- 4
Thermodynamics - H-3	2	- 2
Metallography - D-2	3	- 2
Chemistry - C-2	1	- 2
Lecture	1	- 0

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SYNOPSIS OF COURSES - 4th TERM

	Class Hrs.	Lab(Hrs) Per
SCHOOL OF THE LINE		
Group A - Navigation.		
Organization & Administration - Y-4	1	0
Military Character - X-7	1	0
Leadership Psychology - ~~X-4~~ Y-5 (Business)	1	0
Navigation - P-7	2	2
Gyro Compass - G-16	2b	2h
Tactics - AA-4	1	0
Damage Control - K-3&4	1	2
Gunnery & Fire Control - Q-4	1	0
Engineering (Manual) - I-4	1	2
Electricity - G-4aa	1	2
Radio - L-3	1	0
International Relations - U-1	2	0
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-

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4th Term - Cont'd.

	Class Hrs.		Lab (Hrs) Per
SCHOOL OF THE LINE			
Group 3a - Marine Engrg. (Practical)			
~~Leadership Psychology~~ Business - Y-5	1	-	0
Navigation - P-8	0	-	2
Tactics - AA-2	0	-	2
Damage Control - K-3&4	1	-	2
Gunnery and Fire Control - G-4	1	-	0
Science of Metals - D-9	2	-	0
Electricity - G-4a	2	-	2
Radio - L-3	1	-	0
International Relations - U-1	2	-	0
Engrg. Manual - I-4a	3	-	2
Naval Intelligence Seminar - U-2 Int. Rel.	-	-	-

4th Term - Cont'd.	Class Hrs.	Lab(hrs) Per.
SCHOOL OF THE LINE		
Group B - Marine Engineering.		
Leadership Psychology - ~~X-4~~ Business 4-5	1	0
Navigation - P-3	0	2
Tactics - AA-2	0	2
Damage Control - K-3&4	1	2
Gunnery & Fire Control - Q-4	1	0
Science of Metals - D-9	2	0
Electricity - G-4a	2	2
Radio - L-3	1	0
International Relations - U-1	2	0
Mathematics - A-5	3	0
Mechanics - B-3	2	0
Naval Intelligence Seminar - U-2 (Int. Rel.)	-	-
SCHOOL OF THE LINE		
Group C - Radio Engineering		
Leadership Psychology - ~~X-4~~ Business 4-5	1	0
Navigation - P-8	0	2
Tactics - AA-2	0	2
Damage Control - K-3&4	1	2
Gunnery & Fire Control - Q-4	1	0
Engineering (Manual) - I-4	1	2
Radio Theory - L-4d	3	4
International Relations - U-1	2	0
Mathematics - A-5	3	0
Mechanics - B-3	2	0
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-

4th Term - Cont'd.

	Class Hrs.	Lab(Hrs) Per.
SCHOOL OF THE LINE		
Group D - Ordnance & Gunnery		
Leadership Psychology (Business) - ~~A-4~~ J-5	1	0
Navigation - P-8	0	2
Tactics - AA-2	0	2
Damage Control - M-3&4	1	2
Gunnery & Fire Control - Q-8	2	4
Engineering Manual - I-4	1	2
Electricity - G-4aa	1	2
Radio - L-3	1	0
International Relations - U-1	2	0
Mathematics - A-5	3	0
Mechanics - B-3	2	0
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-
Gunnery Seminar - Q-13	2	0*
SCHOOL OF THE LINE		
Group E - Aeronautical Engineering		
Leadership Psychology (Business) - ~~A-4~~ J-5	1	0
Navigation - P-7	2	2
Gyro Compass - G-16	2b	2b
Tactics - AA-2	1	0
Gunnery & Fire Control - Q-4	1	0
Engineering (Manual) - I-4	1	2
Science of Metals - D-9	2	0
Electricity - G-4aa	1	2
International Relations - U-1	2	0
Mathematics - A-5	3	0
Mechanics - B-3	2	0
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-

*Elective.

4th Term - Cont'd.

	Class Hrs.	Lab(Hrs) Per.
TECHNICAL GROUPS.		
Group "G" - Engrg.Tech, 1st Yr.		
Mathematics - A-9a	3	0
Mechanics - B-11	4	0
Electricity - G-4	3	4
Thermodynamics - H-6	4	4
Metallurgy - D-4	2	2
TECHNICAL GROUPS.		
Group "I" - Engrg. Tech, Aero, 1st yr.		
Mathematics - A-9d	4	1
Mechanics - B-11	4	0
Airplane Stresses - B-7	2	2
Thermodynamics - H-7	4	4
Metallurgy - D-4	2	2
TECHNICAL GROUPS.		
Group "KG" - Engrg.Tech,Ord.(Gen) 1st yr		
Mathematics - A-9b	4	0
Mechanics - B-8	3	0
Electricity - G-4	3	4
Optics - F-1	2	2
Kinematics - J-5	3	2
Damage Control - K-4	0	2

L-25
Sub for J-5

4th Term - Cont'd.

	Class Hrs.		Lab(Hrs) Per.
TECHNICAL GROUP			
Group "KE" Engrg.Tech.Ord.(Expl). 1st yr.			
Mathematics - A-9b	4	-	0
Mechanics - B-8	3	-	0
Physical Chemistry - C-5	4	-	0
Inorganic Chemical Technology - C-3	2	-	2
Qualitative Chemistry - C-4	4	-	8
TECHNICAL GROUP			
Group "KT"Engrg. Tech.Ord.(Torp.) 1st yr.			
Mathematics - A-9b	4	-	0
Mechanics - B-8	3	-	0
Electricity - G-4	3	-	4
Thermodynamics - H-7	4	-	4
Kinematics - J-5	3	-	2
TECHNICAL GROUP			
Group "KM" Engrg. Tech.Ord.(Met.)1st yr.			
Mathematics - A-9b	4	-	0
Mechanics - B-8	3	-	0
Physical Chemistry - C-5	4	-	0
Kinematics - J-5	3	-	2
Metallurgy - D-4	2	-	2
Qualitative Chemistry - C-4a	4	-	4

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4th Term - Cont'd.	Class Hrs.	Lab (Hrs) Per.

TECHNICAL GROUP.
Group "H" Engrg. Tech. Cas 1st yr.

Mathematics - A-9a	3	-	0
Physical Chemistry - C-5	4	-	0
Thermodynamics - H-8	4	-	4
Inorganic Chemical Technology - C-3	2	-	2
Qualitative Chemistry - C-4	4	-	8

Is this Group combined with "G"?

TECHNICAL GROUP
Group "J" Engrg. Tech. Radio

Mathematics - A-9c ✓	5	-	0 ✓
Electricity - G-4 ✓	3	-	4 ✓
Radio Engineering - L-25 ✓	3	-	4 ✓
Sound - E-5 ✓	3	-	2 ✓

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SYNOPSIS OF COURSES - 5th TERM

Last 4 Summer 33

	Class Hrs.	Lab(Hrs) Per
TECHNICAL GROUP		
Group "UM" Engrg.Tech.Ord.(Met).2nd yr -D3M		
Chemistry - C-8	6	- 6
Chemistry - C-7	3	- 5
Metallography - D-5	3	- 4
Metallurgy - D-6	0	- 2
Metallurgy - D-7	0	- 2
TECHNICAL GROUPS		
Group "S" Engrg.Tech. Gas 2nd yr. Last Summer → D3P		
" "UE" " " Ord.(Expl) 2nd Yr.		
Chemistry - C-8	6	- 6
Chemistry - C-6	4	- 16
TECHNICAL GROUPS.		
Group "T" Engrg.Tech. Radio, 2nd Yr.		
Radio Engineering - L-21	3	- 2
Radio Operating - L-18	3	- 2
Communication Instructions - L-13	2	- 0
Communication Security - L-16	1	- 2
Tactics - ~~AA~~ A-1-2-3-4	3	- 2
Mathematics - ~~A-10~~ A-40	3	- 2

T, UM, UE, UG and UA disappear in term 1933-34

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5th Term - Cont'd.	Class Hrs.	Lab(Hrs) Per.
COMMUNICATIONS		
Group "QR" Comm. Radio		
" "QV" Comm. Visual.		
Radio Engineering - L-7	3	- 0
Typewriting - L-19	3	- 2
Radio Operating - L-5a	0	- 10
Communication Security - L-17a	2	- 2
Tactics - AA-5	1	- 2
War College Correspondence Courses - AA-10	0	- 2
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	- -

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SYNOPSIS OF COURSES - 6th TERM

	Class Hrs.	Lab(Hrs) Per.
COMMUNICATIONS		
Group QR - Comm.- Radio 2nd yr.		
Radio Operating - L-5b	6	- 0
Visual Operating - L-6a	2	- 0
Radio Engineering - L-8	4	- 2
Comm. Instructions - L-11	2	- 4
Cryptanalysis - L-17b	2	- 2
Tactics - AA-6	1	- 2
War College Correspondence Courses - AA-10 -	0	- 2
Naval Intelligence Seminar - U-2 (Int.Rel.)-	-	- -
Group QV - Comm.- Visual 2nd yr.		
Radio Operating - L-5b	2	- 0
Visual Operating -L-6a	6	- 0
Radio Engineering- L-8	4	- 2
Communication Instructions - L-11	2	- 4
Tactics - AA-6	1	- 2
War College Correspondence Courses- AA-10---	0	- 4
Naval Intelligence Seminar - U-2 (Int.Rel.)-	-	- -

6th Term - Cont'd.	Class Hrs.	Lab(Hrs) Per.
TECHNICAL GROUP.		
Group "UG" Engrg.Tech.Ord.(Gen)2nd yr.		
Mathematics - ~~A-20~~ 41	3	- 0
Mechanics - ~~B-20~~ 41	3	- 0
Electricity - ~~B-20~~ G-13	3	- 4
Structures and Materials - ~~B-23~~ 43	3	- 2
Metallography - D-8	4	- 4
Gunnery & Fire Control - Q-9	1	- 0

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SYNOPSIS OF COURSES - 7th TERM.

	Class Hrs.	Lab(Hrs) Per.
TECHNICAL GROUPS.		
Group "UG" Engrg. Tech.Ord.(Gen) 2nd Yr.		
Mathematics - A-~~21~~ 42	3	- 0
Mechanics - B-~~21~~ 42	3	- 0
Electricity - G-~~10~~ 14	3	- 4
Machine Design - J-~~4~~	2	- 2
Structures and Materials - B-~~24~~ 44	3	- 2
Optics - F-2	2	- 2
Group "UA" Engrg.Tech.Ord.(Aero) 2nd yr.		
Mathematics - A-~~21~~ 42	3	- 0
Mechanics - B-~~21~~ 42	3	- 0
Aerodynamics- B-~~25~~ 45	3	- 4
Machine Design - J-~~4~~	2	- 2
Structures & Materials - B-~~24~~ 44	3	- 2
Optics - F-2	2	- 2

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7th Term - Cont'd.

	Class Hrs.	Lab(Hrs) Per.
Group QR- Communications-Radio		
Radio Operating - L-5c	3	0
Visual Operating - L-6b	3	0
Radio Engineering- L-9	3	2
Communication Instructions - L-12	3	4
Communication Organizations- L-14	2	0
Operating Procedure - L-15	0	2
Naval Etiquette - L-22	1	0
Tactics - AA-7	1	2
War College Correspondence Course - AA-10	0	4
Naval Intelligence Seminar -U-2 (Int.Rel.)	-	-
Group QV - Communications- Visual		
Radio Operating - L-5c	1	0
Visual Operating - L-6b	6	0
Radio Engineering- L-9	1	2
Communication Instructions - L-12	3	4
Communication Organizations- L-14	2	0
Operating Procedure - L-15	0	2
Naval Etiquette - L-22	2	0
Tactics - AA-7	1	2
War College Correspondence Course - AA-10	0	4
Naval Intelligence Seminar - U-2 (Int.Rel.)	-	-

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SYNOPSIS OF COURSES - 8th TERM. 10

	Class Hrs.	Lab(Hrs) Per.
Group QR - Communications - Radio		
Radio Operating - L-5d	3	- 0
Visual Operating- L-6c	3	- 0
Radio Engineering - L-10	3	- 2
Operating Procedure - L-15	0	- 4
Communication Development - L-20	3	- 2
Direction Finding - L-23	1	- 2
Tactics - AA-8	1	- 2
War College Correspondence Course- AA-10	0	- 2
Naval Intelligence Seminar - U-2-(Int.Rel.)-	-	- -
Group QV - Communications - Visual		
Radio Operating - L-5d	1	- 0
Visual Operating - L-6c	6	- 0
Radio Engineering- L-10	1	- 2
Operating Procedure - L-15	0	- 4
Communication Development - L-20	3	- 2
Naval Etiquette - L-22	2	- 0
Navy Filing System - L-24	2	- 0
Tactics - AA-8	1	- 2
War College Correspondence Course - AA-10	0	- 2
Naval Intelligence Seminar- U-2 (Int.Rel.) -	-	- -

SYNOPSES OF COURSES.

(8230 - 6/13/32)

A-1

Term - Summer (1)

Name of Course - MATHEMATICS.

Hours per week Rec. - 1 P.W.- Lectures-

Texts:- Bullard & Kiernan: Plane and Spherical Trigonometry.

Outline of course:-

The course consists of a review of Plane and Spherical Trigonometry up to and including the solution of oblique plane and spherical triangles. Chapters I to VIII inclusive and XI to XIV inclusive, of the text, are studied.

The purpose of the course is to prepare the student for trigonometric calculation and manipulation found in other courses, particularly in Navigation.

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A-2

Term - Summer.(1)

Name of Course - MATHEMATICS.

Hours per week Rec. - 4 P.W. - Lectures -

Texts:- Mathematics of Engineering, Root.

Outline of course:-

A study of cuntions of one variable with reference to notations, classification, graphs and other modes of representation, with attention to units and scales. Limits and continuity of functions. Derivatives of functions. The meaning of the integral of a function. Solution of equations, algebraic equations, determinants and elimination, trigonometric equations, logarithmic transformations, approximate numerical solutions. Chapters I-V.

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Term - Fall (2)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W.- Lectures -

Texts:- Mathematics of Engineering, Root.

Outline of course:-

The process of integration, standard devices, uses of tables of integrals, limitations of the integration process. Review of the essentials of analytic geometry, the straight line, transformation of coordinates, the conic sections, the general equation of the second degree, families of curves and lines. Applications of derivatives, tangents and normals, maxima and minima, curvature. Chapterx VI-VIII.

(8230 - 6/13/32)

A-4

Term - Winter (3)

Name of Course - MATHEMATICS.

Hours per week. Rec. - 3 P.W. - Lectures -

Texts:- Mathematics of Engineering, Root.

Outline of course:-

Applications of integration, length of arc, plane areas, volumes, moments, mean values, distributed quantities, successive integration, double integrals, approximate numerical integration. Indeterminate forms, Taylor's theorem, convergence of series, expansion in series, operations on series. Complex quantities, simple harmonic functions, Fourier series and harmonic analysis. Chapters IX-XI.

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Term - Spring (4)

Name of course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - Lectures -

Texts:- Mathematics of Engineering, Root.

Outline of course:-

Functions of two or more variables, analytic geometry of three dimensions, multiple integrals, line integrals. Properties of plane curves. Probability and the method of least squares applied to adjustment of observations and precision of results for one or several unknowns. Propagation of error and rules of calculation to conserve precision. Empirical equations. Chapters XII, XIII.

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A-6

Term - Summer (1)

Name of Course - MATHEMATICS.

Hours per week Rec. -5 P.W. - Lectures -

Texts:- Mathematics of Engineering - Root.

Outline of course:-

A study of functions of one variable with reference to notations, classifications, graphs, and other modes of representation. Limits and continuity of functions. Derivatives and integrals of functions. Solutions of equations, algebraic equations, determinants and eliminations, trigonometric equations, logarithmic transformations, approximate solutions. The process of integration, methods and limitations. Use of tables of integrals; based on Chapters I - VI of text.

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Term - Fall (2)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - 2 Lectures -

Texts: Mathematics of Engineering - Root
Graphical & Mechanical Computation - Lipka.

Outline of course:-

Review of analytical geometry, the straight line, transformation of coordinates, the conic sections, families of curves and lines. Applications of derivatives, tangents and normals, maxima and minima, curvature. Applications of integration; lengths, areas, volumes, moments, distributed quantities; successive integration, approximate integration. Indeterminate forms, Taylor's theorem, convergence of series, operations on series. Complex quantities, harmonic functions, Fourier series. Based on Chapters VII- XI of text.

About nine laboratory periods are given to the construction of various scales, systems of curves for equations in three variables, to the use of logarithmic and semilogarithmic paper, and to the construction of various types of alignment charts for equations in three or more variables. Two periods are given to exercises in the use of mathematical instruments, including planimeter, integrator, integraph and ellipsograph.

(8230 - 6/13/32)

A-8

Term - Winter (3)

Name of Course - MATHEMATICS

Hours per week Rec. - 4 P.W. - Lectures

Texts: Mathematics of Engineering, Root.

Outline of course:-

Functions of two or more variables; geometry in three dimensions, partial and total derivatives, with applications. Multiple integrals, line integrals. Probability and precision. Empirical equations. Ordinary differential equations; first order and degree, first order and high degree, linear equations of higher order, solution of various types by reduction of order. Systems of differential equations. Based on chapters XII - XVI of text.

(8230 - 6/14/32)

A-9(a)

Term - Spring (4)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - Lectures -

Texts: Mathematics of Engineering - Root.

Outline of course:-

A continuation of the mathematics of the third term, with additional work on integral in several variables, on treatment of empirical data and on solution of differential equations of higher order and systems of differential equations with applications in electricity and mechanics. Approximate solution of differential equations by numerical integration. Introduction to partial differential equations.

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A-9(b)

Term - Spring (4)

Name of course - MATHEMATICS.

Hours per week Rec. - 4 P.W. - Lectures -

Text: Mathematics for Engineers, Root.
Differential Equations, Cohen.

Outline of course:-

Continuation of the mathematics of the third term with additional emphasis on multiple integrals, on probability with applications to dispersion, and on systems of ordinary differential equations. Introduction to Partial differential equations. Approximate solution of differential equations by series and by numerical integration.

(8230 - 6/14/32)

A-9(c)

Term - Spring (4)

Name of Course - MATHEMATICS

Hours per week Rec. - 5 P.W. - Lectures -

Texts:- Hyperbolic Functions, MacMahon
Differential Equations, Cohen
Electric Oscillations and Electric Waves, Pierce
Vector Analysis, Coffin.

Outline of course:-

First Half Term:-

A study of hyperbolic functions, using as a text, "Hyperbolic Functions" by MacMahon. This is followed by differential equations, with emphasis on linear differential equations and systems of simultaneous linear differential equations, with applications to electricity and mechanics. Cohen's "Differential Equations" and Pierce's "Electric Oscillations and Electric Waves" are used.

Second Half Term:-

A brief course in vector analysis, covering vector sum, difference, scalar product, vector product, product of several vectors. Derivative of vector; line, surface and volume integrals. The Hamiltonian Operator, Gauss' Theorem. Curl of a vector and theorems dealing with curl. Applications throughout to problems in Mechanics and Electricity based on Coffin's "Vector Analysis".

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A-9(d)

Term - Spring (4)

Name of Course - MATHEMATICS.

Hours per week Rec. - 4 P.W. - 1 Lectures. -

Text: Root - The Mathematics of Engineering
Glauert - Aerofoil and Airscrew Theory.

Reference: Cohen - Differential Equations.
Fiske - Theory of Functions of a Complex Variable.

Outline of course:

This course consists of the following:

1. A continuation of the mathematics of the third term with special emphasis on the differential equations applicable to the problems of aerodynamics.

2. Special topics such as: conformal transformations, mapping, potential and stream functions, vortices, line integrals, area integrals, Green's Theorem, Fourier Series.

3. Applications of the above to the problems of air flow in two and three dimensions, determination of the air forces on monoplane, biplanes and propellers.

(8230 - 6/20/32)

A-10

Term - Summer (5)

Name of course - MATHEMATICS.

Hours per week. Rec. - 3 P.W. - 2 Lectures -

Texts:- Differential equations - Cohen
Vector Analysis - Coffin
Elec. Oscillations and Elec. Waves - Pierce
Hyperbolic Functions - McMahon.

Outline of course:-

This course continues the work previously done in differential equations and vector analysis. Further subjects important to the communication engineers are studied. These include hyperbolic functions, partial differential equations, and applications to electric circuits. The afternoon work gives opportunity for drill in problems both in the work of the regular course and in any review that may appear to be desirable as the progress of the students is observed.

(8230 - 6/20/32)

Term - Fall (6)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - 2 Lectures -

Texts: Mathematics of Engineering - Root
Differential Equations - Cohen
Graphical & Mechanical Computation - Lipka.

Outline of Course:-

Ordinary differential equations, including: Deriving differential equations from primitives, solution of equations of first order and first degree and first order and higher degree, singular solutions. Equations of higher order, homogeneous linear and non-homogeneous linear equations with constant coefficients, types solved by devices which reduce the order. Systems of simultaneous differential equations, total differential equations.

Problems are used throughout the course, with emphasis on determination of constants by initial conditions.

About nine laboratory periods are given to the construction of various scales, systems of curves for equations in three variables, to the use of logarithmic and semilogarithmic paper, and to the construction of various types of alignment charts for equations in three or more variables. Two periods are given to exercises in the use of mathematical instruments, including planimeter, integrator, integraph and ellipsograph.

(8230 - 6/15/32)

A-12

Term - Winter (7)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W.- Lectures -

Texts: Mathematics of Engineering - Root
Differential Equations - Cohen
Differential Equations - Fry.

Outline of course:-

A study of partial differential equations, a treatment of the method of numerical integration of differential equations and the expression of solutions in series. Practice in setting up differential equations from the statement of problems arising in engineering, in the use of initial and boundary conditions to satisfy stated conditions, in the interpretation of results in concrete engineering facts.

(8230 - 6/15/32)

A-13

Term - Spring (8)

Name of Course - MATHEMATICS

Hours per week Rec. - 3 P.W. - Lectures -

Text: Vector Analysis, - Coffin
Analytical Mechanics - Barton.

Outline of course:-

Elementary operations of vector analyses, vector and scalar products of two and of three vectors, differentiation of vectors. Applications of vectors to electrical theory and to dynamics. A study of three dimensional motion, with particular applications, including the gyroscope.

(8230 - 6/15/32)

Term - Winter (7)

Name of Course - MATHEMATICS

Hours per week Rec. - 3 P.W. - Lectures -

Text: The Mathematics of Engineering - Root

Reference: Advanced Calculus - Osgood
Aeronautics - Wilson
Treatise on Hydromechanics - Dessnt and Ramsay

Outline of Course:-

The course continues the mathematics of the preceding term, with particular reference to the needs of students in aeronautics.

Among the topics discussed are:

Rigid Dynamics: The two dimensional problem of the motion of an airplane.

Fluid Dynamics: The differential equations of fluid motion.
Line and surface integrals
Theorem of Gauss-Green and Stokes'
vector operations
Point transformations
Conformal transformations and the two dimensional flow problem (Kirchoff)

(8230 - 5/15/32)

A-15

Term - Spring (8)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - 1 Lectures.

Text: Aerofoil and Airscrew Theory - Glauert.

References: Treatise on Hydromechanics - Besant & Ramsay
Hydro and Aerodynamik - Prandtl-Tietzens.

Outline of Course:-

This course discusses the methods of theoretically predicting the behavior of bodies subjected to the action of a fluid (including air). The material of course A-14 as it relates to fluid dynamics, is extended to cover such topics as:

The Joukowski Theory of Lift
Vortex motion (Helmholz)
Three dimensional flow problem
Induced resistance
Boundary layer theory (Prandtl)

The laboratory period is used for the solution of problems.

(8230 - 6/15/32)

Term - Winter (7)

Name of course - MATHEMATICS.

Hours per week Rec. - 4 P.W. - Lectures -

Texts: Mathematics of Engineering - Root
Differential Equations - Cohen
Electric Oscillations & Electric Waves - Pierce
Hyperbolic Functions - McMahon

Outline of course:-

The elements of the theory of probability are first studied. This leads to the discussion of errors of observations, the estimation of precision, and the method of least squares. The application of diffierential equations to electric circuits with emphasis on the determination of the constants of integration continues the term's work. If time permits additional work is given on complex numbers.

(8230 - 6/15/32)

Term - Spring (8)

Name of Course - MATHEMATICS

Hours per week Rec. - 5 P.W. - 0 Lectures -

Texts: Mathematics of Engineering - Root
Differential Equations - Cohen
Elec. Oscillations & Electric Waves - Pierce.
Vector Analysis, Coffin.

Outline of course:-

This course is a continuation of A-16 and takes up the application of differential equations to coupled electric circuits. Certain types of partial differential equations are treated and their use in electric theory indicated. The work in vector analysis develops such topics as are necessary to render the mathematics of electric theory intelligible.

(8230 - 6/15/32)

A-18

Term - Winter (7)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W. - Lectures

Texts: Mathematics of Engineering - Root
Practical Least Squares, Leland.
Mathematical Analysis of Statistics, Forsyth.

Outline of course:-

This course proposes a thorough discussion of elementary probability and considerable drill in its application especially to problems in ordnance. Laws of distribution of errors, precision of observations, method of least squares and the fitting of empirical curves are then treated. Among the topics studied in statistics are - statistical averages, interpolation and extrapolation with statistical series, laws of frequency distribution reliability as influenced by the size of sample, and correlation.

(8230 - 6/15/32)

Term - Spring (8)

Name of Course - MATHEMATICS

Hours per week Rec. - 3 P.W. - Lectures -

Texts: Naval Ordnance
Course in Exterior Ballistics (War Dept.)
Practical Exterior Ballistics
Exterior Ballistics, Moulton.

Outline of Course:-

The subject of exterior ballistics is presented with the view of acquainting the student with the methods of trajectory computation now in use in the Bureau of Ordnance and in the War Department. The trajectory is developed first under standard conditions and then methods of correcting for non-standard cases are introduced.

The work in interior ballistics presents the derivation and applications of the Le Duc formulas.

(8230 - 6/14/32)

A-20

Term - Summer (5)

Name of Course - MATHEMATICS

Hours per week Rec. - 3 P.W. 0 Lectures.

Texts: Differential Equations, Cohen
Hyperbolic Functions, McMahon.

Outline of course:-

This course continues with the work in differential equations started in Term 4, with its application to mechanics and electricity. Emphasis is placed on developing the student along the line of mathematical performance, and to this end the solution of numerous problems of an Ordnance nature are covered.

Hyperbolic functions are introduced, and their use in the expression of the solutions of certain differential equations of non-periodic cases are studied.

(8230 - 6/13/32)

Term - Winter (7)

Name of Course - MATHEMATICS.

Hours per week Rec. - 3 P.W.- Lectures -

Texts: Practical Least Squares, Leland.
Mathematical Analysis of Statistics, Forsythe.
Naval Ordnance.

Outline of Course:-

The purpose of this course is to acquaint the student with the fundamentals of probability and least squares as well as some of the simpler phases of the mathematical handling of data and statistics. This includes interpolation, smoothing of data, curve fitting, index numbers, and correlation. This work is followed by a study of the Le Duc Interior Ballistic Formulas and their application to the more important interior ballistic problems.

(8230 - 6/13/32)

Term - Fall (2)

Name of Course:- MECHANICS

Hours per week Rec. -2 P.W.- Lectures.

Texts:- Analytical Mech. for Engineers, Seely & Ensign.

Outline of Course:-

Statics. The fundamental concepts of mechanics, resultants of force systems, graphical and analytical methods. Equilibrium of force systems. Applications to trusses, cranes, flexible cables, using both graphical and analytical methods.

(8230 - 6/13/32)

B-2

Term - Winter (3)

Name of Course - MECHANICS.

Hours per week Rec. - 2 P.W. - Lectures -

Text: Analytical Mech. for Engineers, Seely & Ensign.

Outline of Course:-

The laws of friction, inclined plane, wedge, screw. Moment of friction in bearings, pivot, collar, journal. Rolling resistance, belt friction. Moments of areas and solids; center of gravity. Moments of inertia of areas, radius of gyration. Product of inertia, principal axes. Moments of inertia of bodies. Experimental methods for determining moments and moments of inertia.

(8330 - 6/13/32)

B-3

Term - Spring (4)

Name of Course - MECHANICS.

Hours per week Rec. - 2 P.W.- Lectures -

Texts:- Analytical Mech. for Engineers, Seely & Ensign.

Outline of course:-

Kinematics of a particle, and of a rigid body. Fundamentals of kinetics, motion of a particle. Translation and rotation of rigid body. General plane motion of a rigid body. Application to engineering problems, flywheels, balancing, governors, the gyroscope.

(8230 - 5/14/32)

B-4

Term - Summer (1)

Name of Course - MECHANICS.

Hours per week Rec. - 2 P.W. - Lectures -

Texts:- Analytical Mech. for Eng. , Seeley & Ensign.

Outline of course:-

The fundamental concepts and definitions of mechanics. Resultants of force systems in a plane and in space by graphical and algebraic methods, with applications to trusses, cranes, cables, centroids and center of gravity. A study of sliding friction, wedge, screw, journal, pivot, belt. Also rolling resistance. Covers up to page 135 of text.

(8230 - 6/14/32)

Term - Fall (2)

Name of Course - MECHANICS.

Hours per week Rec. - 2 P.W. - Lectures -

Texts:- Analytical Mechanics for Engrs., Seeley & Ensign.

Outline of course:-

Moments of inertia of plane areas and of solids, products of inertia, principal axes. Kinetics, linear and angular displacements and velocities. Linear acceleration, components tangential and normal, axial, radial and transverse; angular acceleration, special types of motion of a particle. Motion of rigid bodies, in translation, in rotation, in plane motion. Kinetics of a particle. Newton's laws of motion, with applications. Kinetics of rigid bodies in translation rotation and plane motion. Applications of kinetics to pendulums balancing, the gyroscope, governors. Covers from page 136 to page 243 of text.

(8230 - 6/14/32)

Term - Winter (3)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. - Lectures.

Texts: Analytical Mechanics for Engs. - Seeley & Ensign

Outline of course:-

Work and energy; work of a force and of a couple; work of a force system. Power defined and expressed in standard forms. Energy, potential and kinetic. Relations between work and energy. Conservation of energy. Effecificy, dissipation of energy. Impulse and momentum. Linear impulse, moment of impulse. Momentum, linear and angular. Relations between impulse and momentum, with applications. Problems in motion. Impact. The Gyroscope. Covers pages 244 to end of text.

(8230 - 6/14/32)

Term - Spring (4)
" (8)

Name of Course - MECHANICS.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts: Lecture Notes.

Reference: Airplane Stress Analysis - Klemin
Airplane Structures - Niles & Newell.

Outline of course:

This course is an introductory course in preparation for more advanced work in airplane structural design.

The subject material:

(a) Simple Aerodynamical considerations, airfoils, design and aerodynamic characteristics, pressure distributions along chord and span.

(b) Critical Loading conditions - Load Factors.

(c) Strength of Materials, bending moments, shears and stresses in beams under various loadings; combined bending and axial stress emphasized by working out appropriate Three Moment Equations, bending and shear deflection by the method of work.

(d) Structures, stresses in two force pieces by analytical and graphical methods, deflection of joints of structure by the method of work.

(e) Short Introduction to statically indeterminate structures.

Problems pertaining particularly to typical airplane structures are solved under the supervision of instructor.

(8230 - 6/14/32)

B-8

Term - Spring (4)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. Lectures.

Texts:- Naval Ordnance 1926
Exterior Ballistics - Alger.
A Course in Exterior Ballistics - Ord. Dept. U.S.A.

References: Exterior Ballistics - Hermann.
Introduction to Ballistics - Ord. Dept. U.S.A.

Outline of Course:-

The Elastic Strength of guns occupies about one fourth of the time of this course. The strength and shrinkage computation formulas are developed. This is followed up by the graphical method.

The course in Exterior Ballistics considers first the short flat trajectory and then the Siacci method. Following this the method of numerical integration is introduced. Some work on the method of differential corrections is also included.

Problem work concurrent with the theory is included throughout the course.

(8230 - 6/15/32)

B-10

Term - Fall (6)

Name of Course - MECHANICS

Hours per week Rec. - 2 P.W. - Lectures -

Text: Analytical Mech. for Engineers, Seely & Ensign.

Outline of Course:-

The mechanical definition of work, and the methods for evaluating the work of force systems. Power and energy. Equations of work and energy, efficiency of machines. Definitions and calculations of impulse and momentum. The impulse-momentum equation, with applications to motion problems. Impact. The gyroscopic couple.

(8230 - 6/14/32)

Term - Winter (7)

Name of Course - MECHANICS.

Hours per week Rec. - 4 P.W. - Lectures -

Text: Dynamics of Engine & Shaft - Root.

Outline of Course:-

Analysis of motion of reciprocating parts and connecting rod of reciprocating engine, with determination of harmonics of inertia forces. Balance of shaking forces, rocking moments and rolling moments for engine with fixed cylinders, in line. Balance of engines with cylinders in two or more banks, radial engines, rotary engines, and engines of other types. Determination of turning moment for two - and four-cycle engines with various cylinder and crank arrangements. Speed fluctuation and fly wheels. Determination of forces affecting bearing pressures and friction losses in engines of standard types, with effects of counter-balance. Study of free and forced vibrations and resonance of elastic bodies, with particular reference to torsional and transverse vibrations of a rotating shaft under variously assumed loading.

(8230 - 6/14/32)

B-11

Term - Spring (4)

Name of Course - MECHANICS.

Hours per week Rec. - 4 P.W. Lectures

Texts: Dynamics of Engine & Shaft - Root.

Outline of course:-

Analysis of motion of reciprocating parts and connecting rod of reciprocating engine, with determination of harmonics of inertia forces. Balance of shaking forces, rocking moments and rolling moments for engine with fixed cylinders, in line. Balance of engines with cylinders in two or more banks, radial engines, rotary engines, and engines of other types. Determination of turning moment for two - and four-cycle engines with various cylinder and crank arrangements. Speed fluctuation and fly wheels. Determination of forces affecting bearing pressures and friction losses in engines of standard types, with effects of counter-balance. Study of free and forced vibrations and resonance of elastic bodies, with particular reference to torsional and transverse vibrations of a rotating shaft under variously assumed loading.

Term - Spring (8)

Name of Course - MECHANICS.

Hours per week Rec. - 4 P.W. - Lectures -

Text: Applied Elasticity - Timoshenko & Lessells.

Reference: Strength of Materials - Timoshenko
Vorlemugen über Technische Mechanik,- Foppl.

Outline of Course:

This course carries the analysis of the state of stress in engineering structures to problems outside the group considered in the elementary discussion of the strength of materials.

Topics include: extension of the methods of computing stresses and displacements due to tension, compression, shear, torsion or bending, acting singly or in combination; graphical methods; the membrane analogy; photo-elastic methods and application to stress distribution in irregular sections; energy methods and applications to statically indeterminate structures; beams on elastic foundation, applications to shells; curved bars; thick cylinders and spheres; thin plates.

To illustrate the application of the methods, problems are chosen with reference to the interests of the group.

(8230 - 6/14/32)

B-13

Term - Spring (B)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. - 2 Lectures -

Text: The Principles of Flight - Stalker.

References: Stability in Aviation - Bryan
Airplane Structures - Niles & Newell
N.A.C.A. Reports
Lieferungen der Göttinger Aerodynamischen Versuchsanstadt.

Outline of course:-

The purposes of this course are to present the empirical side of aeronautics; to relate it to the fundamental theory given in course A-15; to extend the dimension of the dynamics of the airplane as a rigid body, also the stress analysis of the airplane considered as an engineering structure; to discuss and apply laboratory methods used in aeronautics.

Among the topics considered are: aerostatics, physical foundation for wind-tunnel experiment, Reynolds Number, experimental methods and corrections, standard method of display of experimental results, data from aeronautical laboratories; the three dimensional equations of motion for an airplane, stability calculations; load factors and stress analysis.

The laboratory period will be used in experiment in the wind-tunnel.

(8230 - 6/14/32)

B-14

Term - Winter (7)

Name of Course - MECHANICS.

Hours per week Rec. - 4 P.W. - Lectures -

Texts: Naval Ordnance
Analytical Mechanics, Barton
Exterior Ballistics, Moulton
Spinning Tops and Gyroscopic Motion, Crabtree.

Outline of course:-

The first part of this work deduces the Lamé formulas for thick cylinders and makes applications to the calculation of the strength of sections of simple and compound cylinders. The computation of shrinkages and their influences on the strength of guns is also presented.

This is followed by the dynamics of a rigid body in three dimensions. The special case of a body rotating with a fixed point is studied intensively and applied to the motion of a gyroscope and further to a discussion of the stability of a spinning projectile. Emphasis is laid on fundamental principles to the end that the student may be able to analyze many mechanical systems other than those specifically treated.

(8230 - 6/15/32)

B-20

Term - Fall: (6)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. - Lectures -

Texts: Analytical Mechanics - Barton
Spinning tops & Gyroscopic Motion - Crabtree.

Outline of course:-

This course deals with advanced analytical mechanics, including the Theory of the Gyroscope and rotational dynamics. It continues the study of the fundamental principles of mechanics and applies them particularly to the motion of a rigid body rotating in three dimensions. This leads to a study of gyroscopic reactions, the behavior of a gyroscope under certain constraints.

(B230 - 6/15/32)

Term - Winter (7)

Name of Course - MECHANICS

Hours per week Rec. - 3 P.W. - Lectures -

Texts: Exterior Ballistics - Moulton
Course in Exterior Ballistics - U.S.Army.

Outline of Course:-

This course in mechanics applies the mechanics of rotating bodies to the study of the stability of a projectile in flight. This is followed by a continuation of the work in exterior ballistics and includes the following topics: Computation of trajectories, calculation of differential corrections to standard trajectories resulting from non-standard muzzle velocity, change in elevation, change in weight of projectile, effect of wind, etc.; coordinate systems; effect of rotation of the earth; etc.

(8230 - 6/15/32)

B-23

Term - Fall (6)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. - 2 Lectures.

Texts: Applied Elasticity, - Timoshenko & Lessells.
Notes on Beams Continuous over Several Supports.

Outline of course:-

This course is intended to give the student a working knowledge of the methods of analysis used in dealing with problems on stress and deformation. It supplements the elementary strength of materials and the strength of guns, giving more exact methods for some cases, and dealing with additional and more involved cases. The laboratory period is devoted to problem work involving the material discussed in class during the previous week. In the selection of text book, and in the choice of items for emphasis, the problems of ordnance equipment, its analysis and design, are given due weight.

(8230 - 6/15/32)

B-24

Term - Winter (7)

Name of Course - MECHANICS

Hours per week Rec. - 3 P.W. 2 Lectures

Texts: Applied Elasticity - Timoshenko & Lessels
Notes on Vibrating Elastic Bodies.

Outline of course:-

This course continues the study of stress analysis as it pertains to curved bars, hooks, and links, and to flat plates subject to normal pressure and to various border conditions. Analysis is made of stresses due to dynamical forces, with applications to rotating bars of variable section and to rotating discs of uniform and variable thickness. The problem of vibrations is treated with reference to transverse and torsional vibrations of elastic systems, with emphasis on the phenomena of forced vibrations, resonance and critical speeds. The laboratory periods are devoted to problem work.

(8230 - 6/15/32)

B-25

Term - Winter (7)

Name of Course - MECHANICS.

Hours per week Rec. - 3 P.W. - 4 Lectures.

Texts: Airplane Structures - Niles & Newell
~~Elements of Aviation, Clark~~
Supplementary Notes.
Principles of Flight - Stalker

Outline of course:-

This course aims to acquaint the student with elementary principles of aeronautics and with the methods of analysis of airplane structures. Consideration is given to principles of air flow, the pressure distribution of an air-foil, the relations between lift and drag, stability and control, the propeller and power as related to speed, climb, etc. Study includes the effect of the earth's atmosphere, and the effect of altitude. It includes a study of the forces involved in various maneuvers and flight conditions producing critical loads on the structure. Graphical and analytical methods of analysis are applied to lift and drag stresses. Ties and struts are designed, and members under combined bending and thrust are treated.

Deflections of beams and trusses are treated by such methods as moment areas, internal work, and the Williot diagram. The redundancies of statically indeterminate structures are solved by Wilson's method and by the method of least work. Attention is also given to the methods of weight estimation and control.

(8230 - 6/17/32)

C-1

Term - Summer (1)

Name of Course - CHEMISTRY - GENERAL.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts: Principles of Chemistry - Hildebrand.
Smith's General Chemistry for Colleges - Kendall.

References: Theoretical Chemistry - Getman
General Chemistry - Deming.

Outline of course:

It is the aim of this course to emphasize the principles of chemistry rather than to devote the time to a detailed study of the properties of substances. The principal topics discussed are: fundamental conceptions of matter; chemical reactions and atomic theory; gas laws and kinetic theory; valency and writing equations; study of solutions; ionization; chemical equilibrium; oxidation and reduction; the Periodic system; electro-chemistry; thermo-chemistry; preparation and properties of the non-metals and their more important compounds.

The practical exercises given in the laboratory are selected as being suited to illustrate the principles discussed in the classroom and to demonstrate the principal properties of the commoner materials.

(8230 - 6/17/32)

C-2

Term - Winter (3)

Name of course - CHEMISTRY - FUEL & OIL.

Hours per week Rec. - 1 P.W. - 2 Lectures -

Texts: Book of stencils on the experiments.
Bureau of Mines Technical Paper 323B
U.S. Govt. Specs. for Lubricants & Liquid Fuels.

Ouline of course:

The classroom work consists of a study of the chemistry of motor fuels, lubricating oils and petroleum oils, their production, technology and uses. The laboratory work comprises actual tests of the oils to determine their physical properties.

The following oil tests are made during the laboratory periods:

Color
Cloud & Pour Points
Viscocity
Carbon Residue
Specific Gravity
Refractive Index
Distillation tests of gasoline
Flash and Fire Points
Fractional Distillation of Crude Petroleum
Doctor test
Unsaturates
Water
Sediment
Corrosion
Emulsion
Demulsibility
Breakdown Test
Sulphur
Acidity
Heat Value of Liquid Fuel
Gas Analysis
Heat value of a gas.

Term - Spring(4)

Name of Course - INORGANIC CHEMICAL TECHNOLOGY.

Hours per week. Rec.-- 2 P. W. 2 - Lectures -

Texts: Inorganic Chemical Technology - Badger & Baker.
General Chemistry - Deming.

References: Industrial Chemistry - Rogers.

Outline of Course:

OBJECT OF COURSE:

Technology in general comprises those sequences of operations by which finished products are fabricated from raw materials. Chemical Technology has to do with such operations of this class as change the chemical nature of the substances involved. Inorganic Chemical Technology embraces the field of the heavy chemicals of inorganic nature that are the basic materials for a great part of chemical and related industries.

It is the object of this course to teach the student the methods whereby laboratory operations may be performed on the manufacturing scale, and to acquaint him with the chemistry involved in the manufacture of the more important chemicals of inorganic nature.

SYNOPSIS OF THE COURSE:

The commercial production of the following chemicals are studied:

Common salt, sulfuric acid, nitric acid, hydrochloric acid, sodium carbonate, caustic soda, chlorine, bleaching powder, alum, copperas, and other minor or miscellaneous products.

Class hours are devoted to lecture or recitation, P.W. hours are devoted to study or problem work.

REMARKS:

This course is to be equivalent to Ch. E. 4 as given in the past to the Ord. Expl. at Michigan.

Term - Spring (4)

Name of Course - CHEMISTRY - QUALITATIVE.

Hours per week dec. - 4 P.M. - 8 Lectures -

Text: Solutions of Electrolytes - Hammott.

Lab. Manual: Qualitative Chemical Analysis - Noyes
Qualitative Chemical Analysis - Scott

References: Qualitative Analysis, Vol. I - Stieglitz
Qualitative Analysis - Prescott & Johnson.

Outline of course:-

This is a course comprising the principles and laboratory practice in qualitative chemical analysis in preparation for the courses in quantitative and physical chemistry.

The class room work consists of lectures and the solution of problems, emphasizing the more important physico-chemical laws of solutions of electrolytes, the law of mass action, solubility product, etc.

The laboratory work consists of practical experiments in analyzing known and, later, unknown solutions and mixtures for the elements and radicals present.

Term - Spring (4)

Name of Course - CHEMISTRY - QUALITATIVE.

Hours per week Rec. - 4 P.W. - 4 Lectures -

Text: Solutions of Electrolytes - Hammett

Lab. Manual: Qualitative Chemical Analysis - Noyes
Qualitative Chemical Analysis - Scott

References: Qualitative Analysis, Vol. I - Stieglitz
Qualitative Analysis, - Prescott & Johnson.

Outline of Course:-

This is a course comprising the principles and laboratory practice in qualitative chemical analysis in preparation for the courses in quantitative and physical chemistry.

The classroom work consists of lectures and the solution of problems, emphasizing the more important physico-chemical laws of solutions of electrolytes, the law of mass action, solubility product, etc.

The laboratory work consists of practical experiments in analyzing known and, later, unknown solutions and mixtures for the elements and radicals present.

(8230 - 3/17/31)

C-5

Term - Spring (4)

Name of Course - PHYSICAL CHEMISTRY

Hours per week Rec. - 4 P. - Lectures -

Text: Theoretical Chemistry - Getman & Daniels.

Outline of course:-

OBJECT: To give the student a course in Physical Chemistry substantially equivalent to the similar course in Physical Chemistry offered by the leading universities.

SYNOPSIS: A course equivalent to the standard university course in Physical Chemistry cannot be given in one term, and the Spring Term is devoted to the first part of the Postgraduate School course in Physical Chemistry, the second part of which will be taken during the fifth or special Summer Term.

Laboratory work and the remaining 60 class hours necessary to complete the course are scheduled for the Summer.

The physico-chemical study of solids, liquids, gases, and solutions is undertaken during the Spring Term. The general properties of the several states of matter are discussed, and the laws governing their behavior subjected to examination and used in solving numerous problems.

Term - Summer (5)

Name of Course - CHEMISTRY - QUANTITATIVE.

Hours per week Rec. - 4 P.W. - 15 Lectures -

Text: Inorganic Quantitative Analysis - Files.

References: Analytical Chemistry - Treadwell-Hall.

Outline of Course:-

The course includes the general theory of chemical analysis in the quantitative determination of the constituents of inorganic and metallic materials, and the laboratory work includes experiments and analyses designed to familiarize the student with the technique of the typical analytical procedures. Exercises are included on Preparation of standard solutions; volumetric methods of analysis; gravimetric methods, iodiometric methods; electrolytic methods; and oxidation-reduction methods.

Analyses are performed such as: determination of iron, of nickel, of copper, of sulphur, of phosphorus, of calcium, of acidity, of alkalinity.

The text is covered completely as regards theory, and such portions devoted to laboratory exercises as are typical of the various analytical methods.

(8230 - 6/17/32)

C-7

Term - Summer (5)

Name of Course - CHEMISTRY - QUANTITATIVE.

Hours per week Rec. - 3 P.W. - 5 Lectures -

Text: Inorganic Quantitative Analysis - Fales.

Outline of course:-

The class work is identical with that covered in the quantitative analysis course for the Ordnance Explosives Engineer, etc. That is, it covers the general theory and discussion of the technique of quantitative analysis.

Sufficient time is not available for the students taking this course to go through the time-consuming laboratory procedure details, but the time allotted for their laboratory work will be spent in exercises teaching the technique of analytical methods, yet involving no lengthy complete analysis.

The course is designed to suffice for the special needs of the metallurgists.

(8230 - 6/17/32)

C-8

Term - Summer (5)

Name of Course - PHYSICAL CHEMISTRY.

Hours per week Rec - 6 P.W. - 6 Lectures -

Text: Theroetical Chemistry, 1928 Ed - Getman.

Lab. Manual: Epxerimental Physical Chemistry - Daniels, Mathews & Williams.

References: International Critical Tables
Thermodynamics - Lewis & Randall
Practical Physical Chemistry - Findlay, and others.

Outline of course:-

This course, supplementing C-5, is designed to cover the subject matter of Physical Chemistry to the same extent as the usual one year course in Physical Chemistry, given by leading universities.

The laws governing chemical behavior are studied, and problems involving their applications are solved. The course offers a review and extension of the principles of chemistry studied in the general inorganic chemistry course and applied in the qualitative and quantitative courses in chemical analysis. Solids, liquids, gases, solutions, thermo-chemistry, electro-chemistry, colloid chemistry, photo-chemistry, and atomic structure are discussed.

The laboratory work includes fifteen to twenty experiments illustrating applications of theory and affording a training in physico-chemical methods.

(8230 - 6/17/32)

Term - Fall (2)

Name of Course - METALLURGY

Hours per week Rec. - 2 P.W. - Lectures -

Texts: Engineering Metallurgy - Stoughton & Butts
Metallurgy of Iron & Steel - Bradley Stoughton

Reference: Making, Shaping & Treating of Steel - Camp & Francis
Heat Treatment & Metallography of Iron & Steel - Sauveur.

Outline of Course:-

In this course the general metallurgy of some of the more common non-ferrous metals is first briefly discussed and then the general metallurgy of iron and steel is studied in detail. The aims of this course are to make the student familiar with the more important processes in the manufacture of copper, lead, zinc, iron and steel from their ores and especially to understand the essential differences in the processes and products in the manufacture of steel by the various methods. The principal topics discussed are: common ores of the principal non-ferrous metals and their reduction; reduction of iron from its ores; manufacture of wrought iron; steel making; manufacture of iron and steel; manufacture of cast irons; metallurgical fuels.

During the course an all day trip is made to the Sparrows Point plant of the Bethlehem Steel Co., where the steps in the development of sheet steel and steel rails are watched from the ore to the finished product.

A trip is usually made to the plant of the Baltimore Copper Smelting and Refining Co. at Baltimore.

(8230 - 6/17/32)

D-2

Term - Winter (3)

Name of Course - METALLOGRAPHY - GENERAL.

Hours per week Rec. - 3 P.W. - 2 Lectures -

Texts: Met.& Heat Treatment of Iron & Steel (1926) - Sauveur
Lab. Manual of Metallography (1930) - Woldman
Principles of Metallography - Williams & Homerberg.

Outline of the Course:-

In this course the general principles of metallography, the metallography of the more important non-ferrous metals and alloys, and the metallography and heat treatment of iron and steel are studied. The principal topics discussed are: Formation and structure of alloys; methods of investigation; solubility and cooling curves; alloy equilibrium diagrams; structures of metals and alloys resulting from various treatments; metallography and properties of bronzes, brasses, and aluminum-copper alloys; properties of wrought iron, cast irons, alloy steels, carbon steels; properties of steel resulting from heat and mechanical treatments; causes of defects and failures in metals.

The laboratory experiments aim to clarify the principles and topics discussed in the class-room, particularly to make the student familiar with the effects of composition, mechanical work and heat treatment on the properties of metallic alloys. The exercises include: macroscopic and microscopic examination of specimens; preparation of specimens for microscopic examination; microscopic study of effect of heat treatment, effect of composition, and effect of mechanical treatment on steels, brasses, and bronzes. About 100 prepared specimens are examined and sketched. The student is required to keep a complete notebook and to incorporate in his notes data on physical properties of the metals studied. Commercial literature is supplied in order that the student may become acquainted with commercial products and exercise a critical judgment as regards the claims of the various manufacturers.

(8230 - 6/17/32)

D-3

TERM 4

Name of Course - SCIENCE OF METALS.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Text: Science of Metals - Jeffries & Archer.

References: Met. & Heat Treatment of Iron & Steel - Sauveur
Prins. of Metallography - Williams & Homerberg
Metallic Alloys - Gulliver.

Outline of course:-

The purpose of this course is to give the student a foundation in theoretical and physical metallurgy, especially suitable as a preparation for more advanced practical metallurgy and metallography or to supplement a course such as D2.

The structure of metals and alloys, constitutional diagrams, the relation of structure constitution and composition to properties; theories of strength, hardening and heat treatment are among the topics of major importance discussed and studied in the course.

Laboratory exercises are selected to illustrate the experimental methods of the science of metals.

(8230 - 6/17/32)

D-4

Term - Spring (4)

Name of Course - METALLURGY (LIGHT ALLOYS)

Hours per week Rec 2 P.W. - 2 Lectures

Texts: Light Alloys, Bureau of Stds. Circ. #346.
Metallurgy in Aircraft Construction - Daniels & Sisco.

References: Phys. Properties of Materials - Bu.Stds.Circ. #101
Selected references to scientific and technical Literature.
Metallurgy Papers - Postgraduate School.

Outline of Course:-

This is a course, especially designed for the Aeronautical Engineers, on the metallurgy of metals used in aircraft, particularly the light aluminum and magnesium alloys.

The chemical and physical properties, the metallography and fabrication of the light alloys are studied.

Laboratory work includes the microscopic examination of typical specimens; the heat treatment of duralumin; X-ray examination of light alloys; corrosion tests on metals used in aircraft construction; physical testing of light alloys; casting light alloys.

(8230 - 6/17/32)

D-5

Term - Summer (5)

Name of Course - METALLOGRAPHY & HEAT TREATMENT, IRON & STEEL

Hours per week Rec. - 3 P.W. 4 Lectures -

Text: Metallography & Heat Treatment of Iron & Steel - Sauveur
Lab. Manual - Physical Metallurgy - Woldman 1930.

References: Selected Ord. Pamphlets and P.G. Met. Papers.

Outline of Course:-

The metallography and heat treatment of iron, steel and ferrous alloys is the subject matter of the course in ferrous metallurgy. This includes a study of the relation between composition, structure, and treatment to the physical properties; theories of heat treatment and properties of metals; selection and testing of metals. The laboratory work includes microscopical and macroscopical examination of good and defective material, physical testing, heat treatment, etc.

Causes of Defects and Failures in Metals; Steel for crankshafts; Combatting Corrosion; Recent Developments in High Strength Casting; Recent Developments in Case-hardening; Steels for Ordnance use, and other special topics of interest to the Naval Ordnance officer are discussed.

(8230 - 6/17/32)

D-6

Term - Summer (5)

Name of Course - METALLURGICAL PRACTICE.

Hours per week Rec. - P.W. - 2 Lectures -

Texts: Lab. Experiments in Metallurgy, Sauveur & Boylston
Physical Metallurgy - Woldman.

Outline of course:-

This is a laboratory course in metallurgical practice and includes the use of various types of metallurgical furnaces, heat treatments, pyrometric measurements, ore reduction, etc.

(8230 - 6/17/32)

Term - Summer (5)

Name of Course - METALLURGY SEMINAR

Hours per week Rec. - P.W. - 2 Lectures -

Text: Engrg. Non-Ferrous Metals & Alloys - Aitchison & Barclay

References: Handbook of Non-ferrous Metallurgy - Liddell
Engineering Metallurgy - Stoughton & Butts.

Outline of Course:-

In this course the student devotes his time to a study of the non-ferrous alloys and their engineering uses. Some time is also spent reviewing the methods of extracting the metal from its ore.

Some of the topics considered, in addition to studying the properties of specific alloys of copper, aluminum, nickel, etc. of engineering importance, are: general properties of the non-ferrous metals and alloys, the casting of metals and alloys, the working of non-ferrous alloys, the mechanical properties and testing of non-ferrous metals.

(8230 - 6/17/32)

D-8

Term - Winter (6)

Name of course - METALLOGRAPHY & HEAT TREATMENT OF IRON & STEEL.

Hours per week Rec. - 4 P.W. - 4 Lectures -

Text: Metallography & Heat Treatment of Iron & Steel - Sauveur
Lab. Manual - Physical Metallurgy 1930 Ed.- Woldman.

References: Selected Ord. Pamphlets, P.G.S. Metallurgy Papers, etc.

Outline of course:-

The first part of this course is devoted to a study of the Metallography and heat-treatment of iron and steel. The rest of the course is devoted to metallurgical topics of special interest to Naval Ordnance Officers, including: Steels for Ordnance Use; Manufacture of Armor Plate; Armor Piercing Projectiles, etc. During the latter half of the course one of the two Lab. periods is devoted to discussion of special topics and papers presented by the students.

(8230 - 6/17/32)

D-9

Term - Spring (4)

Name of Course - SCIENCE OF METALS.

Hours per week Rec. - 2 P.W. o Lectures -

Texts - Science of Metals - Jeffries & Archer.

References: Met. & Heat Treatment of Iron & Steel - Sauveur
Prins. of Metallography - Williams & Homerberg
Metallic Alloys - Gulliver.

Outline of course:-

The purpose of this course is to give the student a foundation in theoretical and physical metallurgy especially suitable as a preparation for more advanced practical metallurgy and metallography.

The structure of metals and alloys; experimental methods; the relation of structure, constitution and composition to properties; theories of strength, hardening and heat treatment, are among the topics of major importance discussed and studied in the course.

(8230 - 6/16/32)

E-1

Term - Summer (1)

Name of Course - PHYSICS.

Hours per week Rec. - 3 P.W. - 4 Lectures.

Texts: General Physics - Ferry
Physic's Measurements - Ferry
Optics Notes - Postgraduate School.

Outline of course:-

Elementary mechanics, heat, sound and light. Classroom work supplemented by about 20 laboratory experiments. Particular attention paid to these principles which are particularly needed in engineering.

E-1a will be given to Ba third term. and Ca

E-

(6230 - 6/16/32)

E-2

Term - Fall (2)

Name of Course - PHYSICS

Hours per week Rec. - P.W. - 2 a Lectures -

Texts: Experimental Optics - Wagner
Miscellaneous Mimeograph Lab. instruction Sheets - Wagner.

Outline of course:-

A laboratory course (no class-room work) dealing with experimental work on subjects as follows:

1. Photoelectricity
2. Piezo-Electric Effect.
3. X-Rays.
4. Infra-Red Spectrometry. Uses of Infra-Red Radiation.
5. Ultra-Violet Spectrometry. Use of Ultra-Violet Radiation.
6. Television Reception.
7. Supersonics.

New E-2 - 3-9
Grand Bz Term 2

(8230 - 6/16/32)

E-5

Term - Spring (4)

Name of Course - SOUND.

Hours per week Rec. - 3 P.W. - 2 Lectures -

Text: Sound - Capstick.

References: Textbook of sound - Barton
Sound - Richardson
Sound - Poynting & Thomson
Laboratory Stencils.

Outline of course:-

This course includes a study of sound characteristics; sound production and propagation; sound waves as illustrated by Foley's sound wave pictures; simple harmonic motion, composition of collinear and rectangular simple harmonic motions; wave motion; Huyghen's Principle; conditions necessary for reflection, refraction and diffraction of sound waves; Doppler's Principle; elasticity as affecting sound velocity; Newton's and Laplace's formulae for sound velocity; differential equations of simple oscillations, damped oscillations and forced oscillations; resonance; interference; combinational tones; velocity of sound in different media and methods of measurement; the binaural sense; sound ranging; ocean depth sounding; supersonics; miscellaneous practical applications of sound.

The laboratory work consists of: Meldes Experiment, Wave length measurement by resonance methods; Measurement of frequency of tuning forks; Kundt's dust tube experiment; Interference experiment; use of sensitive flame as a sound detector. Vibration of plates as illustrated by Chladnis figures; Koenig's Manometric Capsule experiment; use of the General Electric oscillograph to study quality, frequency of organ pipes, beats between two organ pipes and between two tuning forks; experiment illustrating binaural sence.

(8230 - 6/8/32)

E 7a

Ba

Term - Winter (3)

Name of Course - PHYSICS.

Hours per week Rec. - 3 P.W. - 4 Lectures -

Texts: General Physics - Ferry
Physics Measurements, Vol. I. - Ferry
" " " II - Ferry
Misc. Mimeograph Notes on Applications of Modern Physics - Prepared by A.F.Wagner.

Outline of course:-

1. General Review of Definitions and Units in Physics generally employed in Engineering.
2. Dimensional Equations.
3. Heat. Particular emphasis on calorimetry and elementary thermodynamics.
4. Sound. General review with emphasis on military applications.
5. Supersonics.
6. Light. Geometrical and Physical Optics relating to Engineering.
7. Modern Physics.
Piezo-electricity, photo-elasticity, X-Rays, gamma rays, photo-electricity.

(023 - 11/30/32)

E-7a

Term - Winter (3)

Name of Course - PHYSICS.

Hours per week - Rec. 3 P.P. 4. Lectures.

Texts: General Physics, Ferry.
Experimental Optics, Wagner.
P.C.S. Mimeograph Pamphlets on Special Subjects in Physics.

Outline of Course:

1. Fundamental Physical Quantities and Units employed in Engineering. Dimensional Equations.

2. Heat.
Thermometry, Calorimetry, Radiation Laws, Elementary Thermodynamic Relations.

3. Sound
Theory of Vibrations, Vibrating Systems and Sources of Sound, Transmission of Sound, Technical Applications.

4. Light
Nature of Light, Photometry, Interference and Diffraction, Spectrometry, Polarization, Lens Optics, Telescopic Optics, Photo-Electricity.

NOTE. This course is less mathematical than E$_4$-9. Less problem work.

Term - Winter (3)

Name of Course - PHYSICS

Hours per week Rec. - 3 P. T. - 4 Lectures.

Texts: General Physics - Perry
Experimental Optics - Tagner
P.G.S.Mimeograph Pamphlets on Special Subjects in Physics.

Outline of Course:

1. Fundamental Physical quantities and units employed in Engineering. Dimensional equations.

2. Heat.
Thermometry, Calorimetry, Radiation Laws, elementary thermodynamics radiation.

3. Sound.
Theory of vibration, Vibrating systems and source of sound, Transmission of sound, Technical applications.

4. Light.
Nature of Light, Photometry, Interference and diffraction, spectrometry, Polarization, Lens optics, Telescopic optics. Photo-electricity.

(8230 - 6/16/32)

F-1

Term - Spring (4)

Name of Course - OPTICS.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts: Postgraduate School Optic Notes - Wagner
Experimental Optics - Wagner
Light for Students - Edser
Ultra-Violet Radiation - Luchiesh.
Theory of Modern Optical Instruments - Gleichen.

Outline of course:-

Principles of lenses, prisms, and mirrors. Lens aberrations. Cardinal points of lenses and lens systems. Elementary treatment of telescopic systems. Measurements of focal length, index of refraction, dispersion, lens aberrations, constants of telescopic systems, radius of curvature, prism angles.

(8230 - 6/16/32)

F-2

Term - Winter (7)

Name of Course - OPTICS

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts:- Fundamentals of Applied Optics.- Wagner
Experimental Optics - Wagner
Light for students - Edser
Ultra-Violet Radiation - Luckiesh.

Outline of Course:-

Photometry. Interference. Diffraction. Polarization. Measurement of aberrations of lens systems. Analysis, testing and design of monocular and binocular military telescopic systems. Testing of optical glass.

(8230 - 6/16/32)

G-1

Term - Fall (2)

Name of Course - ELECTRICITY.

Hours per week Rec. - 3 P. W. - 4 Lectures

Texts: Electrical Engineering, Vol. I - Dawes
Electric & Magnetic Measurements - Smith
Problems in Electrical Engineering - Lyon

Outline of course:-

This course covers a study of electric units; power and energy; the electrical circuit; resistance; insulating materials; electrolytic conduction; the magnetic circuit; the magnetic field; induced voltages; magnetic properties of iron; and generated voltages.

The laboratory work consists of: the measurement of resistances with the box bridge, with the Kelvin bridge, by the substitution method, and by the fall of potential method; the measurement of potential with the simple potentiometer and the type K potentiometer; the measurement of self inductance and mutual inductance by comparison with a standard; the determination of the hysteresis loop; the measurement of capacities with the Wheatstone bridge and from the time-constant; a measurement of the internal resistance of a battery; a study of the thermocouple; and a study of Kirchoff's laws.

(8230 - 6/16/32)

G-2

Term - Winter (3)

Name of Course - ELECTRICAL ENGINEERING

Hours per week Rec. - 3 P.W. - 4 Lectures -

Texts: Elec. Engineering Vol. I, - Dawes
Elec. Engrg. Lab. Experiments - Ricker & Tucker

Outline of course:-

This course consists of a study of: the construction of the continuous-current machine; simplex and multiplex armature windings; commutation; flux distribution; armature reaction; generated voltage; characteristic curves; shunt, series, and compound generators; operation in parallel; three-wire generators; boosters; shunt, series, and compound motors; speed control; comparison of motor characteristics; applications of motors.

The work consists of a study of: Direct-current generator connections; the potential about the commutator; Direct-current compound generators; parallel operation of generators; starting boxes for Direct-current motors; load characteristics of motors; efficiency by the stray power method; efficiency by the "pumping back" method; separation of the losses; heat run.

(8230 - 6/16/32)

G-3

Term - Winter (3)

Name of Course - AC THEORY.

Hours per week Rec. - 4 P.W. - 2 Lectures -

Text: Problems in Electrical Engineering - Lyon.

Reference: Electricity & Magnetism - Starling.

Outline of course:-

The primary object of this course and that to follow in the Spring Term is a preparation for the work at Harvard and Yale. With this in mind the course has been mapped out to lay a strong foundation in those fundamental principles of electricity which underlie the future work, viz., Electrostatics, Magnetics, these two combined and principles of alternating currents.

There being no suitable text books the course is purely of a lecture nature with copious problems to illustrate and fix the ideas in the students' minds. The problems are taken from Lyon's "Problems in Electrical Engineering". A list of questions completely covering the work as it progresses is given to the students with the understanding that such questions will be the basis of all quizzes and examinations. The idea of this is to give the students something definite to study and incidentally in learning the answers to these questions he learns the work of the course.

One afternoon a week is devoted to problems and individual instruction whereby the student is afforded all opportunity to clear up anything giving him personal difficulty.

(8230 - 6/16/32)

G-4

Term - Spring (4)

Name of Course - ELECTRICITY.

Hours per week Rec - 3 P.W. - 4 Lectures -

Texts: Electrical Engineering, Vol. II - Dawes
Problems in Electrical Engineering - Lyon
Electrical Engineering - Ricker & Tucker.

Outline of course:-

This course covers the fundamentals of alternating current circuits. A study of wave form is made and the analysis of one or more waves is carried out. A large number of problems are assigned to gain a working use of impedance, resistance, reactance, admittance, conductance and susceptance of circuits. The use of complex notation in alternating current circuits is also studied. Considerable time is spent on the fundamentals of alternating current machinery.

The laboratory work consists of experiments illustrating principles of the following: Series circuit and resonance parallel circuits and resonance, measurement of inductance, capacity and mutual inductance by A.C. methods, power measurement in polyphase circuits, the use of the oscillograph in illustrating phase relations between current and voltage, the alternator, synchronous motor, transformer and induction motor.

(8230 - 6/16/32)

C-9

Term - Fall (6)

Name of Course - ELECTRICITY.

Hours per Week Rec. - 3 P.W. - 4 Lectures -

Texts: Electrical Engineering, Vol. II - C.L.Dawes.
Lab. - "Electrical Engrg. Lab. Expts."- Ricker & Tucker.

Outline of Course:

During the Fall Term of the second year at the Postgraduate School, the officers of the ordnance group take a course in electricity consisting of three recitations and two laboratory periods per week. This is a continuation of the work in A.C. begun in the Spring Term of the 1st year. In detail the theory and characteristics of the transformer are studied. The different types and their use in various ways and in many connections are presented. The alternator, the synchronous motor and the induction motor are thoroughly studied. An attempt is made to present the material so that the application to Naval practice may be seen. A foundation is laid for the electrical theory of electric drive and fire-control both of which are studied during the following term.

The laboratory work treats of experiments that illustrate the theory of the machines studied in the class room.

(8230†6/16/32)

Term - Winter (7)

Name of Course - ELECTRICITY.

Hours per week Rec. - 3 P.W. - 4 Lectures -

Text: Electrical Engineering, Vol. II - C.L. Dawes.
Lab. - "Elec.Engrg. Lab. Expts". - Ricker & Tucker.

Outline of course:-

During the winter term of the second year at the Postgraduate School, the officers of the Ordnance Group except the aviators take a course in electricity consisting of three recitations and two laboratory periods per week. This is a continuation of the work in A.C. presented during the fall term. In detail the theory of the special types of transformers, the synchronous motor, the induction motor, and the single phase motor is studied. The rotary converter, the underlying principles of the electric drive, the electrical features of fire control instruments, and the basic principles of lighting design are studied. Toward the close of the term the main design principles of the transformer, the turbo-alternator, and the induction motor are given. Quantitative problems on each of these machines are solved using the general design method.

The laboratory periods are devoted to experiments that illustrate the theory presented in the classroom or to the presentation of design principles.

(8230 - 6/17/32)

G-1-A

Term - Summer (1)

Name of Course - ELECTRICITY.

Hours per week Rec. - 2 P.W. - Lectures -

Texts: Electrical Engineering, Vol. i - Dawes.

Outline of course:-

The work of the Summer Term in electricity for the engineering group of the General Line consists of two recitations per week. The course is designed to give a broad foundation in the principles of the electric and the magnetic circuits. Ohm's Law, Kirchhoff's laws, resistances in series, in parallel, and in mesh are studied in detail. The principle and application of the meters and instruments used in the various D.C. circuits are fully presented. The work of this term is given as a preparation for the work of the following term which treats of D.C. machines and their application.

The text used in the class is "Electrical Engineering" Vol. I by C.L. Dawes.

(8280 - 6/17/32)

G-2-A

Term - Fall (2)

Name of course - ELECTRICITY

Hours per week Rec. - 2 P.W. - 4 Lectures -

Text: Electrical Engineering, Vol. I - Dawes.

Outline of course:-

The work of the Fall Term in electricity for the engineering group of the General Line consists of two recitations and two laboratory periods per week. The course is designed to give a thorough understanding of the principles of D.C. machines, both motors and generators, and of their control and application. Armature winding, commutation, and armature reaction are studied in detail. The qualitative characteristics of shunt, series and compound motors and generators are developed from basic principles. Much time is spent in a study of starting and control devices and in the proper application of each type of D.C. machine.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Electrical Engineering" Vol. I by C. L. Dawes. In the laboratory Postgraduate School Stencils are used as references.

(8230 - 6/18/32)

G-3-A

Term - Winter (3)

Name of Course - ELECTRICITY.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts: Electrical Engineering, Vol. II - Dawes.

Outline of course:-

The work of the Winter Term in electricity for the engineering group of the General Line consists of two recitations and one laboratory period per week. The course is designed to give a broad foundation in the basic principles of alternating current theory. The general properties of resistance, inductance, and capacity are presented. Vector notation and the analytical representation of A.C. magnitudes are studied. Meters with their application to the various A.C. circuits are included. The work of this term is given as a preparation for the work of the fourth term which treats of A.C. machines and their application.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Electrical Engineering" Vol. II by C. L. Dawes. In the laboratory PostgraduateSchool Stencils are used as references.

(8230 - 6/18/32)

G-4-A

Term - Spring (4)

Name of Course - ELECTRICITY.

Hours per week Rec. 2 P.W. - 2 Lectures

Texts: Electrical Engineering, Vol. II, Dawes

Ourline of course:-

The work of the Spring Term in electricity for the engineering group of the General Line consists of two recitations and one laboratory period per week. The course is designed to give a thorough understanding of the principles of A.C. machines, motors, generators, and transformers, and of their control and application. Armature winding and armature reaction are studied in detail. The qualitative characteristics of transformers, alternators, synchronous motors, and induction motors are developed from basic principles. Much time is spent in a study of starting and control devices and in the proper application of each type of A. C. machine.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Electrical Engineering" Vol. II by C. L .Dawes. In the laboratory Postgraduate School Stencils are used as references.

(8230 - 6/18/32)

G-1-aa

Term - Summer (1)

Name of Course - ELECTRICITY.

Hours per week Rec. - 1 P.W. - 2 Lectures -

Texts:- Principles of Elec. Engrg. - Timbie & Bush.

Outline of course:-

The work of the Summer Term in electricity for the naval ordnance and aviation group of the General Line consists of one recitation and one laboratory period per week. The course is designed to give a foundation in the principles of the electric and the magnetic circuits. Ohm's law, Kirchhoff's laws, resistances in series, in parallel, and in mesh are studied. The general principle and application of the meters and instruments used in D.C. circuits are presented. The work of this term is given as an introduction to that of the following term which treats of D.C. machines and their application.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Principles of Electrical Engineering" by Timbie and Bush. In the laboratory Postgraduate School Stencils are used as references.

(8230 - 6/18/32)

G-2-aa

Term - Fall (2)

Name of Course - ELECTRICITY.

Hours per week Rec. - 1 P.Q. - 2 Lectures -

Texts: Prins. & Practice of Elec.Engineering - Gray.

Outline of course:-

The work of the Fall Term in electricity for the naval ordnance and aviation group of the Gneral Line consists of one recitation and one laboratory period per week. The course is designed to give a practical understanding of the principles of D.C. machines, both motors and generators, and of their control and application. Armature winding, commutation, and armature reaction are studied briefly. The qualitative characteristics of shunt, series, and compound motors and generators are developed. Time is spend in a study of starting and control devices and in the proper application of each type of D.C. machine.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Principles and Practice of Electrical Engineering" by Gray. In the laboratory Postgraduate School Stencils are used as references.

(8230 - 6/18/32)

G-3-aa

Term - Winter (3)

Name of Course - ELECTRICITY.

Hours per week Rec. - 1 P.W. - 2 Lectures -

Texts:- Prins. & Practice of Elec. Engrg. - Gray

Outline of course:-

The work of the Winter Term in Electricity for the naval ordnance and aviation group of the General Line consists of one recitation and one laboratory period per week. The course is designed to give a practical understanding of the principles of alternating current theory. The general properties of resistance, inductance, and capacity are presented. Meters with their application to the various A.C. circuits are included. The work of this term is given as a preparation for that of the fourth term which treats of A.C. machines and their application.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Principles and Practice of Electrical Engineering" by Gray. In the Laboratory Post-graduate School Stencils are used as references.

(8230 - 6/18/32)

G-4-aa

Term - Spring (4)

Name of course - ELECTRICITY.

Hours per week Rec. - 1 P.W. - 2 Lectures -

Texts: Prins. & Practice of Elec. Engineering - Gray

Outline of course:-

The work of the Spring Term in electricity for the naval ordnance and aviation group of the General Line consists of one recitation and one laboratory period per week. The course is designed to give a practical understanding of the principles of A.C. machines, motors, generators, and transformers, and of their control and application. The qualitative characteristics of alternators, synchronous motors, transformers, and induction motors are developed. Time is spent in a study of starting and control devices and in the proper application of each type of A.C. machine.

The laboratory work runs along parallel to that of the class room and is designed to demonstrate the theory presented there.

The text used in the class is "Principles and Practice of Electrical Engineering" by Gray. In the laboratory Postgraduate School Stencils are used as references.

(8250)

G-16

Term - Spring (4b)

Name of Course: PRINCIPLES & OPERATION OF THE GYRO-COMPASS

Hours per week: Rec. - 2b P.W. - 2b Lectures

Texts & References:

(a) Bureau of Navigation Pamphlets on the Gyroscopic Compass
(b) Sperry Publication No. 17-1612
(c) Mimeographed Lectures: "Theory, Operation and Maintenance of Gyro-Compasses" by Lt. T.B.Fitzpatrick,USN

Outline of Course:

This is a continuation of the navigation course P-7 wherein the student has made a study of the magnetic compass. The lectures cover the theory behind the gyroscope and the undamped gyro-compass, followed by a careful study of both the Sperry and Arma compasses. Particular attention is given the errors and their elimination arising from rolling, pitching, speed, latitude, and turning. The electrical aspects, especially the follow-up and transmission systems, of both compass, and the mechanical and electrical aspects of the repeater are taken up in detail. In the five two-hour sessions of the laboratory work there is covered a description and the operation and maintenance of the Master Compasses and the auxiliary apparatus - control panels, motor-generators, and repeaters.

(8230 - 6/16/32)

Term - Fall (2)

Name of Course - THERMODYNAMICS

Hours per week Rec. - 3 P.W. - 2 b Lectures -

Text: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.

Outline of Course:-

A development of the general basic principles and concepts of Engineering Thermodynamics, providing the foundation from which to proceed in the following terms to the more or less detailed thermodynamic analyses of current forms and types of heat-power machinery et cetera, as those are employed in the marine and shore power-plant. A suitable basis is also provided for further developments of the general science of Thermodynamics, such as is required for later attention to the meteorological and chemical aspects of Thermodynamics by the Aerology, Gas, Petroleum, Metallurgical groups, etc.

In summary, there are developed -

(a) Concepts of the various distinctive manifestations and classes of energy, of the primary manners and processes of energy transitions and of the energy equations pertaining to such processes;

(b) The basic and important concepts of reversibility and of the energy scale of temperature, a recognition of the inherent limitations to the availability of heat energy for transformation to work, and the evolution of the entropy function as an index for the evaluation of the unavailability of energy and as an important property associated with any state of an engineering fluid;

(c) The methods by which are made the computations or determinations of the property changes and energy transitions accompanying the conventional state changes of engineering fluids. This latter is done at this time only for those liquids and vapors for which tables of properties are extant and for those gases which follow adequately closely the so-called perfect gas laws.

The course is accompanied by five (5) afternoon periods of practical work which are devoted to special problems and to the evolution of the T-S and H-S diagrams for water and its vapor.

(8230 - 6/16/32)

H-2

Term - Fall (2)

Name of course - THERMODYNAMICS.

Hours per week Rec. - 3 P.W. - 2b Lectures

Texts: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.
Postgraduate School Stencil No. 4907.

Outline of Course:-

For the group of Communication Engineers, who take only the one term of Thermodynamics, the schedule of Thermodynamics course H1 is followed for about eighty-five (85) per cent of the term, but briefer attention is given to the properties of the vapors and gases and at the end of the term a brief analysis is made of several of the principle types of prime movers.

(8230 - 6/16/32)

H-3

Term - Winter (3)

Name of Course - THERMODYNAMICS.

Hours per week Rec. - 2 P.W. - 2 Lectures.

Text: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.

Outline of course:-

In this (second term) course in Thermodynamics the knowledge of the basic thermodynamic principles and of fluid properties, as developed in the preceding term, is applied -

(a) To determine the fundamental laws which govern the flow of gases and vapors through nozzles, the design of such nozzles and the metering of such fluids by the use of devices such as the Venturi meter, the orifice and the impact tube; and

(b) To analyze the practical vapor cycles which are employed in power production, also investigating the factors which fundamentally influence the performance obtainable by those cycles and which explain the modern trends and developments in actual power plant design and operation ashore and afloat. The cycles considered are the Rankine, the regenerative feed-heating, the reheating-regenerative and the binary-fluid cycles.

The concurrent laboratory experiments include five (5) tests which are designed primary to apply and substantiate the flow laws which are developed in the class-room work.

(8230 - 6/16/32)

H-4

Term - Winter (3)

Name of Course - THERMODYNAMICS.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Text: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.

Outline of Course:-

In this course, which is the last Thermodynamics course for the groups noted, the principles and information developed in course H-1 are applied in a very concise survey and study of the flow of gases and vapors through the nozzle and various metering devices, of the steam power-plant, the steam turbine and the air compressor, of the properties of gas-vapor mixtures, and of combustion and the internal combustion engine.

The concurrent laboratory work is designed to supplement the class-room work and consists of a series of practical tests of the machines studied.

(8230 - 6/16/32)

H-6

Term - Spring (4)

Name of Course - THERMODYNAMICS.

Hours per week Rec. - 4 P.W. - 4 Lectures -

Texts: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.
Engineering Thermodynamics - Lucke.

Outline of course:-

Continuing the thermodynamic analysis of heat-power machinery as initiated in course H-1 and H-3, a further and rather detailed application of the Thermodynamics is made to the reciprocating steam engine and the steam turbine, to mixtures of gases and gas-vapor mixtures, to combustion in the furnace and internal combustion engine, to the internal combustion engine cycles, to the air and gas compressor and blower and to the refrigerating plant. Brief consideration is also given to the principles of heat transmission.

Concurrent laboratory experiments include tests of a steam boiler, steam turbine, feed-water heater, Otto and Diesel type engines, reciprocating and centrifugal air compressors, refrigerating plant, comparative test of horseshoe and Kingsbury thrust bearings, static and dynamic balancing of a rotor et cetera.

(8230 - 6/16/32)

H-7

Term - Spring (4)

Name of Course - THERMODYNAMICS.

Hours per week Rec. - 4 P.W. - 4 Lectures.

Texts: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.
Kinematics of Machines - Guillet.

Outline of Course:-

Continuing the thermodynamics analyses of heat-power machinery as initiated in courses H-1 and H-3, a further and rather detailed application of the Thermodynamics is made to the air and gas compressor and blower, to mixtures of gases and gas-vapor mixtures, to combustion and to the internal combustion engine. To meet certain subsequent needs of these groups about the last thirty (30) per cent of the course is devoted to kinematic analyses of the form and arrangements of gears, gear trains, cams and valve mechanisms.

Concurrent laboratory experiments include tests of reciprocating and centrifugal air compressors, mechanical, volumetric and thermal efficiency tests of Otto and Diesel Types of internal combustion engines, static and dynamic balancing of a rotor, layouts of gears, gear trains, cams, etc.

(8230 - 6/16/32)

H-8

Term - Spring (4)

Name of Course - THERMODYNAMICS

Hours per week Rec. - 4 P.W. - 4 Lectures -

Texts: Prins. of Engrg. Thermodynamics - Kiefer & Stuart.
Thermodynamics - Ewing.

Outline of course:-

The contents of the first seventy (70) per cent of this course are identical with those of course H-7. During the last thirty (30) percent of the course attention is given to the general thermodynamic equations and their applications, in preparation for subsequent studies of the groups concerned in connection with the physical and chemical aspects of the Thermodynamics.

Concurrent laboratory experiments include tests of reciprocating and centrifugal air compressors, mechanical, volumetric and thermal efficiency tests of Otto and Diesel types of internal combustion engines, static and dynamic balancing of a rotor, problems concerned with transitions from engineering to physical and chemical systems of units, with the liquefaction of gases, et cetera.

(8230 - 6/18/32)

Term - Summer (1)

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 1 P. W. - Lectures -

Texts:- Manual of Eng. Instr.
Stencil #1 to 7.

References: Dept. Commerce Tech. Paper 323, Master specifications for lubricants & liquid fuels.
Bu. Eng. pub. N.Eng. #31, General Info. for Refiners of Petroleum.

Outline of course:-

Study of the Manual of Engineering Instructions, Chapters 36, 10, 5, 4, 2, covering

Fuel Oils
Lub. oils
Fuel oil apparatus
Blowers + oil boilers

in the order given.

Term - Fall (2)

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 1 P.W. - 0 Lectures

Texts: Stencils #8 to 18
Manual of Eng. Inst.

References: P.G. Stencil 8003, Fundamental Prins. of Ship. Elec. Propulsion.

Outline of course:

Study of Manual of Engineering Instructions, Chapters 6, 7, 8, 9, 11, 12, 13, 14 and 15 covering:

Boiler Feed Water and Feed Water Apparatus
Turbine Operation
Care of Turbines
Electric Drive
Diesels
Reduction Gears
Bearings
Propellers
Piping and fittings
Heat Insulation
Pumps
Condensers

in that order.

(8230 - 6/18/32)

Term - Winter (3)

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 1 P. W. - 2 Lectures -

Texts: Stencils #1 to #19
Manual Eng. Instr.

Outline of Course:-

Study of Manual of Engineering Instructions, Chapters 16, 17, 18, 19, 20, 21, 23, 24 & 27 covering:

Distilling Plants
Refrigerating Plants
Compressed Air Plants
Trials, Materials, Inspections
Painting
Power Boat Machinery
Measuring Instruments
Generator Sets.
Searchlights

in that order.

(8230 - 12/2/32)

I-3a

Term - 3

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 2 P.T. 2 Lectures

Texts: P.G.S.Stencils - 1-14 Engineering Manual.

References: (A) Dept.of Commerce Paper 323, Master Specifications for Lubricants and Liquid Fuels
(B) Bu.Eng. Pub. - N.Eng. #31, General Information for refiners of Petroleum.
(C) P.G.S.Stencil #8005, Fundamental Principals of Electric Ship propulsion.

Outline of course:

Study of Manual of Engineering Instructions, Chapters #33, 10, 5, 4, 2, 6, 7, 8, 9, 11, and 12, covering Fuel Oils, Lubricating Oils; Fuel Oil Apparatus; Blowers; Oil Boilers; Boiler Feed Water and Feed Water Apparatus; Turbine Operation; Care of Turbine; Electric Drive; Diesels; Reduction Gears; Bearings; Propellers; Piping.

Practical work, and preliminary Reports covering operation of

Boiler Room
Steam Turbine
Gas Engine
Diesel Engine
Refrigeration Plant (CO_2)

(8230 - 6/18/32)

Term - Spring (4)

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 1 P.W. - 2 Lectures -

Texts:- Stencils ~~11~~ 19 to ~~20~~ 38.
Manual Eng. Instr.

References: Bu. Eng. Forms, N.Eng. 125, 126, 127, 128, 129, 161
N.E.I. 57, 164, N.Eng. 28, 165, 166, 167, 237,
348 B, 348 A, 366.
Current Rules for Eng. Performances
Current Report of Eng. Performances
Aviation Eng. Manual.
Gen. Specs. for Machy. for vessels of the U.S.Navy, issued by Bu. Eng.
Special Specs. for Propelling Machy. issued by Bu. Eng
Leaflet Specs. issued by Bu. S&A
Gen. Instructions to Inspectors of Machinery
Instructions to Inspectors of Naval Material
Gen. Spec. for Inspection of Material.
Bu. Std. Plans, Appendix 1, Gen. Specs. for Machy.
Type A drawings (submitted by contractor with bid)
Type B drawings (working drawings submitted for approval, subsequent to award of contract).
Type C drawings (prepared during progress of work to accompany orders on subcontractors.
Type D drawings (finished drawings submitted after work is completed.
Booklet Plans of Machinery & Record of Elec. Installation (submitted as directed by Bureau)
Painting & cementing of vessels of the U.S.Navy issued by the Bu. of C. & R.
G.O. #66 of 22 June 1922 on "Requests for Work"
G.O. #216 on Allotments
Circular letters, Bu. Eng.
Directory of Bureau. Boards & Offices, Navy Dept.

Outline of course:

Study of Manual of Eng. Instructions Chaps. 28, 30, 33, 35 and 38. Engineering Forms and Logs.

(8230 - 12/2/32)

I-4a

Term - 4

Name of Course - ENGINEERING (MANUAL)

Hours per week Rec. - 3 P.T. -2 Lectures.

Texts: P.C.S.Stencils - 15-38, Engineering Manual.

References: Same as Course I-4

Outline of course:-

Study of Manual of Engineering Instructions, Chapters 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 27, 28, 30, 33, 35 and 39. Covering:-

Heat Insulation; Pumps; Condensers; Distilling Plants; Refrigerating Plants; Compressed Air Plants; Trials, Materials, Inspections; Painting; Power Boat Machinery; Measuring Instruments; Generator sets; Searchlights; Storage Batteries, Radio Compass Equipment; Cognizance of Material; Laying up and re-commissioning machinery; Tables; Study of Engineering Rules; Forms, and Logs.

Practical Work - visits to Commercial Plants.

(8230 - 6/16/32)

J-3

Term - Summer (1)

Name of course - HYDRAULICS - ENGINEERING MEASUREMENTS.

Hours per week Rec. - 3 P.W. - 4 Lectures -

Texts: Hydraulics - Daugherty
Engineering Instruments & Meters - Griffiths.
Mechanical Engineers' Handbook - Marks.

Outline of course:-

The general objectives of the course are the acquisition of an understanding of the fundamental principles of the science of Hydraulics, an understanding of the general methods and instruments employed in making the simpler mechanical engineering measurements and an appreciation of the technic of engineering laboratory procedure.

The class-room course develops the following general subjects in the order stated:- the engineering units for the expression of pressure intensity and the methods of conversion from one to another unit; the steady-flow energy equation and the energy analysis of hydraulic flow; application of the energy equation in the metering of the flow of liquids; the energy losses in the flow of liquids through various types of pipes, fittings et cetera, with attention to the principles of dimensional analysis in correlating and interpreting data on such losses; the dynamic forces associated with liquid flow and the diversion of liquid streams; the pressures and pressure distribution on submerged surfaces; the principles of buoyancy and an analysis of the factors controlling stability in flotation; the general principles of engineering laboratory technic and procedure, giving particular attention to the methods and refinements in pressure, temperature, speed and power measurements.

The laboratory periods are devoted to experiments developing the principles and procedures in the measurements of the following:- temperature, pressure, linear and rotative speed, the clearance volume of a reciprocating machine, the indicated power of a reciprocating machine, the shaft power of machines by several types of dynamometers, the measurement of liquid flow by means of orifices, Venturi meter et cetera, the energy losses in the flow of a liquid through pipes and various types of fittings, the performance of a centrifugal pump.

(8230 - 6/16/32)

Term - Fall (2)

Name of Course:- ENGINEERING MATERIALS II.

Hours per week Rec. - 3 P.W. -2 Lectures -

Text: Resistance of Materials - Seely.

References: Johnson's "Materials of Construction".
Marks "Mechanical Engineers Handbook"
Navy Department Specifications.

This is essentially a course in the Strength or Mechanics of Materials. Each of the following topics is thoroughly discussed and working formulas are derived, particular attention being given to explaining any assumptions that are made in deriving the formulas. Practical problems, drawn from engineering experience are given throughout the course to illustrate the theory. The following topics are covered: stress and strain relations due to tension, compression or shear; temperature stresses, Poisson's ratio; internal stresses in various directions within a body resulting from external forces; equivalent stresses; stresses in beams; moments of inertia of areas; shear and bending moment diagrams, investigation of, determining the safe load for, and designing beams, deflections in simple antilever, built in, and continuous beams; theorem of Three Moments; work of deformation; principle of least work, columns and struts; torsional stresses in shafts; horsepower of shafts; helical springs; thin spheres and cylinders; rivcted joints.

The aim of the laboratory work is three fold; first, to make the student familiar with the ordinary means and methods of making physical tests of materials, second to acquaint him with the principal physical properties of the common materials of construction and, third, to illustrate the theory developed in the classroom. The following tests are made: tensile; compressive; plane shearing; torsional; compression of a helical spring, determination of Poisson's ratio, hardness, bend, transverse or cross breaking of beams, column, impact and endurance.

(8230 - 6/16/32)

Term - Spring (4)

Name of Course - KINEMATICS IV.

Hours per week Rec. - 3 P.W. - 2 Lectures

Text: Kinematics of Machines - Guillet.

References: Theory of Machines - Angus
Elements of Mechanism - Schwamb, Merrill & James.
Mechanism - Dunkerly
Pure Mechanism - Sibley
Mechanism - Krown.

Outline of course:-

This course is a general course in Mechanisms.

A study of constrained motion in mechanisms. A graphical analysis of motion, rules for transmitting motion; link connectors, intermittent motion by linkwork, trains of mechanism; transmitting motion by pure rolling, rolling and sliding contact, spur and annular gears, helical gears, gear trains, etc.

(8230 - 6/16/32)

J-6

Term- Winter (7)

Name of course - MACHINE DESIGN.

Hours per week Rec. - 2 P.W. - 2 Lectures -

Texts: Machine Design - Bradford & Eaton
Machine Design - Hyland & Kommers.

References: Marks Handbook
Machine Design - Leutwiler
Principles of Machine Design - Norman.

Outline of course:-

A study of the elements of machine design; bolts and screw fastenings, force and shrink fits, stuffing boxes and packing, chain and friction drives, lubrication, plain and ball bearings, clutches, brakes, etc. In the laboratory periods the preliminary design of a complete machine is completed and such working drawings as time permits.

(8230 - 6/16/32)

K-2

Term - Fall (2)
Spring (4)

Name of Course - DAMAGE CONTROL.

Hours per week Rec. - 1 P. W.- Lectures -

Texts: U.S. Navy Regulations
Bureau of Construction & Repair Manual.

Outline of Course:-

The ten assignments for this term cover the responsibilities of the First Lieutenant as given in the U.S. Navy Regulations. A study is also made of the Manual of the Bureau of Construction and Repair.

(8230 - 6/16/32)

K-3

Term - Spring (4)

Name of Course - DAMAGE CONTROL.

Hours per week Rec. - 1 P.W. - Lectures -

Text: Bureau of Construction & Repair Manual.

Outline of Course:-

The ten assignments for this term cover a further study of the Bureau of C & R Manual as pertaining to the duties of the First Lieutenant, to the watertight integrity of ships, gas defense, cognizance of material and the allotment of funds for upkeep and equipage.

(8230 - 6/16/32)

K-4

Term - Spring (4)

Name of Course - DAMAGE CONTROL.

Hours per week Rec. - P.W. - Lectures - 1

Texts: Stability of Ships and Damage Control - Bu. C&R Booklet
Stability of Submarines - Bu. C&R booklet.

Outline of course:-

Lectures are given by an officer from the Bu. of C&R on the principles of stability. The use of the diagrams and docking data is explained. The student officers are instructed in the use of the Damage Control charts and the latest in gas defense.

(8230 - 6/7/32)

Term - Fall (2)

Name of Course - COMMUNICATION SECURITY.

Hours per week Rec. 1 hour - P.W. 2 hours - Lectures - 1.

Texts:- Notes on Use of Codes & Ciphers, R.P.S.
Registered Publication Manual
Rules governing the Communication Competition 1933.
R.P.S. Distribution and Allowance Lists.

References: All Navy effective Codes and Ciphers.

Outline of course:-

The purpose of the course is to familiarize the students with the organization and operation of the entire Naval Communication Service. Instruction and practical work in coding and decoding is given in all types of codes and ciphers used by the Navy. TheCommunication Instructions and other publications listed are normally considered as essential background information for the administration of the communication department on board ship.

FALL TERM

Lecture	Recitation	Practical Work
1. Handling of registered publications, responsibilities	Extracts from Notes on Use of Codes & Ciphers pp. 1-22	Navy Service Cipher
2. Organization & Duties Registered Publication Section	Do, pp. 23-41	State Navy Cipher
3. Elementary Cryptanalysis	Do, pp. 42-60	Cylindrical Cipher Device
4. Radio Frequency Operating Plan	Do, pp. 61-83	Enemy Contact Code.
5. Duties of Communication officers Afloat	Registered Publication Manual p. 5-16	Code E and Cipher
6. Correspondence, visual & radio channels	Do, p. 17-35	Code F and Cipher
7. The Communication Competition	Rules for Communication Competition and Part I	Shore Communication Facilities

Communication Security - Cont'd.

Lecture	Recitation	Practical Work
8. N.C.B. Mark II	Do, Part II	N.C.B. in and out messages
9. Reports, Musters, Forms Used in Custody, transfer and destruction.	Distribution and Allowance Lists.	N.C.B. Garbles
10. Duties of Communication Officers Ashore	General Review	Identification of Indicators and codes.

(8230 - 6/8/32)

L-2

Term - Winter (3)

Name of course - COMMUNICATION INSTRUCTIONS & PROCEDURE.

Hours per week Rec. 1 P.W. - 2 Lectures 1.

Texts: General Signal Book
Communication Instructions 1929
Bu. Eng. Abstract forms.

Outline of course:-

During this term the handling of communications by both radio and visual means will be covered in detail. The form and procedure used are of prime importance in maintaining discipline and effecting prompt delivery of messages. The course consists of one lecture, and one Practical Work period each week for ten weeks. (CI = Communication Instructions and GSB = General Signal Book).

Week	Lecture	Prac. Work
1.	Flag Signals Exchanging Calls- Tactical reports- Call systems 2001-2040; 2201-2230; 2301-2330.	Letters & Numerals CI par. 2101-2132 and plates A&B part III	Gen.Sig.Book pp. 1-31
2.	Semaphore system Flashing light " Distinctive & personal flags 2401-2893	Special flags & pennants: CI par. 2133-2150 and plate C Part III	GSB pp. 32-77
3.	Radio Traffic 1000-1052	GSB- Fire Distribution Signals - pp. 91-111	GSB pp.83-90
4.	Message Forms 3001-3032 3101-3142	Abbreviated Procedure 1201-1229 Intercepts 1301-1325 DirectionFinding1401-1425;	Radio Procedure
5.	Commercial Procedure: 1600-1650	CI 101-211; 214-216 301-318	"
6.	Control of Radio 1101-1163	Drafting Messages 501-549	"
7.	General Messages 550-565	Movement Reports & Crr. 566-671; 601-623; 701- 708; 717-718; 725-726	GSB and radio procedure
8.	Govt. Rdo Telegram 728-729; 750, 762	Class D: 730-743; 747-748; 751; 801-811	Visual Procedure
9.	Abstracts 744-748	Aircraft 901-935 Examples 3200, 3301	" "
10.	Class D- Commercial Class E- Unofficial 751-761	General Review	

(8230 - 6/8/32)

L-3

Term - Spring(4)

Name of Course - GENERAL LINE RADIO.

Hours per week Rec. - P.W. - Lectures - 1

Texts:- None

References: Elements of Radio Communication - Morecroft.

Outline of course:-

The course is given in the form of lectures on the essential elements of modern radio. No attempt is made at great detail, nor mathematical theory. The elements covered are resistance of radio circuits, resonance phenomena in single and coupled circuits, radiation and wave propagation, vacuum tubes, systems of transmitting intelligence, and essentials of typical radio circuits.

Lectures -

1. Nature of frequencies, resistance, inductance and capacity as used in radio.
2. Series, parallel and coupled resonant circuits.
3. Characteristics of triodes, types of tubes.
4. Tubes as amplifier.
5. Tubes as modulator and detector.
6. Tubes as oscillator, crystal oscillator.
7. Wave propagation, Direction Finder.
8. Types of receivers.
9. Types of transmitters.
10. Review.

(8230 - 6/16/32)

L-4 A

Term - Summer (1)

Name of Course - RADIO THEORY

Hours per week Rec. - 3 P.W. - 2 Lectures.

Texts: Electricity & Magnetism - Starling
Electricity & Magnetism - Dawes
Problems in Elec. Engrg. - Lyons

Ouline of course:

Class.

1. Introduction to electrostatics.
2. Electric fields and potential.
3. Gauss' Theorem, etc.
4. Charge by influence, Electric machines.
5. Fields about conductors.
6. Quiz.
7. Capacity of various conductors.
8. Energy of electric field.
9. Magnetic field.
10. Continued.
11. Fields about conductors.
12. Quiz.
13. Calculation of magnetic field circuits.
14. Continued.
15. Electromagnetic induction.
16. Self induction.
17. Continued.
18. Mutual inductance.
19. Energy of magnetic fields.
20. Relations between electric and magnetic fields.
21. Nature and properties of resistance and electric current.

Laboratory.

The weekly laboratory period is to be used for problems and personal instruction.

(8230 - 6/16/32)

L-4 B

Term - Fall (2)

Name of Course - RADIO THEORY

Hours per week Rec. -3 P.W. - 2 Lectures

Texts:- Electricity & Magnetism - Dawes
Problems in Elec. Eng. - Lyons.

References: Electricity and Magnetism. - Smith

Outline of course:-

Class

1. Potential drop, work and power.
2. Series and parallel circuits.
3. Kirchoff's Laws.
4. Continued.
5. Batteries.
6. Continued.
7. Quiz.
8. Galvanometers, Shunts.
9. Ammeters and Voltmeters.
10. Continued.
11. Resistance measurement, potentiometer.
12. Power measurement.
13. Watthour meter.
14. Quiz.
15. Magnetization curve.
16. Hysteresis Loop.
17. Continued.
18. Growth and decay of inductive current.
19. Growth and decay of capacitive current.
20. AC principles.
21. Vector diagrams.
22. Quiz.
23. Complex algebra.
24. Resistance, inductance and capacitance in A.C.
25. General series A.C. circuit.
26. Series resonant circuit.
27. Conductance, admittance and susceptance.
28. Parallel resonant circuit.
29. Continued.
30. Review.

Laboratory

1. Wheatstone Bridge.
2. Measurement of Low Resistance.
3. Measurement of High Resistance.
4. Galvanometer Sensitivity.
5. Kirchoff's Laws.
6. Potentiometer.
7. Ammeter and Voltmeter.
8. Ballistic Galvanometer.
9. Watthour meter.
10. Magnetization Curve.

(8230 - 6/16/32)

L-4 C

Term - Winter (3)

Name of course - RADIO THEORY

Hours per week Rec. - 3 P.W. - 4 Lectures.

Texts:- Peters Thermionic Vacuum Tubes.

Outline of course:-

Class

1. Discussion of exam.
2. Coupled circuits.
3. Continued.
4. Continued.
5. Analysis of dc voltage impressed on general series circuit.
6. Continued.
7. Quiz.
8. Introduction to tubes.
9. Tube characteristics.
10. Tube constants.
11. Voltage amplification.
12. Power amplification.
13. Multistage amplification.
14. Ideal transformer theory.
15. Multistage amplifier continued.
16. Quiz.
17. Practical amplifier circuits.
18. Tube as source of AC power.
19. Conditions necessary for 18.
20. Resistance neutralization.
21. Quiz.
22. Oscillating tubes.
23. Mathematical analysis of oscillating tubes.
24. Continued.
25. Crystal oscillators.
26. Types and adjustments of oscillating circuits.
27. Continued.
28. Practical hints on oscillating circuits.
29. Power packs.
30. Review.

Laboratory

1. Hysteresis Loop.
2. Measurement of inductance.
3. " " capacitance.
4. Discharge of capacity through resistance.
5. Measurement of coupled circuit effects.
6. Series resonance curves.
7. Parallel " "
8. Coupled " "
9. Characteristics of triodes.
10. " " tetrodes.
11. Tube constants.
12. Discussion of experiments 9-11.
13. Tube ionization.
14. Resistance coupled amplifier.

Radio Theory Condt.

15. Transformer coupled amplifier.
16. Power Pack.
17. Adjustments of Hartley oscillator.
18. " " Colpitts "
19. Crystal oscillator.
20. Detector characteristics.

(8230 - 6/16/32)

L-4 D

Term - Spring (4)

Name of course - RADIO THEORY.

Hours per week Rec. - 3 P.W. - 4 Lectures.

Texts:- Peters Thermionic Vacuum Tubes.

Outline of course:-

Class

1. Discussion of exam.
2. Physics of modulation.
3. " " detection.
4. Mathematical analysis of modulation and detection.
5. Continued.
6. Continued.
7. Heterodyne detection.
8. Quiz.
9. Analysis of suppressed carrier and push pull.
10. Types of receivers.
11. Superheterodyne.
12. Types of transmitters, single tube.
13. Master oscillator, Power amplifier type.
14. Quiz.
15. RE receiver.
16. " "
17. RG "
18. TV Transmitter
19. " "
20. TP "
21. " "
22. Quiz.
23. TAJ2 transmitter
24. " "
25. TAR "
26. " "
27. RO receiver
28. Wave propagation.
29. " "
30. Review

Laboratory

1. Heterodyne Frequency Meter and Crystal Calibrator.
2-3. RE receiver
4-5. RG "
6-7. RO "
8-9. TP transmitter
10-11. TV "
12-13. TAJ "
14-15. TAR "
16-17. Direction finder.
18. Antenna measurements.
19-20. To be determined later.

(8230 - 6/8/32)

L-5(a)

Term - Summer (5)

Name of Course - RADIO OPERATING.

Hours per week Rec. - P.W. - 10 Lectures -

Texts:- Bunav Training Courses for Radiomen 1929
Communication Instructions 1929

References: Radio School N.T.S. Hampton Roads Courses
" " Bellevue Operating Instructions.

Outline of Course:-

All students considered as having no previous operating experience. A complete understanding of the basic relations of dots, spaces and dashes from the communication instructions, with timing drills on the proper duration of each part of each letter and numeral is essential before students are allowed to use keys. This term receiving is all done by lead pencil, the proper printing of letters as shown in Nav. Training Course is preferable to script writing for accuracy. An enlisted operator or mechanical transmitter is used for all transmitting. At first drills on separate letters, then letters in pairs, mixed letters and numerals, then mixed code groups, with a gradual increase of speed. Although a two hour drill is mentally tiring, it is essential to compel a sub-conscious recognition of signals, and several short rest periods can be permitted. In transmitting the accurate spacing and regularity must be carefully criticized, a tape recorder will give convincing evidence to the student of his faults and errors. All code messages should be used with gradual inclusion of headings. Plain language should be avoided as it is apt to create inaccuracy due to reduced concentration.

(8230-6/8/32)

L-5(b)

Term - Fall (6)

Name of Course - RADIO OPERATING

Hours per week Rec. R-6 V-2 P.W.- Lectures -

Texts:- Bunav Training Courses for Radiomen 1929
Communication Instructions 1929

References: Radio School N.T.S. Hampton Roads Courses
" " Bellevue Operating Instructions.

Outline of course:-

The coordinating of radio reception and touch typing must be done at considerably lower speed than reception with lead pencil. During the previous term both typing and reception should attain fairly high speed, for their combined use it is desirable to conduct drills as slowly as necessary for the majority of the group to take perfect reception. Increases in speed can be made so that the group average will be about 70% perfect in reception. The "hump" in reception will appear at about 15 words per minute, but it is the continuous effort to receive at higher speed that will gradually pull each student over the "hump". This is the critical point in reception, and increases in speed must be cautiously made and special attention paid to the slower students. Messages can be varied so as to be evenly divided between code and plain language, headings used on all messages to be analyzed and understood by each student. During the latter part of the term intercept messages can be copied.

The visual group instruction follows in general that of the radio group, but with less time applied progress will be considerably slower. The subconscious translation of Morse characters into plain letters is most readily attained by radio drill and is also valuable as the basis of blinker and searchlight.

(8230-6/8/32)

L-5(c)

Term - Winter (7)

Name of Course - RADIO OPERATING.

Hours per week Rec. R-3 V-1 P.W.- Lectures -

Texts: Bunav Training Courses for Radiomen 1929
Communication Instructions 1929

References: Radio School N.T.S. Hampton Roads Courses
" " Bellevue Operating Instructions.

Outline of course:-

An enlisted operator (one good man used for all drills is preferable) using a file of messages of old intercept schedules sending entire messages at intercept speed prepares the students for more complete copying of intercept schedules. Intercept schedules should be copied daily when available during study periods. The transmitting speed of drills can be increased so that drill messages will habitually be over the maximum intercept speed. During this term students' transmission accuracy and speed can be brought up by use of drill sets at home. Frequent check of each student on the key with criticism of his position and quality of transmission is necessary. The ability to meet the requirements of the Communication Competition for radio officers should be attained.

The visual group will be considerably behind the radio group and special attention must be given to their accuracy of reception rather than speed.

(8230-6/8/32)

L-5(d)

Term- Spring (8)

Name of Course - RADIO OPERATING

Hours per week Rec. R-3 V-1 P.W.- Lectures -

Texts:- Bunav Training Courses for Radiomen 1929
Communication Instructions 1929

References: Radio School N.T.S. Hampton Roads Courses
" " Bellevue Operating Instructions.

Outline of Course:-

For the advanced group (Radio) messages in plain language and code are used, transmitted mechanically or by enlisted operator at speeds well above competition requirements. Received messages from each student must be checked for accuracy of reception.

For the visual group who have spent less time on receiving drill speed shall be reduced so that majority of group can make 90% copy, the speed regulated accordingly. It is undesirable to set an objective as regards speed, emphasis being given to accuracy of reception for assistance in other means of communication.

Student ability in transmitting must be closely criticized, alphabet drills being used to overcome faulty keying. The use of correct procedure will be stressed in all operating practices.

(8230-6/8/32)

L-6(a)

Term - Fall (6)

Name of Course - VISUAL OPERATING.

Hours per week Rec. R-2 V-6 P./.- Lectures -

Texts:- Bunav Training Courses for Signalmen 1929
Communication Instructions 1929.

Outline of Course:-

In this course the student officers are trained in transmitting and receiving messages by semaphore and flag hoist. In semaphore the speed of transmission must be kept down in the interest of form and accuracy. The tendency for short-arm semaphore must be violently discouraged in order to improve accuracy and distance. Code messages tend to improve clarity and accuracy for beginners. Later, plain language messages will automatically develop speed as required in Bunav Training Course. About 25% of the time, outdoor drills will be found impracticable. This time is used to develop familiarity with flags used in signalling. The use of the General Signal Book in handling flag hoists is of great assistance in learning the flags. Each student should be able to reproduce from memory all alphabet and number flags, and all numeral and special pennants.

(8230 - 6/8/32)

L-6(b)

Term - Winter (7)

Name of Course - VISUAL OPERATING.

Hours per week Rec. R-3 V-6 P.W.- Lectures-

Texts: BuNav Training Course for Signalmen 1929
Communication Instructions 1929

Outline of course:

All students are now well familiar with code in its sound application. In blinker and searchlight the coordination of the eye is entirely different from that of the ear with the mind. Consequently slow speed and accurate spacing is necessary for the beginner. The ability of the student develops rapidly, and a sharp maximum of speed is found to depend on persistance of vision at about 18 words per minute. Accuracy in reception must be demanded from the very beginning. Student transmission required constant supervision and criticism, and readibility and clarity take precedence over speed. The equipment used simulates shipboard installation representing yardarm blinker (with proper light intensity) and searchlight transmissions.

(8230 - 6/8/32)

L-6(c)

Term - Spring (8)

Name of Course - VISUAL OPERATING

Hours per week Rec. R-3 V-6 P.W.- Lectures

Texts: Bunav Training course for signalmen 1929
Communication Instructions 1929

Outline of Course:-

Student ability to qualify as signal officers in all means of visual communications requiring thorough familiarity with the Signal Book is the objective of this course. The radio group should be able to pass this test, the visual group to go well beyond in both quality and accuracy of transmissions and reception. The time allotted to each system, flashing light, semaphore and flags will depend largely on the average ability of the groups, the largest percentage of time being given to that system in which the majority find difficulty. Each student is expected to develope sufficient proficiency to intelligently direct, train and supervise communication personnel and to conduct fleet drills and supervise fleet traffic.

(823046/8/32)

L-7

Term - Summer (5)

Name of Course - RADIO ENGINEERING.

Hours per week Rec. R-3, V-3 P.W.- Lectures-

Texts:- Robison's Manual of Radio Telegraphy
Henney's Principles of Radio
Lyon's Problems in Electrical Engineering.

Outline of course:-

Summer Term - Combined Groups.

1.	Electric charges, Fields of Force, etc.	Lecture
2.	Electric potential, Gauss' Theorem.	"
3.	Problems on above.	Lyons
4.	Electric field and potential gradient	Lecture
5.	Problems	Lyons
6.	Charge by influence, Electric machines	Lecture
7.	Quiz.	
8.	Farady's ice pail experiment, Field about plane surface.	"
9.	Fields and capacities of various forms	"
10.	Energy of condenser and space	"
11.	Problems	Lyons
12.	Magnetic fields	Lecture
13.	Self inductance.	"
14.	Continued, Energy of a magnetic field.	"
15.	Quiz	
16.	Relations between electric and magnetic fields.	"
17.	Wave propagation.	
18.	Growth and decay of current in inductive circuit.	
19.	Complex algebra.	
20.	Mutual inductance.	
21.	Continued.	
22.	Quiz.	
23.	Growth and decay of current in cap. circuit,	
24.	Analysis of resistance, inductance and capacitance circuits.	
25.	Power in A.C. circuits.	
26.	Vector diagrams, General series circuit.	
27.	Series resonance.	
28.	" "	
29.	Review.	
30.	" ,	

(8230 - 6/8/32)

L-8

Term - Fall (6)

Name of Course - RADIO ENGINEERING.

Hours per week Rec. R-4, V-4 P.W. R-2, V-2 Lectures-

Texts:- Robison's Manual of Radio Telegraphy
Henney's Principles of Radio
Lyon's Problems in Electrical Engineering.

Outline of Course:-

Fall Term - Combined Groups

1. Discussion of exam.
2. Admittance, conductance and susceptance.
3-6. Parallel resonant circuits.
7. Problems.
8-9. Coupled circuits.
10. Quiz.
11. Tube, actions & types.
12. " , characteristics and constants.
13. Development of plate circuit theorem.
14. Measurement of tube constant.
15. Action of tube as amplifier,
16. Voltage and power amplification.
17. Interstage coupling.
18. Multistage amplification.
19. Push Pull amplification,
20. Radio Frequency amplification.
21. Quiz.
22. Practical amplifier circuits.
23. " " "
24. Modulation.
25. "
26. Demodulation.
27. "
28. Automatic volume control.
29. Grid circuit detection and Heising modulation.
30. Mathematical analysis of mod. and detection.
31. Quiz.
32. Power packs.
33. Oscillating tubes.
34. " "
35. Crystal oscillator.
36. Practical oscillator circuits and adjustments.
37. " " " " "
38. Mathematical analysis of oscillating circuits.
39. Review.
40. " .

Radio Engrg. - Cont.

Laboratory Experiments

Radio and Visual Groups

1. Series resonance.
2. Parallel resonance.
3. Coupled "
4. Tube characteristics and constants.
5. Construction of amplifier circuits.
6. Detector characteristics.
7. Problems on 6.
8. Construction of power packs.
9. " and adjustments oscillators.
10. " of crystal oscillators.

Term - Winter (7)

Name of Course - RADIO ENGINEERING.

Hours per week Rec. R-3 V-1, P.W. R-2 V-2 Lectures -

Texts: Robison's Manual of Radio Telegraphy
Henney's Principles of Radio
Lyons Problems in Electrical Engineering.

Outline of Course:-

Winter Term - Radio Group

1. Discussion of exam.
2. Simple detector receiver.
3. Regenerative type and neutrodyne.
4. Screen grid RF amplifier.
5. Superheterodyne receiver.
6. " "
7. Quiz.
8. Single tube transmitter.
9. Master oscillator, power amplifier transmitter, multipliers.
10. Heterodyne Frequency Meter.
11. " " "
12. Quiz.
13-16. R.E. receiver.
17-18. R.G. "
19. Crystal frequency calibrator.
20. Crystal frequency indicator.
21. Quiz.
22-25. Marshall experimental receiver.
26-28. T.P. Transmitter.
29-30. Review.

Winter Term - Visual Group

1-3. Types of receivers.
3-4. " " transmitters.
6. Quiz.
7. Heterodyne frequency meter.
8. Crystal frequency calibrator.
9. Crystal frequency indicator.
10. Review.

Radio Engrg. - Contd.

LABORATORY EXPERIMENTS.

Radio Group.

1. Impedance bridge.
2. Measurement with impedance bridge.
3. " " " "
4. Heterodyne Frequency meter and Crystal calibrator.
5. Calibration of R.E. receiver.
6. " " " "
7. " " R.G. "
8. " " " "
9. T.P. transmitter.
10. " "

Visual Group

1. Impedance Bridge.
2. Measurements with impedance bridge.
3. " " " "
4. Practice with R.E. receiver.
5. " " " "
6. " " R.G. "
7. " " " "
8. To be determined later.
9. Heterodyne frequency meter and crystal calibrator.
10. " " " " " "

(8230 - 6/8/32)

L-10

Term - Spring (8)

Name of Course - RADIO ENGINEERING

Hours per week Rec. R-3 V-1 P.W. R-2 V-2 Lectures -

Texts:- Robison's Manual of Radio Telegraphy
Hemney's Principles of Radio
Lyons Problems in Electrical Engineering.

Outline of Course:-

Spring Term - Radio Group

1. Discussion of examination.
2-4. T.V. transmitter.
5-6. X.C. "
7-9. TAJ2 "
10. Quiz.
11-13. Properties of antennae.
14-16. Wave propagation.
17. Quiz.
18-20. Radio direction finding.
21-22. Facsimile transmission.
23. Quiz.
24-26. Television.
27. Spark and Arc.
28. Alternators.
29-30. Review.

Spring Term - Visual Group

1-2. R.E. receiver.
3. R.G. "
4. Marshall "
5-6. T.P. transmitter.
7. Quiz.
8-9. Direction finder.
10. Review.

Radio Engrg. - Cont.

LABORATORY EXPERIMENTS.

Radio Group.

1. T.V. transmitter.
2. " "
3. X.C. "
4. TAJ2 "
5. " "
6. Antenna constants.
7. Radio Direction Finder.
8. " " "
9. To be determined later.
10. " " " "

Visual Group.

1. Calibration of R.E. receiver.
2. " " " "
3. " " R.C. "
4. " " " "
5-6. TP transmitter.
7-8. TV "
9. TAJ2 "
10. Direction finder.

(8230 - 3/8/32)

L-11

Term - Fall (6)

Name of Course-COMMUNICATION INSTRUCTIONS.

Hours per week Req.- 2 P.W. -4 Lectures

Texts:- Communication Instructions 1929
Rules Governing the Communication Competition 1933
Naval Shore Radio Facilities
Fleet Radio Frequency operating Plan
R.P.S. Distribution and Allowance Lists
General Signal Book.

Outline of Course:-

A detailed study and discussion of the Communication Instructions and the general signal book require the larger part of this term's work. Part one and two of the instructions with emphasis on procedure and handling of traffic are gone over in great detail. The General Signal Book is also subjected to detailed analysis and study. Abstracting of messages, the handling of communication funds and several trips to nearby naval communication activities are used to acquaint the student with general communications.

Week	Lesson Assigned	Text	Practical Work
1.	1. pp. 1-5 2. pp. 6-13 3. pp. 14-23 Inc.	CI part I " "	1. GSB pages 1-31. 2. " " 32-77.
2.	4. Quiz pp. 1-23 5. pp. 24-28 6. pp. 28-34 top	" " "	3. " " 83-90 4. Inspection trip Radio Test shop, Wash. D.C.
3.	7. pp. 34-37 middle 8. pp. 37-40 9. Quiz pp. 23-40	" "	5. GSB drill corpen& Deploy 6. " " Emerg. & Form.
4.	10. pp. 41-44 11. pp. 45-49 12. pp. 50-55 middle	" "	7. " " Position& Speed 8. Inspection trip Radio mfg Dept. Wash.Navy Yard.
5.	13. pp. 55-60 top 14. Quiz pp. 41-60 15. pp. 60-67	" "	9. GSB drill Turn&Anchoring 10. " " Gunnery Sigs.
6.	16. pp. 67-72 17. pp. 72-79 18. pp. 80-88	" " "	11. " " Gunnery Sigs. 12. Inspection trip Annapolis Hi-power.

Comm. Instrs. - contd.

Week	Lesson	Text	Practical Work
7.	19. Quiz pp. 80-88	CI part I	13. GSB Drill One letter sigs
	20. Review all.	"	14. " " Three " "
	21. pp. 1-4	CI part II	
8.	22. pp. 4-7	"	15. " Review
	23. pp. 8-12	"	16. Inspection trip Arlington Hi-power
	24. pp. 13-20		
9.	25. pp. 21-26	"	17. Commercial AbstractForms
	26. pp. 29-32	"	18. Class E - typical examples.
	27. Quiz p. 1-32	"	
10.	28. Radio Frequency Op. Plans		19. Class D - Typical Examples.
	29. Holidays & Reviews		20. Inspection trip radio Central, Navy Dept.
	30. " " "		

(8230 - 6/8/32)

L-12

Term - Winter (7)

Name of Course - COMMUNICATION INSTRUCTIONS

Hours per week Rec. - 3 P.W. - 4 Lectures

Texts:- Communication Instructions 1929
General Signal Book
U.S.Fleet Letter #21-30 Communication Competition Questions
Bureau of Engineering Manual
Fleet Radio Frequency Operating Plan.

Outline of course:-

Practical application of radio and visual procedure stressing the communication instructions. Handling of confidential and secret publications, use of form reports.

Week	Recitation	Practical work
1	1:Part II, C.I. pp. 33-39	1:C-in-C type ques. 1-21
	2: " " " " 39-44	2:Gen.Signal Book Drill
	3: " " " " 45-49	
	4:Quiz on pp. 32-39	3:C-in-C type ques. 22-42
2	5:Part IV, CI. pp. 1-7	4:G.S.B.
	6: " (Also stencil)8-17	
	7: " 66-73	5:C-in-C type ques. 43-63
3	8:Quiz on Part IV	6:G.S.B.
	9:Part III, C.I. pp. 1-6	
	10: " " " 7-23	7:C-in-C Op. ques. 1-25
4	11: " " " 24-32	8:G.S.B.
	12: " " " 33-39	
	13: " " " 40-50	9:C-in-C Op. ques. 26-50
5	14: " " " 51-62	10:G.S.B.
	15:Quiz on Part III	
	16:Bu.Eng.Manual Ch. 31	11:C-in-C Op. ques. 51-75
6	17: " " " Ch.32 (1-13)	12:G.S.B.
	18: " " " " " (13-34)	
	19: " " " Ch. 30	13:C-in-C Op. ques. 76-98
7	20:Radio Freq.Op.Plan Apr1931	14:G.S.B.
	21:Quiz on lessons 16-20 inc.	
	22:Seminar #1, & 2	15:Radio Procedure Examples
8	23: " #3,& 4	16:G.S.B.
	24: " #5 & 6	
	25: " #7 & 8	17:Radio Procedure Examps.
9	26:Commercial Abstracts	18:Trip Navy Dept. (Commercial Traffic Office)
	27:Comm. Competition 1-17	
	28: " " 17-23	19:Radio Procedure Examps.
10	29:Holidays & Review	20:Use of Radio Op. Signals
	30: " " "	

Comm. Instrs. - Cont'd.

Seminars: Proceedings Inst. Radio Conference
Communications in the British Empire.

(Type Examps) Proceedings Institute Radio Eng.
Navy Radio Sets, Classifications
International Telegraph Convention
Radio Commission Proceedings
Radio Aids to Navigation.

(8230 - 6/8/32)

L-13

Term - Fifth.

Name of Course - COMMUNICATION INSTRUCTIONS.

Hours per week Rec. - 2 P.W. - Lectures -

Texts: Communication Instructions 1929
Naval Shore Communication Facilities
U.S.Fleet letter #21-30 Comm.Comp.Type Questions.

References: Fleet Radio Freq. Operating Plan.

Outline of course:

This course uses the Navy Communication Instructions as a text. Its purpose is to thoroughly familiarize the communication engineers with the standard procedure in use for radio and visual communications, with the scope of navy communications and with the importance of the rules for drafting messages. Numerous examples in routing and procedure are used to impress the points involved on the students.

1.	CI - Part I, Chap. 1-4 Inc.	
2.	" " " 5	1st Week
3.	" " " 6, 7 through p. 54	
4.	" " " 7 through p. 70	2nd Week
5.	" " " 7 to end	
6.	" Part IV to page 11	3rd Week
7.	" " to 2 inc.	
8.	Quiz.	4th Week
9.	CI - Part II, Chap. 10 and 11	
10.	" " " 12 - 15 Inc.	5th Week
11.	" " " 16	
12.	" Part III, " 20, 21 through p. 15	6th Week
13.	" " " 21, 22, 23	
14.	" " " 24, 25, 26	7th Week
15.	" " " 27, 28	
16.	Quiz.	8th Week
17.	Shore Communication Facilities	
18.	R.P.S. #3	9th Week
19.	R.P.S. #4	
20.	Radio Frequency Operating Plan	10th Week

(8230 - 6/8/32)

L-14

Term - Winter (7)

Name of course - COMMUNICATION ORGANIZATIONS.

Hours per week Rec. - 2 P.W. - Lectures -

Texts:- Navy Regulations 1920
Staff Instructions, U.S.Fleet
Communication Instructions 1929
Ships Communication Organizations (All types)

References: Radio Corporation of American Organization
American Tel. & Tel. Co. "
Western Union & Postal Telegraph "
International Tel. & Tel. Co. "
British Postal Communication Services
War College Lectures on Organization.

Outline of Course:-

An analysis of the basic principles of organization as applied to the Communication Services of the Navy, various Commercial Systems and the British Empire.

After the fundamental functions of the parts of all organizations are familiar to the students, the seminar system of having each student concentrate on a single system and present the information he has gathered from texts, current periodicals and direct contact, as a lecture to the group.

This course will require close attention by the supervising instructor and can be developed into a very valuable asset for the student officers.

(8230 - 6/8/32)

L-15

Term - Winter (7)
Spring (8)

Name of Course - OPERATING PROCEDURE

Hours per week Rec. - P.W. - 2/4 Lectures.

Texts: Communication Instructions 1929.

Outline of course:-

The students' training in reception, and in familiarity with the Communication Instructions has been conducted separately up to this point in the course. It is now highly desirable to combine the two by the actual handling of messages in a circuit simulating operating conditions afloat. A squadron of destroyers, with division flagships, during maneuvers is found to be excellent drill in operating procedure. Each student takes the call letters representing a ship or flag, calls and answers are made collective and individual; messages transmitted, corrections made and receipts given. Each doubtful point encountered is looked up in the Instructions and a working familiarity with actual traffic problems is obtained, meantime handling the key and guarding a circuit is practically demonstrated.

(8230 - 6/8/32)

L-16

Term - Fifth.

Name of Course - COMMUNICATION SECURITY

Hours per week Rec. - 1 P.W. 2 Lectures

Texts:- Notes on Use of Codes and Ciphers
Rules for Communication Competition
Elements of Cryptanalysis

References: All effective Naval Codes and Ciphers.

Outline of course:-

The student officers in this group have had communication experience afloat and are already familiar with fleet practice in use of codes and ciphers. To bring their knowledge up to current practice and to impress the importance of protection against compromise and the reduction of garbling is theobjective of this course.

	Recitations	Practical Work
1.	Elements of Cryptanalysis Sect. 1-5	Elementary Cipher Solution
2.	" Sect. 6-9	Navy Service Cipher and Cylindrical Cipher
3.	" Sect. 15-18	Enemy Contact Code State-Navy Cipher
4.	" Sect. 19-24	Problems Monthly Bulletins
5.	Notes on use of Codes & Ciphers p. 1-22	Trip - DNC Application of Cryptanalysis
6.	" p. 23-41	Code E and Cipher
7.	" p. 42-60	Code F and Cipher
8.	" p. 61-83	Trip - Organization R.P.S. C.N.O.
9.	Rules for Communication Competition and Part I	NCB coding and decoding
10.	Comm. Competition Part II	NCB garbles

(8230 - 6/8/32)

L-17(a)

Term - Summer (5)

Name of Course - COMMUNICATION SECURITY.

Hours per week Rec. - 2 P.W. 2 Lectures

Texts: Notes on Use of Codes & Ciphers
Instructions for various Navy Codes & Ciphers
RPS #4, 6

References: All effective Naval Codes & Ciphers.

Outline of course:-

This course deals with the Navy's Secret and Confidential Publications, the instructions for their care, handling and protection with the objective of impressing the student officers with the serious consequences of loss and compromise of important information. A working familiarity with all the code and cipher systems employed, is developed, with emphasis on the necessary protective measures.

Week	Lesson Assignment	Text book	Practical Work
1.	1. Sects. 1-4 inc. 2. " 5-8 "	Notes on Use of Codes and Ciphers "	Navy Service Cipher.
2.	3. " 9-12 " 4. " 13-16	" "	Cylindrical Cipher
3.	5. " 17-19 " 6. " 20 Finish	" "	Enemy Contact Code
4.	7. Quiz. 8. First Half	" R.P.S. #4	State Navy Cipher
5.	9. Last Half 10. All text.	" R.P.S. #6	Code E and Cipher
6.	11. All tables 12. Instructions for	" use N.C.B.	Code F & Cipher
7.	13. Pages 1 - 5 14. " 10 - 21	Radio Intelligence & Comm. Security	N.C.B.
8.	15. Lecture 16. "	Care & Handling of Registered Publications	N.C.B.& Garbles
9.	17. Pamphlet 18. Chap. 3 Security	Naval Shore Facilities Communication Instr.	Trip Organization CNO - RPS
10.	19. General Review 20. " "	All books " "	Identification of codes & ciphers by inspection.

(8230 - 6/8/32)

L-17(b)

Term - Fall (6)

Name of Course - CRYPTANALYSIS

Hours per week Rec. - 2 P.W. -2 Lectures

Texts: Elements of Cryptanalysis

Ouline of course:

The study of cryptanalysis is an analytical and logical training in methods of attack. This training is applicable to all problems requiring systematic and continuous attack, and is particularly useful in enabling the student to avoid the most common errors and exposures made in using codes and ciphers, as such mistakes usually present a conspicuous vulnerable point to an experienced cryptanalyist.

Week	Recitation Assignment	Practical Work
1	Sections 1 - 3 Inc.	Substitution Cipher - standard alphabets
2	4 - 6 "	Substitution Cipher - single mixed alphabets.
3	7 - 9 "	Substitution Cipher - standard polyalphabets
4	10 - 12 "	Substitution cipher - mixed polyalphabets
5	13 - 15"	Transposition ciphers
6	16 - 18 "	Numberical ciphers, type recognition
7	19 - finish	Problems monthly Comm. Bulletin
8	Review or Quiz	Trip to Cryptographic Sec., Naval Communications
9	Cylindrical Cipher - development of attack.	Cylindrical cipher using known words to solve
10	RPS - elementary cipher solution	RPS - Elementary cipher solution.

(8230 - 6/13/32)

L-18

Term - Summer (5)

Name of Course - RADIO OPERATING.

Hours per week Rec. - 3 P.W. - 2 Lectures

Texts: Bureau Nav.Training Courses for Radiomen 1929.

Outline of course:-

This group was required to take radio officers operating test before assignment to the Postgraduate School, but have had no opportunity for practice during their first year in technical work at the Postgraduate School.

This course serves to refresh and improve their operating ability, so that each student is able to meet the requirements of the Communication Competition; necessary for proper supervision and training of operators afloat. It has been found that a few of the students are well advanced while others in the group require additional time to bring their operating ability up to the standard.

(8230 - 6/13/32)

L-19

Term - Summer (5)

Name of Course - TYPEWRITING

Hours per week Rec - 3 P.W. -2 Lectures

Texts: New Rational Typewriting - Sorelle.

Outline of Course:-

The self-instruction method is used, but due to the limited time available, close supervision is required by the instructor. Students must be warned that lack of facility on the typewriter will seriously handicap them in their later advanced radio operation ability and also retard their work in War College Course.

Those students falling behind the group should put in extra time outside of class, - those going ahead of the group should be carefully observed to see that accuracy and fingering are not being neglected.

Experience has shown that an average radio operator can only copy messages at about one half his normal typewriting speed. Hence the desirable typewriting objective should be between 45 and 50 words per minute.

(8230 - 6/13/32)

L-20

Term - Spring (8)

Name of Course - COMMUNICATIONS DEVELOPMENT.

Hours per Week Rec - 3 P.W. - 2 Lectures

Texts:- Robison's Manual of Radio Telegraphy.
File of Bu.Eng. Monthly Radio & Sound Reports
Current Bu.Eng. Letters re Radio Material.

Outline of course:-

This course is a historical rather than technical development of communication material. By familiarizing the students with the background of the improvements made in receivers, transmitters, vacuum tubes, etc. the student obtains an understanding of basic principles which will adapt him to analyse, install and test the newest equipment when received on board ship.

The practical work is largely the tuning, calibration and operation of modern radio transmitters and receivers, simulating actual conditions of installation and operation afloat.

Week:		Lecture	Practical Work.
1.	:1	Storage batteries (Types)	1- 936 Receiver-Transmitter
	:2	" " (care)	
	:3	" " (circuits)	
2.	:4	Frequency spectrum	2 RE receiver
	:5	" standards	
	:6	" adjustment	
3.	:7	Inductance	3 RG receiver
	:8	Capacity	
	:9	Resistance	
4.	:10	Transmitters-early types	4 Trip Arlington High Power
	:11	" development	
	:12	" modern trend	
5.	:13	Receivers - early types	5 Heterodyne Freq. Meter
	:14	" development	
	:15	" modern trend	
6.	:16	Supersonics - Theory	6 Crystal calibrators
	:17	" installation	
	:18	" operation	
7.	:19	Television - theory	7 Television demonstration
	:20	" transmission	
	:21	" reception	
8.	:22	Seminar - V.T. detectors	8 TP transmitter
	:23	" " amplifiers	
	:24	" " oscillators	
9.	:25	" " modulators	9 TV transmitter
	:26	" "new type tubes	
	:27	" Peculiarities of high frequency	
10.	:28	" Piezo Elec.Crystals	10 X type transmitters
	:29	General Review	
	:30	" "	

(8230 - 6/13/32)

L-21

Term - Summer (5)

Name of Course - RADIO ENGINEERING

Hours per week Rec. - 3 P.W. - 2 Lectures

Texts:- Peters, "Thermionic Vacuum Tubes".

Outline of Course:-

1. Discussion of Exam.
2. Mathematical analysis of modulation.
3. Mathematical analysis of detection.
4. Continued.
5. Continued.
6. Analysis of heterodyne detection.
7. Surpressed carrier transmitter, push pull amplifier.
8. Analysis of radio frequency amplification.
9. Continued.
10. Types of receiving sets, regenerative, neutrodyne.
11. Screen grid amplification, supergenerator.
12. Continued.
13. Types of transmitters, single tube.
14. Master oscillator power amplifier.
15. Antenna properties.
16. Radiation and wave propagation.
17. Direction finders.
18-19. RE receiver.
20-21. RG receiver.
22. Heterodyne Frequency Meter, Crystal calibrators.
23-24. TP Transmitter.
25-26. TV Transmitter.
27-28. TAJ Transmitter.
29. XC Transmitter.
30. Review.

Laboratory

1. Detector characteristics.
2. Modulating circuit.
3. Antenna measurements.
4. RE receiver.
5. RG receiver.
6. TP transmitter.
7. TV transmitter.
8. TAJ transmitter.
9. XC transmitter.
10. Direction finder.

(8230 - 6/13/32)

L-22

Term - Winter (7)
Spring (8)

Name of Course - NAVAL ETIQUETTE

Hours per week Rec. R-1 R-0 P.W. - Lectures -
V-2 V-2

Texts: Navy Regulations
Navy Boarding Book
Etiquette - Emily Post
Who's Who

References: Foreign Publication on Naval Customs & Traditions
Customs and Traditions by former Admirals.

Outline of course:-

This is a new course, having as a mission to develop in the students a finer recognition of the customs, traditions and courtesies of the old Navy and a working familiarity with honors, salutes and ceremonies as they should be given. The students of this group are available for staff duty, although they may not be so assigned immediately. Subject material is listed under Naval Etiquette section of the General Line Bookshelf and will retuire considerable building up to develop the course and assign reading and recitation material.

(8230 - 6/13/32)

L-23

Term - Spring (8)

Name of Course - DIRECTION FINDING.

Hours per week Rec. R-1 P.W. R-2 Lectures

Texts:- Bureau Eng. Manual Chapter 30
" " " " 32
Current Fleet Orders.

References:- Monthly Radio & Sound Reports, 1925 to 1932.
Parts RD, RS, Rules governing the Communication Comp. 1933.

Outline of course:-

This is a new course intended to thoroughly familiarize the student with the principles and practical operation of Direction Finding equipment, including sonic, supersonic and radio direction finding. Orientation, calibration and compensation and the preparation and use of the necessary charts will give the student a practical understanding that should reflect in improved operating conditions afloat. Theory and principles have been covered under courses L10 and L20, hence this course should concentrate on operation under service conditions with emphasis on the accuracy and reliability.

(8230 - 6/13/32)

L-24

Term - Spring (8)

Name of course - NAVAL FILING SYSTEMS.

Hours per week Rec. - V-2 P.W.- Lectures -

Texts:- Navy Filing Manual
Communication Instructions.

Outline of course:-

This is a new course with the objective of indoctrinating the student officer in the standard system of filing as given in the Navy Filing Manual. Conditions of correspondence files afloat and ashore reflect the lack of intelligent supervision. The Navy Filing Manual, if understood and adhered to will prevent any confusion or incorrect classification. Current orders and practice in handling files of despatches should be fully understood. Drills in classification, in preparing files for newly commissioned vessels and in locating correspondence can be profitably used. Further development of the course is necessary to fulfil its mission of improving filing conditions.

(8230 - 6/23/32)

L-25

Term - Spring (4)

Name of Course - RADIO ENGINEERING.

Hours per week Rec. - 3 P.W. - 4 Lectures.

Texts: Morecroft - Principles of Radio Communication
Peters - Thermionic Vacuum Tubes.

Outline of course:-

This is a continuation of the course entitled "A.C. Theory" given in the preceding term. It carries on the work of that course from resonant circuits of the series, parallel, and coupled types, through transient phenomena, to a study of the basic principles of the vacuum tube and its actions as amplifier, oscillator and detector. This work is to be continued in a fifth term.

The laboratory experiments are designed to illustrate the principles studied where possible.

(8230 - 6/10/32)

Term - Summer (1)

Name of Course - NAVIGATION

Hours per week Rec. 2 P.W. 2-1/2

Texts: Pamphlets
Principles of Meteorology
Types of Gales & Storms
Weather Forecasting
Organization of Weather Bureau
Bu. Aero. Preparation of Weather Maps
Dept. Agriculture, Weather Forecasting.
Notes on Hydrographic Surveying
Dutton, Navigation and Nautical Astronomy.

References: H.O. 207 New Dynamical Wave - Theory of the Tides
Light and Buoy List
Tide and Current Tables
U.S. Coast and Pilot Charts
Bowditch, Practical Navigation
Maguire, Aerology
Elements of Hydrographic Surveying.

Outline of Course:-

The course in Navigation is continuous through the school year, with an allotment of time in each term as follows:

Summer	2 - 1;	Winter	2 - 1;
Fall	2 - 0;	Spring	2 - 1.

Total: 80 recitations, 30 practical work periods.

Mission:

"To instruct and train the general line student in the theory and practice of navigation, to the end that he may graduate from the school fully equipped to assume and carry out the duties of navigating officer aboard any vessel to which he may be assigned".

Navigation - Contd.

Term Assignments.

Week	1st Assignment	1st Recitation	2nd Assignment	2nd Recitation	Practical Work
1.	Pamphlet Principles of Meteorology	Principles of Meteorology	Bu. Aero. Pamphlet #24 - 1930	Construction of Weather Charts	Weather Chart #1
2.	Pamphlet: Types of Storms & Gales	Storms	Pamphlet: Org. of US Weather Bu.	Operation of U.S. Weather Bu.	Weather Chart #2
3.	Pamphlet: Weather Forecasting	Weather Forecasting	Pamphlet: Weather Forecasting from Synoptic Charts	Quiz	Visit to Aerological Off. Luce Hall, Naval Academy
4.	Chaps. I&II Dutton	Mercator Charts and the sailing	Chap. IV Dutton	Great Circle sailing	Great Circle Sailing
5.	Chap. V Dutton	Description of H.O. Publications	Chap. V Dutton	Methods & possible Errors in fixing position	Radio and Piloting Prob. #1
6.	Pamphlet: Notes on Hydrographic Surveying	Methods and Organization of Hydrographic Surveying	Notes on hydrographic Surveying Review	Limited harbor survey Review	Visibility of lights. Piloting Prob. #2

Term - Summer (1)

Name of Course - NAVIGATION.

Hours per week Rec. - P.W. - 2 Lectures -

Texts: Dutton's Navigation & Nautical Astronomy
Bowditch - Practical Navigator.

References: Tide and Current Tables
Light and Buoy Lists
U.S.Coast Pilots and H.O. Pilots.

Outline of course:-

Mission:

To instruct and train the student in the theory and practice of Navigation, commensurate with alloted time, in order to prepare the student further for carrying out the duties of navigating officer of any type vessel and of aircraft.

The course in Navigation is continuous through the school year with an allotment of time in each term as follows:

Summer	0 - 1	Winter	0 - 1
Fall	1 - 1	Spring	0 - 1

Term Assignments

Week	Practical Work
First	Dutton Chaps. I, II
Second	Dutton Chap. III
Third	Dutton Chap. IV
Fourth	Dutton Chap. V.
Fifth	Coast Pilot Tide and Current Tables
Sixth	Light and Buoy Lists Radio Aids for Navigation

Term - Fall (2)

Name of Course - NAVIGATION.

Hours per week Rec. - 2 P.W. Lectures.

Texts: Dutton, Navigation & Nautical Astronomy
Nautical Almanac 1932

References: Admiralty Manual of Navigation, Vol. I and II
Bowditch, American Practical Navigation.

Outline of course:-

This is a continuation of course P-1

Term Assignments.

Week	1st Assignment	1st Recitation	2nd Assignment	2nd Recitation	Prac: Work:
First	Dutton Chap. VI	Chronometers: Their care & Upkeep	Dutton Chap. VI	The Sextant Prins. & use of surface & bubble sextant	None
Second	Dutton Chap. VII	Solar system: The Celestial Sphere	Dutton Chap. VII	The Equinoctial System	None
Third	Dutton Chap. VIII	The tropical and sideral year	Nautical Almanac. Arrangements & use of tables	Time zones of the world G.C.T. and date	none
Fourth	Problems	Solution of Problems	Problems	Solutions of Problems	None
Fifth	Problems	Solution of Problems	Dutton Chap. IX	The horizon System.	None
Sixth	Problems	Solution of Problems	Problems	Solution of Problems	None
Seventh	Problems	Solution of Problems	Dutton Chap. X.	Corrections to Sextant, Alt. of bodies	None
Eighth	Problems	Solution of Problems	Problems	Solution of Problems	None
Ninth	Nautical Almanac-Tables VI, VII, VIII	Rising & setting of sun & moon, north & south lat.	Problems	Solution of Problems	None
Tenth	Problems	Solution of Problems	Review	Review Notes	None

Term - Fall (2)

Name of course - NAVIGATION.

Hours per week Rec. - 1, P.W. - 2-1/2 Lectures -

Texts: Pamphlets:
Principles of Meteorology
Dept. of Agriculture, Weather Forecasting
Org. of Weather Bureau
Weather forecasting.
Bu. Aero. Preparation of Weather Maps
Types of Storms & Gales
Dutton - Navigation & Nautical Astronomy
Nautical Almanac.

Outline of course:

The main features of the Navigation course for navigation and aviation groups are treated in accordance with the following schedule:

Term Assignments

Week	Recitation	Practical Work
First	Principles of Meteorology	Weather Chart #1
Second	Construction of Weather Charts	Weather Chart #2
Third	Types of Storms and Gales	Weather Chart #3
Fourth	Weather Forecasting	Visit Aerological Off. Naval Academy
Fifth	Weather forecasting from Synoptic charts	Quiz
Sixth	Dutton, Chap. VII	Solution of problems
Seventh	Dutton, Chap. VIII	Solution of problems
Eighth	Nautical Almanac, Arrangement and use	Solution of problems
Ninth	Dutton, Chap. IX	Solution of problems
Tenth	Review	Solution of problems

(8230 - 12/5/32)

Term - Winter (3)

Name of Course - NAVIGATION.

Hours per week Rec. - 2 P.W. 2-1/2 Lectures.

Texts: Bowditch
Dutton
H.O. 203, 204 Lines of Position
H.O. 208 Dreisenstok
Gingrich
H.O. 71 Azimuth of the Sun
H.O. 120 Azimuths of Celestial Bodies.

References: H.O. 127 Star Identification Tables
H.O. 202 Noon Interval Tables
Lecky, Wrinkles in Practical Navigation
H.O. 209 Pierce's Tables
H.O. 211 Ageton's D.R. tables
Weems' Line of Position
Aquino's Sea and Air Navigation.

Note: Reference books should not be taken out for more than one week.

Outline of Course:

This is a continuation of courses P-1 and P-3.

Term Assignments.

Week	1st Assignment	1st Recitation	2nd Assignment	2nd Recitation	Practical Work
1.	Dutton, Chap. XI to par. 156	Lat. by Meridian Altitudes	Dutton, Chap. XI	Lat. by exmeridian altitudes.	Lat. by meridian altitudes and exmeridian altitudes.
2.	Dutton Chap. XII to Art. 170	Solutions of Astronomical Triangles	Dutton, Chap. XII	Solutions of Astronomical Triangles	Lat. by meridian altitudes. Solutions of astronomical triangles.
3.	Dutton Chap. XII H.O. 71	Azimuths of Sun	Dutton Chap. XII H.O. 120	Azimuths of Celestial Bodies	Latitude Longitude Azimuths Compass Error

Term - Winter (3)

Navigation - Cont'd.

Week	1st Assignment	1st Recitation	2nd Assignment	2nd Recitation	Practical Work
4.	Dutton Chap. XIII to Art.190	Lines of Position	Dutton Chap. XIII	Definitions of terms used in Day's work	Day's work by Cos-Hav Formula
5.	Bowditch Chap. XV and XVI	Sequence of day's work at sea.	Dutton Chap. XIV	Navigator's work at sea	Day's work
6.	H.O. 203	Structure of Tables	H.O. 203 H.O. 204	Computation of Azimuths Star Identification	Day's work using H.O. 203 and 204
7.	H.O. 208	Structure of Dreisonstok's Tables.	H.O. 208 pp. 75-81	Uses of Tables	Day's work by H.O. 208
8.	Gingrich's Tables	Structures and uses	Gingrich's Tables	Discussion of various methods	Day's work by preferred method
9.	Dutton Chap. XV	Dutton Chap. XV	Dutton Chap. XX	Aerial Navigation	Day's Work by preferred method.
10.		REVIEW.			Day's work by preferred method.

(8230)

Term - Winter (3)

Name of Course - NAVIGATION.

Hours per week Rec. - P.W. - 2-1/2 Lectures

Texts: Bowditch Practical Navigation
Dreisonstok H.O. 208
Dutton's Navigation & Nautical Astronomy
H.O. 203, - 204.
Gingrich's Aerial & Marine Navigation Tables.

References: H.O. 127 Star Identification Tables.
H.O. 71 Azimuths of Sun
H.O. 120 Azimuths of Celestial Bodies

Note: Reference books should not be taken out for more than one week.

Outline of Course:

The main features of the Navigation course for navigation and aviation groups are treated in accordance with following term assignments:

Week	Practical Work
First	Dutton, Chap. X and XI to paragraph 156.
Second	Dutton, Chapt. XI
Third	Dutton, Chap. XII to Art. 170
Fourth	Dutton, Chapt. XII, Art. 170 to end of chapter
Fifth	Dutton, Chapt. XIII
Sixth	Dutton, Chapt. XIV
Seventh	H.O. 203, H.O. 204
Eighth	H.O. 208, Dreisonstok
Ninth	Gingrich - Aerial and Marine Navigation Tables
Tenth	Day's Work - Any preferred method

Term - Spring (4)

Name of Course - NAVIGATION.

Hours per week Rec. - 2 P.W. 2-1/2 Lectures.

Texts:- Practical Manual of the Compass.
Bureau of Navigation Case Instructions 1 to 10, 11 to 20
Sperry Pamphlet, 17-1612, Operating Prins. of Gyro Compass.

References: Dutton's Navigation & Nautical Astronomy
Bureau of Navigation Case Instructions 31-40
U.S. Navy Regulations.

Outline of course:-

This is a continuation of courses P1, 3, and 5.

Term Assignments.

Week	1st Assignment	1st Recitation	2nd Assignment	2nd Recitation	Practical Work
1.	Prac.Manual of the Compass. Chps.I,II,III	Causes of Compass Errors	Prac.Manual of the Compass. Ch. V,VI	Compensation of the Compass	Visit deviascope, Luce Hall, Naval Academy
2.	Prac.Manual of the Compass. Ch.VII,VIII	Spec. Methods of Compensation	PracManual of the Compass Ch.IX,X,XI	Records Instruments	Visit deviascope, Luce Hall, Naval Academy
3.	Extracts of Navy.Reg. pertaining to Navigator	Duties of Navigator	Collision Cases 1-5 inc.	Discussion of cases	Compass problem
4.	Collision Cases 6-10	Discussion of Cases	Grounding Cases 11&12	Discussion of Cases	Plotting of Grounding Cases
5.	Grounding Cases 13-14	Discussion of Cases	Grounding Cases 15&16	Discussion of Cases	ditto
6.	Grounding Cases 17-20	ditto	Quiz	--	ditto
7.	Sperry Pub. 17-1612	Theory of Gyroscope	SperryPub. 17-1612	Theory of Gyroscope	Gyro
8.	ditto	Sperry & Arma damping	ditto	Sperry compass errors & their elimination	Gyro
9.	ditto	Arma compass errors&their elimination		Follow up & transmission systems	Gyro
10.	ditto	Follow up & transmission systems	Review	Review Notes	Gyro

(8230 - 6/13/30)

Term - Spring (4)

Name of Course - NAVIGATION.

Hours per week Rec. - 0 P.W. 2-1/2 Lectures -

Texts: Practical Manual of the Compass.
Bureau of Navigation Case Instructions 1 to 10; 11 to 20.

References: Bureau Navigation Case Instructions.

Outline of course:-

The main features of the Navigation course for navigation and aviation groups are treated in accordance with the following term assignments.

Week	Practical Work
First	Day's work
Second	Day's work
Third	Day's work
Fourth	Magnetic Compass Assign. #1
Fifth	Magnetic Compass Assign. #2
Sixth	Magnetic Compass Assign. #3
Seventh	Selected Collision Cases
Eighth	Selected Grounding Cases
Ninth	Selected Grounding Cases
Tenth	Review

(8230-4/7/32)

Q-1

Term- Summer(1)

Name of Course - Gunnery and Fire Control.

Hours per week Rec. 1 hour - P.W. 2 hours - Lectures -

Texts: Ordnance & Gunnery Notes Vol. I & Vol. II
" " " Problems, Vol. III.
Gunnery Instructions, 1926
Manual of Interior Control 1929
O.P. 300
O.D. 956 and O.D. 2281.

References: O.P. 319 and 319A Torpedoes.
O.P. 4 Ammunition and Explosives.
O.P. 328 Torpedo tubes, O.P. 35 Depth charge release gear.
O.P. 36 Depth charge, O.P. 570 mines MK VI
O.P. 378 Exploder Mech.

Outline of Course:-

Class:

1. Definitions of fire control
2. Elements of director fire.
3. Sperry-Ford system of fire control
4. Vickers fire control system.
5. Ford DSC transmission system.
6. Arma transmission system and F.C. installation Lexington Class.
7. Range Keeper Mark I.

Laboratory:

1. Mines - Depth charges - Ammunition Details.
2. Ford Range keeper Mark I and Mark II instruction.
3. Torpedoes and Torpedo Director MK XXVI and gear.
4. Plotting room and M.B. instruction and drill.
5. Secondary battery installation and drill.
6. Ford D.S.C. transmission experiments.
7. Vickers transmission Experiments.

Problems: On alignment of F.C. systems.

(8230 - 6/7/32)

Q-2

Term - Fall(2)

Name of Course - GUNNERY AND FIRE CONTROL.

Hours per week, Rec. 1 hour - P.W. 2 hours - Lectures

Texts:- Ordnance and Gunnery Notes Vol. I and Vol. II
" " " Problems Vol. III.
O.P. 395 and O.P. 396, Roller Path data.
O.P. 105 Rangefinders
Gunnery Instructions 1926
Bu. Ord. Manual 1930

References: O.P. 4
Roller Path Inclinations- Navy Yard, Puget Sound, O.D. 43743.

Outline of Course:-

Class:

1. G.E. Transmission and Theory
2. G.E. Main Battery and Secondary battery fire control installations.
3. Consolidated and Auxiliary fire control system on heavy cruisers.
4. Fire Control installation, heavy cruisers, 32-36 inch.
5. Roller path compensation.
6. Rangefinders.
7. Ordnance Dept. Organization - Requisitions, etc.
8. Reports and Returns.
9. Explosives - Types, etc.

Laboratory:

1. Range Keeper drill.
2. G.E. Transmission experiments and adjustments.
3. Rangefinder operation and adjustment.

Problems: On alignment of F.C. systems.

(8230 - 6/7/32)

Q-3

Term - Winter (3)

Name of Course - GUNNERY AND FIRE CONTROL.

Hours per week Rec. 1 hour - P.W. - Lectures -

Texts: Ordnance and Gunnery Notes, Vol. I and Vol. II
" " " Problems Vol. III
Gunnery Instructions 1926
Naval Ordnance 1929
Bu.Ord. Manual 1930
O.D. 939, Recoil and counter recoil gear.

Outline of course:-

Class:

1. Explosive, tests, etc.
2. Ammunition, Kind and Uses.
3. Handling and stowage of explosives.
4. Guns and attachments.
5. Accuracy of fire-dispersion effects, etc.
6. Probability.

(8230 - 6/7/32)

Q-4

Term - Spring (4)

Name of Course - GUNNERY AND FIRE CONTROL.

Hours per week Rec. 1 hour - P.W. - Lectures.

Texts:- Ordnance and Gunnery Notes, Vol. I and Vol. II
" " " Problems Vol. III.
Gunnery Instructions 1926
Manual of Interior Control 1929
O.D. 2001
O.D. 2006

Outline of course:-

Class:

1. Ballistic corrections.
2. Spotting Instructions and Spotting Board.
3. Fire Control doctrines.
4. Main Battery Control Procedure.
5. Secondary and AA battery procedure
6. Illumination procedure.
7. AA procedure with director
8. Indirect fire.

Problems: 1. Ballistic corrections.

(8230 - 6/17/32)

Term - Summer (1)

Name of Course - GUNNERY AND FIRE CONTROL.

Hours per week Rec. - 4 P.W. - 4 Lectures -

Texts:- Ord. Manual 1930
Naval Regulations
Ordnance & Gunnery Notes, Vol. I and Vol. II
" " " Problems, Vol. III.
O.P. 4 and O.P. 110
O.P. 319 and O.P. 378 torpedoes
Ordnance Photostat book.
Naval Ordnance 1929
Manual of Interior Control U.S.N. 1929
O.P. 395 and O.P.396
Roller Path Inclinations - Puget Sound Dup. 43743

Reference: Blue prints of ammunition supply.

Class

1. Bu. Ord. organization - administration.
2. Organization of Gunnery Department.
3. Reports and Returns, paper work.
4. Explosives - Types, etc.
5. " tests.
6. Ammunition, kind, uses, tests.
7. Ammunition details.
8. Handling and stowage of explosives.
9. Ammunition supply.
10. Projectiles, types, tests, etc.
11. Fuses and tracers.
12. Pyrotechnics.
13. Armor, types, tests.
14. Proving Ground tests.
15. Elements of interior ballistics and probs.
16. Bu. Stds. gun tests.
17. Fire control definitions.
18. Range Keepers Mk I, Mk II and Mk III.
20. Elements of director fire.
21. Roller Path compensations.

Laboratory:

1. Upkeep and repair of ordnance equipment (lecture)
2. Time standards and analysis. (lecture)
3. Safety precautions (lecture)
4. Torpedoes and war head attachments.

Gunnery & Fire Control - Contd.

5. Ammunition Supply Arrangements (Blue prints)
6. Ammunition exhibit.
7. Oscillograph demonstration.
8. Recoil and counter recoil design as related to interior ballistics (lecture)
9. Elements of a range keeper (lecture)
10. Range keeper drill and instructions.

Problems

No. 1 and 2, Armor Penetration and interior ballistics.

(8230 - 6/17/32)

Q-6

Term - Fall (2)

Name of Course - GUNNERY & FIRE CONTROL.

Hours per week Rec. - 1 P.Q. - 2 Lectures -

Texts: Ordnance & Gunnery Notes Vol. I and Vol. II.
" " " Problems Vol. III.
O.P. 300, O.P. 110, O.P. 469,
O.D. 956, O.D. 2281.

References: Gunnery Instructions 1926
Manual of Interior Control 1929
Ordnance Manual 1930.

Outline of Course:-

Class

1. Vickers Fire Control system.
2. Compensators for Roller path, parallax and erosion.
3. Sperry-Ford fire control system.
4. General Electric Transmission (Selsyn)
5. Ford D.C.S. transmission.
6. Arma synchronous transmission.
7. Main battery F.C. systems (Maryland class)
8. Secondary battery F.C. system (Maryland class)
9. Heavy cruiser fire control (consolidated and auxiliary)

Laboratory

1. Instruction in Vickers fire control.
2. Plotting room instruction.
3. Sperry-Ford fire control instruction.
4. Plotting room drill.
5. Fire control transmission experiments and adjustments.

Problems

Selected problem on fire control alignment and roller path compensation.

(8230 - 6/17/32)

Q-7

Term - Winter (3)

Name of Course - GUNNERY & FIRE CONTROL.

Hours per week Rec.-2 P.W. - 2 Lectures -

Texts: Ordnance and Gunnery Notes Vol. I and Vol. II
" " " Problems Vol. III
O.P. 434; O.P.416; O.P. 467; O.P. 110;
O.P. 397; O.P. 469.
O.D. 950; O.D. 2179; O.D. 2180; O.D. 2292; O.D. 854
O.P. 108; O.P. 328; O.P. 105; O.P. 35, O.P. 36;
O.P. 570.

References: Gunnery Instructions 1926
Manual of Interior Control 1929
Ordnance Manual 1930.

Outline of course:-

Class

1. Heavy cruisers 32-36 Fire control.
2. Remote control.
3. Elements of optics.
4. Telescopes.
5. Stabilized sight Mark II
6. Stabilized sight, gun director Mk XVIII
7. Stabilized sight, gun director Mk XIX
8. Gyroscopic- Stable Vertical Dir. Mk XXIX and XXX
9. General features of F.C. instruments, Trunnion Tilt Corr.MkII
10. Transmitters.
11. Indicators.
12. Switching equipment.
13. Torpedo Control System (Arma type)
14. Torpedo tubes (above water).
15. Range finders
16. Altimeter
17. Spotting glass (AA)
18. Depth charges and release gear.

Laboratory

1. Fire Control transmission experiments & adjustments.
2. Operation, stabilized sight Mark II
3. Operation Torpedo Directors.
4. Operation and adjustment of rangefinders.
5. Instruction in mines, mine safety and firing devices.

Problems: Selected problems on fire control alignment.

(8230 - 6/17/32)

Term - Spring (4)

Name of Course - GUNNERY & FIRE CONTROL.

Hours per week Rec. - 2 P.W. - 4 Lectures -

Texts: Ord. & Gunnery Notes, Vol. I and Vol. II
" " " Problems Vol. III
Naval Ordnance 1929
O.D. 939
Bu. Ord. Manual 1930
Ingalls Ballistic Tables.
A.L.V.F. " "
O.P. 500
Range Tables (USNA)
Gunnery Instructions 1926
Manual of Interior Control 1929
Ord. Photostat book.

Outline of course:-

Class

1. Naval Guns and Radial Expansion
2. Naval Gun Mounts.
3. Breech mechanisms and firing locks.
4. Machine guns .5 and 1.1 cal.
5. Gun sights.
6. Recoil and counter recoil systems.
7. Gun attachments.
8. Sprinkling systems.
9. Accuracy of fire.
10. Exterior ballistics.
11. Spotting instructions.
12. Fire control doctrines.
13. Main Battery F.C. procedure.
14. Secondary and AA battery fire control procedure.
15. Indirect fire.

Laboratory

1. Lectures on sight alignment and boresighting.
2. Lecture on dotter gear.
3. Lecture on horizontal and dive bombing.
4. Lecture current rules for target practice and analysis.
5. Lecture Illumination procedure.
6. 5" F.C. drills.
7. Lecture on 5" A.A. Director control.
8. Lecture on 3" A.A. control.

Problem work

1. Exterior ballistics.
2. Ballistic computations.

(8230 - 6/17/32)

Q-9

Term - Fall (6)

Name of Course - GUNNERY & FIRE CONTROL.

Hours per week Rec. - 1 P.W. - Lectures -

Texts: Ord. & Gunnery Notes Vol. I and Vol. II
" " " Problems, Vol. III.

Outline of course:-

This is a seminar course. Each student is required to prepare a short thesis on a selected subject of Ordnance or Fire Control. The choice of subject is left to the student. He is required to read his thesis before the group and it becomes a subject for discussion. As incidental reading, the students are required to study pamphlets on Ordnance and Gunnery prepared at the Postgraduate School. An examination covering this reading matter is given at the end of the term.

(8230 - 12/3/52)

Term - 3

Name of Course - ORDNANCE AND GUNNERY.

Hours per week Rec. - 1 T.U. Lectures

Texts: Seminars.

Outline of Course:

This is a seminar course designed to cover the work and procedure established by Gunnery Schools afloat. Each student will be required to investigate and deliver a seminar before the group on a selected topic dealing with current problems in Gunnery, mining and torpedo control.

(8230 - 12/3/52)

Q-13

Term - 4

Name of Course - ORDNANCE AND GUNNERY.

Hours per week Rec. - 2 T.U. Lectures

Texts: Seminars.

Outline of Course:

This is a seminar course designed to cover the work and procedures established by Gunnery Schools afloat. Each student will be required to investigate and deliver one or more seminars before the group on a selected topic dealing with current problems in gunnery, mining, and torpedo control.

(8230 - 6/15/32)

Term - Fall (2)

~~POLICY~~

Name of Course - AMERICAN DIPLOMATIC POLICY.

Hours per week Rec. - 2 P.W. - Lectures -

Texts: Practice of Diplomacy - J.W. Foster
Principles of American Diplomacy - J.B.Moore.
Leading American Treaties - Hill

Mission:

To conduct a course of study of the fundamentals of american diplomacy, including arbitration, neutral rights and obligations, the Monroe Doctrine, and a sketch of the contributions of the United States to international law in order to aid the student to perform the technical duty of Commanding Officer of a vessel on a foreign station or of Intelligence Officers.

(8130-8/31/32)(3d)

Term - Winter (3)

Name of Course - POLICY - AMERICAN ~~DIPLOMACY~~ Diplomatic Policy - ~~INTERNATIONAL RELATIONS.~~

Hours per week Rec. - 2 P.W. - Lectures -

Texts: Practice of Diplomacy - J. W. Foster
International Relations - R. L. Buell

Outline of Course:

To conduct a course in the functions of diplomats and consuls, relations of treaties to the Constitution and federal statutes, effects of war on treaties, and, racial factors in international relations in order to aid the student in the performance of the technical duty of Commanding Officer of a vessel on a foreign station or of Intelligence Officers.

(8230 - 6/15/32)

S-1

Term - Summer (1)

Name of Course: -ECONOMICS

Hours per week Rec - 2 P.W. - Lectures.

Text: Principles of Economics - F.W. Taussig

Mission:

Wars have their roots in economic problems. This course is technical and is conducted to introduce the student to a study of the fundamental concepts of economics in order to aid him to perform the Technical work of securing information and preparing Naval Intelligence Reports.

(8230 - 6/15/32)

S-2

Term - Fall (2)

Name of course - ECONOMIC FOREIGN POLICY OF THE U.S.

Hours per week Rec. - 2 P.W. - Lectures -

Text: Economic Foreign Policy of the U.S. - B.H.Williams.

Mission:

To conduct a course of study that gives a view of the economic motive in all international relations, followed by a particular study of the foreign policy of the United States as related to economic demands. These studies cover such subjects as the transition of theUnited States from a debtor to a creditor nation, the interallied debts, the open door and other matters of similar import and are conducted in order to aid the student to perform the Technical work of securing information and preparing Naval Intelligence Reports.

(8230 - 6/15/32)

U-1

Term - Spring (4)

Name of Course -- INTERNATIONAL RELATIONS.

Hours per week Rec. - 2 P.W. - Lectures -

Text: International Relations - Buell, R.L.

Mission:

To conduct a course of study of the chief factors in international relations, such as nationalism, imperialism, conflict of color, self-determination, the protection of minorities, political significance of investments, control of opium, white slave traffic, world courts, and international conferences in order to equip the student to perform the technical work of securing information and preparing Naval Intelligence Reports.

O.K.

(8230 - 7/20/32)

U-2

Term - Summer (1)
Fall (2)
Winter (3)
Spring (4)

Name of course - INTERNATIONAL RELATIONS - ~~NAVAL INTELLIGENCE~~ SEMINAR.

Hours per week Rec. - P.W. - Lectures -

Texts: Works and Volumes on Foreign Relations
Encyclopedia
Govt. Reports
Published Articles
Press Reports.

Outline of course:-

Each student of the School of the Line is required to prepare a comprehensive report on the life and fabric of a designated country. The study embraces the country's situation on the globe, natural features, resources, racial elements, neighbors, government, policies, commerce and industry. About ten months is given to this study in order to ground student officers in the elements of Naval Intelligence.

(8230 - 6/15/32)

W-1

Term - Summer (1)

Name of Course - MILITARY LAW.

Hours per week Rec. - P.W. - Lectures - 3 hrs.

Texts: Naval Courts and Boards.
P.G.S. Stencil 6507 Parts I and II
(Questions and answers on N.C.& B.)

References: (a) U.S.N. Regulations
(b) Naval Digest 1916- 1921
(c) C.M.O.'s to date.
(d) U.S. Code
(e) Laws for the Navy Annotated (Melling)
(f) Cyclopedic Law Dictionary
(g) Criminal Evidence (Underhill)
(h) Cases on Evidence (Hinton)
(i) Cases on Criminal Law (Mikell)
(j) Law problems with Solutions (Ballantine)
(k) McKelvey on Evidence
(l) The American Judiciary (Baldwin)
(m) History of English and American Law (Walsh)

Outline of Course:-

In the limited time available it is not possible to give a course in law. Only the merest background can be roughed in. The course is entirely based on the material found in "Naval Courts and Boards" and is chiefly procedural in nature. Daily assignments will be made from the text and students will be quizzed in class to bring out salient points. Students will be given an opportunity to ask questions on points not clear to them. The instructor will endeavor to explain the why's and wherefore's of things as they are as exemplified in the text, as well as emphasize the points that seem most important. The object is not to achieve the impossible and turn out lawyers qualified to appear as counsel before "a court of justice in due course of law" - rather it is hoped that the student will learn to be content to "follow the book" as regards the law and search for justice rather in sifting the evidence according to his conscience. It is hoped that our students will be able to function as judge-advocate or member of a G.C.M., detect the more glaring errors, and steer clear of the worst pitfalls.

(8230 - 7/5/32)

X-1

Term - Summer (1)

Name of Course - PSYCHOLOGY.

Hours per Week - Rec. - 2 P.W. - 0 Lecture - 0 -

References: The Psychology of Personality - Bagby
Psychology of Character - Roback
Fundamentals of Objective Psychology - Dashiell
Elements of Scientific Psychology - Dunlap
Discovering Ourselves - Stricker & Appel
Emotions of Men - Lund.

Outline of Course:-

School of the Line students are introduced to the subject of Psychology by a reading course which brings out the basic elements of the science.

This reading course cultivates penetrative insight and accuracy of evaluation for dealing with groups of men, some of whom are mentally healthy and some are not.

Mentally healthy men are influenced by the bad as well as by the good and so the course directs a study of stimuli and reaction in their inter-relations in order to evolve available the contributions of this science in conditioning and controlling men.

Text for first 13 assignments: Dashiell, Fundamentals of Objective Psychology.
Text for last 5 assignments: Strecker & Appel, Discovering Ourselves.

Assignment		Subject.
1.	Chapter III, Pages 34-45.	Stimulus response Mechanism.
2.	Chapter IV, pages 49 to 54,62 to 73	"
3.	Chapter V, pages 78 to 112	"
4.	Complete reading for above assignment.	
5.	Chapter VII, pages 154-170	Integration.
6.	Chapter VII, pages 170-180	"

Psychology - Continued.

Assignment		Subject.
7.	Chapter XII, pages 333-347	Learning
8.	Chapter XII, pages 347-362	"
9.	Chapter XII, pages 362-385	"
10.	Chapter VIII, pages 205-215	Feeling and Emotions
11.	Chapter IX, pages 229-248	Desires and motivation
12.	Chapter IX, pages 248-260	" " "
13.	Chapter IX, pages 260-273	" " "
14.	Chapter I-III	Discovering Ourselves- Strecker & Appel.
15.	" IV-VI	"
16.	" VII-X	"
17.	" XI-XIV	"
18.	" XV-XXI	"

(8130 - 9/29/32)

X-2

Term - Fall (2)

Name of Course - LEADERSHIP PSYCHOLOGY.

Hours per week Rec. - 1 P. W. - Lectures -

Texts: Strecker & Appel - with Questions P.G.Stencil 8469
Military Character - Schofield
Military Character - Sims. RP 16
Collateral Reading - P.G.S. Stencil 8044
Notes on Applied Psychology, RP 14.

Outline of Course:-

Continue the reading course started in course X-1.

Assignments.

No. 14	Chap.	I-III	Discovering Ourselves-	Strecker	&	Appel	
" 15	"	IV-VI	"	"	"	"	"
" 16	"	VII-X	"	"	"	"	"
" 17	"	XI-XIV	"	"	"	"	"
" 18	"	XV-XXI	"	"	"	"	"

Note: P.G. Stencil 8469 is supplied to be used in connection with Strecker & Appel.

No. 19 P.G.S. Stencil 8044
(a) Leadership - Hocking
(b) Morale - "
(c) Relation Psychology to Leadership - Helmick

" 20 Military Character - Schofield
from BuNav Pamphlet, Leadership Study Command
Military Character - Sims - RP 16

" 21 Notes on Applied Psychology R.P. 14 + 15

" 22 " " " "

" 23 " " " "

" 24 " " " "

Note: In using Notes on Applied Psychology R.P. 14 & 15 particular attention is invited to the questions in the Text and at the end of the Chapters.
These questions are to be answered by reference to text. Quizzes will be given from time to time on Saturday recitation periods.

(8130 - 9/20/32)

X-3

Term - Winter - (3)

Name of Course - LEADERSHIP PSYCHOLOGY (Exercises in Processes of Thinking)

Hours per week Rec. - 1 P.W. - Lectures -

Texts: Cases for Discussion in the Study of Command.
P.G.S. Stencil 7794.

References: The Estimate of the Situation - War College
U.S. Navy Regs. 1920
Court Martial Orders
Naval Digest 1916 & 1921
Fleet Regulations
Force Regulations
Can the Engineering Student be taught to Handle Men?- R.P. #9.

Outline of Course:-

To conduct a course in logic by studies of situations arising in actual service.

To indoctrinate the student in orderly processes of thinking in the manner outlined in the "Estimate of the Situation". Having considered the law, regulation, or custom governing the situation, the common sense in the case and having weighed the effect on the culprit as against the discipline of the command, the student is then in a position to make his decision. Whether that decision and its consequent execution affects the discipline of the Command favorably or not is of course his responsibility. It is not the purpose of this school to minutely advise nor to hamper the initiative of the young officer but to teach him to know, and to analyze the facts, - - - then to act as a reasoned judgment may direct as opposed to "Snap judgment".

(8230 - 7/1/32)(3d)-

X-4

Term - Spring (4)

Name of Course - LEADERSHIP PSYCHOLOGY (cases)

Hours per week Rec. - 1 P.W. - Lectures -

Outline of Course:-

Continuation of X-3.

(8230 - 6/15/32)

X - 5, 6, 7

Term - Fall, Winter, Spring
(2, 3, 4).

Name of Course - MILITARY CHARACTER.

Hours per week Rec. - 1 P.W. - Lectures -

Texts: Platform Speaking - Collins
Psychology of Public Speaking - Scott
Leadership - Study of Command) - Bunav.
Leadership - Military Character)
The Elements of Leadership - Knox
Military Character - Schofield
Leadership - Bunav.
Control Force, Stencil 6078

References: Collateral Reading Course - P.G.S. Stencils.

Outline of Course:-

This course has a double purpose. The speaker learns to address an audience and present a subject. The audience have a great deal more biographical material presented than they could possibly cover individually.

At the beginning of the term a prominent character is assigned each member of the class as a subject for a paper of about 2000 to 3000 words. On the assigned date this paper is delivered in the form of a lecture.

Attention is paid to the following points:

(a) Manner of presentation.
(b) Structure of ideas.
(c) Perception of character, the principles of Command exemplified.
  (a) Analytical
  (b) Deductive, and
  (c) Imaginative, thinking.
(d) Interpretation of historical events.
(e) Faculty of expression.
(f) Sastention of interest.
(g) Cultivation of attitude before an indifferent or hostile audience.

(8230 - 6/10/32)

Y-1-2-3-4.

Term- Summer, Fall,
Winter-Spring(1,2,3,4)

Name of Course - ORGANIZATION & ADMINISTRATION.

Hours per week Rec. - 1 P.W. - Lectures -

Texts: Advanced American History - Forman
The Government of the U.S. - Munro
Naval Command & Administration - Pratt
The making of an Executive - Shell
The Executive and his Control of Men - Gowan.

Reference:- U.S. Navy Regs. 1920
Fleet Regs.
Battle Force Regs.
Scouting Force Regs.
Bureau Manuals.

Outline of Course:-

The course begins with a background of American Origin and the Pilgrim movement, the organization of our government, the basic principles of organization, organization groups of governments, Navy Department, Fleet, Force and Ships and the laws or regulations governing base organizations. Then will be taken up Administration from the texts. Problems as published in case form by the Bureau of Navigation will be studied.

(8230 - 6/17/32)

AA-1

Term - Summer (1)

Name of Course - TACTICS

Hours per week Rec. - 1 P.W. - 2 Lectures -
0 2

Texts:- Tactical Graphics
F.T.P. 43
F.T.P. 45

Outline of course:-

The course in Tactics extends throughout the school year for the Aviation and Navigation (A&E) sections and during the summer (1st) and Spring (4th) terms for the Engineering (D&E), Communications (F) and Ordnance (G) sections. The allotment of time is as follows:-

	Sections A & E				Sec.B,C,D	
	Summer	Fall	Winter	Spring	Summer	Spring
Recitation, 1 hr per week	6	10	10	10	0	0
Prac. Work, 2 hrs " "	12	20	20	0	12	20
Examination, 4 " " term	4	4	4	4	4	4
Preparation (Estimated)	12	20	20	10	12	20
Total per term -	34	54	54	24	28	44

Total for course - Sections A&E 166; Sections B,C,D,G-72 hours.

The course consists of the study of official tactical publications, and of instruction and practical work in relative movement as applied to the Maneuvering Board. A part of each recitation and practical work period is devoted to the explanation of the text assigned and the remainder to practical work on problems based on the tactical publications and manouvering board cases. As more time is allotted to this course for sections C&H, they are expected to go more deeply into the subject and to become more proficient in the solution of problems.

As only a limited number of copies of F.T.P. 43 and 45 are available, section B studies F.T.P. 43 while sections C and D study F.T.P. 45 and vice versa.

(8230)

AA-1

Tactics - Contd.

Week	Tactical Graphics (All sections)	Sections A, E, B.	Sections C & D
1.	Cases 1 and 2 -----FTP	43, pp. 1-35	FTP 45, pp. 1-17
2.	" 3 " 4 ----- "	", pp. 36-72	" " ,pp. 30-63
3.	" 5 " 6 ----- "	", pp. 73-103	" ", pp. 64-97
4.	" 7 " 8 ----- "	", pp. 104-132	Review F.T.P. 45
5.	" 9 " 10 ---- "	45, pp. 1-17	FTP 43, pp. 1-35
6.	" 11 " 12 ---- "	", pp. 30-63	" ", pp. 36-72

(8230 - 6/17/32)

AA-2

Term - Fall (2)
Spring (4)

Name of Course - TACTICS.

Hours per week Rec. - 1 A,E. P.W. - 2 Lectures -
0 B,C,D - 2

Texts: F.T.P. 43
F.T.P. 45
F.D. & D.P.

References: C.S.P. 435

Outline of course:-

This is a continuation of course AA-1.

Assignments.

Week	Tactical Graphics	Official Publications.
1.	Cases 13 - 14	A, E, B - FTP 45, pp. 64-97; F&G - FTP 43, pp. 104-132.
2.	" 15 - 13	F.D. & B.P. pp. 1-19
3.	" 17 - 18	" " " pp. 20-30 & 38-46
4.	" 19	" " " pp. 47-60
5.	" 20	" " " pp. 62-76
6.	" 20	Notes on Formation Maneuvering
7.	" 21 - 22	F.D. & B.P. pp. 77-92
8.	" 23 - 24	" " " pp. 93-107
9.	" 25-26	" " " pp. 108-118
10.	Review & problems	Review and problems.

Note: C.S.P. 435 is used in connection with certain problems which are stated in the form of signals.

(8230 - 6/17/32)

AA-3

Term - Winter (3)

Name of Course - TACTICS.

Hours per week Rec. - 1 P.W. - 2 Lecture -

Texts: W.P.L. 4
Tactical Graphics

References: C.S.P. 435

Outline of course;-

This is a continuation of Courses AA-1 and AA-2

Week

1.	W.P.L.	pp. 1-12	Tactical Graphics	Cases 27-28
2.	"	pp. 13-22	" "	" 29-30
3.	"	pp. 23-38	" "	" 31-32
4.	"	pp. 39-53	" "	" 33-34
5.	"	pp. 54-68	" "	" 35-36
6.	"	pp. 69-84	" "	" 37-38
7.	"	pp. 85-88	" "	" 39-40
8.	"	pp. 1-53	" "	" 50-51
9.	"	pp. 54-88	" "	" 52-54
10.			" "	" 53

(8230 - 6/17/32)

AA-4

Term - Spring (4)

Name of Course - TACTICS

Hours per week Rec. - 1 P.W. - Lectures -

Texts:- F.T.P. 88
D.A.D.
Tactical Graphics.

Reference: C.S.P. 435

Outline of course:-

This is a continuation of courses AA-1, AA-3, and AA-4, The one hour per week allotted is used in explanation of the text and in the solution of short problems.

Assignments -

Week

1. F.T.P. 88, pp. 1-32
2. " " , pp. 33-60
3. " " , pp. 61-71
4. D.A.D., pp. 1-12
5. " , pp. 13-27
6. Problems on F.T.P. 88 and D.A.D.
7. Tactical Graphics , Cases 41-43
8. " " , " 44-46
9. " " , " 47-49
10. Review.

(8230 - 6/17/32)

AA-5,6,7,8

Term - Summer, Fall (5, 6
Winter, Spring 7, 8)

Name of Course - TACTICS.

Hours per week Rec. - P.W. - 2 Lectures - 1

Texts: Tactical Graphics
F.D. & B.P. F.T.P. 45
W.P.L. 4 F.T.P. 88
F.T.P. 43 D.A.D.

Reference: C.S.P. 435.

Outline of course:-

The course in Tactics for this group comprises a review and a closer study of the publications previously taken up in the School of the Line, more detailed instruction in the use of the Maneuvering Board, and analysis of Fleet Problems.

The subject of Formation Maneuvering is dealt with in more detail than is possible in the School of the Line, and is intended to develop speed in maneuvering board operation as well as a thorough understanding of the principles involved.

Time allotted is distributed equally over four terms as follows:

	Hours per term
Recitation and instruction, class room	10
Practical Work	20
Examination	4
Preparation (estimated)	20
Total	54

SUMMER TERM
Maneuvering Board Cases 1-19 and 21-26
Fleet Dispositions and Battle Plans.

FALL TERM
Maneuvering Board Cases 27-44
FTP 43 and 45

WINTER TERM
Maneuvering Board Cases 20 and 45-54
WP. 4
FTP 88
DAD

SPRING TERM
Solution of problems based on FD & BP, WPL4, FTP 88, and DAD.
Analysis of Fleet Problems.

War College Corres. Course AA-10

(a) Four terms of ten weeks each.

One period per week - 2 ~~1/2~~ hours.

Class work	100 hours
Estimated Prep.	100 hours
Total	200 "

(b) Text books required, as specified by War College.

(c) Each student has been required to enroll as a correspondent student of the War College. Progress of the students will be checked in order to insure the completion of the course during the year. The receipt of a diploma from the War College will be considered to be the attainment of a satisfactory mark.

(8484 - 10/7/32) (2)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Policy Governing Courses in Modern Languages.

Modern language courses at the Postgraduate School may be given to certain designated groups by instructors borrowed from the Department of Modern Languages at the Naval Academy.

Groups to be designated are governed by following considerations:

(a) Type of duty for which student is pursuing a postgraduate course requires a fluency in languages other than English.
Example - ~~Requirement~~ Voluntary for Communication Group.

(b) Course pursued requires study of language other than English in order to understand text, reference books and lectures.
Example - Requirement for (1) Aerologist - (2) Diesel Engineering in Germany. Aeronautical Engineering (Structures)

(c) Course pursued is language itself.
(At present language students are sent to country itself to study language).
Example, None - but may be Voluntary but not to interfere with other work.

(8230 - 7/1/32)

U N I V E R S I T Y C O U R S E S

TECHNICAL GROUPS POSTGRADUATE SCHOOL

(8255 - 6/29/32)

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

OFFICIALS IN CHARGE OF POSTGRADUATE STUDENT GROUP AT UNIVERSITIES

Group	University	In Charge
Naval Constructor	Mass. Inst. Tech.	Prof. Wm. Hovgaard
Ord.Torp. Design	Do	Prof. Edward F. Miller
Aeronautical	Do	Prof. Charles F. Taylor
Gas	Do	Prof. Frederick G. Keyes
Communication	Harvard Univ.	Prof. George W. Pierce
Communication	California	Prof. L. F. Fuller
Engineering	California	Prof. B. M. Woods
Civil Engineering	Rensselaer Poly.In.	Dr. Palmer C. Ricketts
Ord. Explosive	Univ. Michigan	Prof. Alfred H. White
Ord. Metallurgist	Carnegie Inst.Tech.	Dir. Wm. E. Mott
Law	Harvard	G.H. Holliday,Secretary
International Law: Foreign Relations	Harvard	Prof. G. G. Wilson

(8087 - 3/3/32)(2)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

INSTRUCTIONS FOR STUDENT OFFICERS ATTENDING UNIVERSITIES OR UNDER PRACTICAL INSTRUCTION AT INDUSTRIAL PLANTS, NAVY YARDS OR ELSEWHERE.

1. Officers attending universities for courses of instruction are on detached duty. The Postgraduate School exercises supervision over all educational matters, and the Commandant of the District in which the educational institution is located exercises military jurisdiction.

2. Fitness Reports are completed by the Head of Postgraduate School. These reports should be carefully filled out by the officer concerned and returned to the Head of Postgraduate School via the Commandant of the district. The latter will make a special report when desirable in accordance with U.S. Naval Regulations, Article 137, subparagraph 11(e).

3. The attached schedule of instruction will be carried out. Should changes in this schedule appear advisable or necessary, full report of the facts shall be made to the Head of Postgraduate School. No changes in this schedule, including the taking of additional courses, shall be made until authorized by the Head of Postgraduate School.

4. Tuition will be paid and books supplied by the Postgraduate School. Separate instructions regarding books are attached.

5. Officers will keep the Head of Postgraduate School and the local senior officer informed of their correct address. They will also inform the Head of Postgraduate School when promoted and of all leave taken and absence from classes on account of illness or for other reasons.

6. Student officers at private institutions are not only students but representatives of the Navy. It is expected that they will conduct themselves in accordance with Naval traditions and in conformity with the rules and customs of the institution they are attending, so as to avoid criticism and to uphold strictly the dignity of an officer and gentleman, thus reflecting credit upon themselves and the service. Conduct of a similar character applies equally while undergoing summer practical work at private and governmental plants. This ideal conduct requires that the courtesies in social and official intercourse be punctiliously observed.

7. While at universities officers will come in contact with prominent civilians from all parts of the country. Advantage

ORD

should be taken of the opportunity to promote popular knowledge of, and interest in, the Navy.

8. In addition to reporting officially as directed in your orders, you should make calls of courtesy on the Commandant of the District, President of the University and Heads of Departments in which instruction is being received and upon such others as may be appropriate.

9. All officers on duty under instruction at naval stations should have with them all uniforms and equipment except frock coats, cocked hats, epaulets, and dress belt.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8410 - 9/7/32)(6)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

From: Head of Postgraduate School.
To: Each student officer.

SUBJECT: Work Involving Additional Expenditures.

1. No work which might involve an expenditure of public funds above the tuition costs, such as material for theses, etc. will be undertaken by any officer under postgraduate instruction without obtaining prior authority of the Postgraduate School and the Bureau concerned.

2. Any such work contemplated will be made the subject of a request and will contain a complete statement as to nature of proposed work and information as to necessity for undertaking same.

F. H. Sadler.

Follows letter in Catalog for students

(7708 - 7/2/31)(4a)-75

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

ORDNANCE METALLURGY COURSE AT
CARNEGIE INSTITUTE OF TECHNOLOGY

Subjects - Day and Night.		First Semester: Attend.	First Semester: Units	Second Semester: Attend.	Second Semester: Units
E 625: Electro-Metallurgy - Rec -	Day	2	6		
E 625: Electro-Metallurgy - Lab -	Day			5	5
E 651-2: Seminar	Day	1	1	1	1
GE 687: a & b Metal-lography III -	Night:	4	6	4	6
GE 688: a & b Metal-lography IV -	Night:	6	8	6	8
GE 689: a & b Engineering Alloys -	Night:	2	5	2	5
E 691: a & b X-Ray Anal. & Crystallography -	Night:	1	2.5	1	2.5
Special: Light Alloys	Day	As Arranged	5	As Arranged	4
E 699: Thesis	Day		12		12
E 128: Electro-Chemistry - Rec -	Day			2	5
E 629: Economic Metallurgy -	Day			2	6
E 630: Metallurgical Calculations -	Day			3	9
GE 693: Corrosion of Metals -	Night:	1(3 lib)	4	1(3 lib)	4
GE 193: Physical Chemistry of Metals -	Night:	1	3	1	3
		18 +	52.5	28 +	70.5

Note: This course leads to the degree of Master of Science in Metallurgical Engineering.

(6820 - 5/5/30)(5a)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

COMMUNICATION ENGINEERING AT HARVARD

Winter Session

		Class	Lab.	Prep.
Eng. 221	Elec. Oscillations & their Application to Radiotelegraphy & Radiotelephony	3	4 hrs EOW	6
Eng.223	Electric Waves & Radio Telegraphy	3		8
Eng.224(a)	Electron Tubes	3	4 hrs EOW	4
Eng.225	Electric Communications	3		6
	Total	12	4	26
			42	

Spring Session

		Class	Lab.	Prep.
Eng.222	Elec. Oscillations, Elec. Waves & Radio Frequency Measurements.	3	4 hrs EOW	8
Eng.224(b)	Electron Tubes	3	4 hrs eow	4
Eng.225	Electric Communications	2		6
Eng.226	Acoustic Theory, Propagation of Sound, Acoustic Signaling	3	3 hrs EOW	8
	Total	12	5-1/2	26
			45	

Fein

(8253 - 6/25/32)(4)

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

EXPLOSIVE ENGINEERING COURSE AT
UNIVERSITY OF MICHIGAN.

		First Semester	Second Semester
Chem. 67	Organic Chemistry (with Lab).	4 hrs.	
Ch.E. 11	Chemical Engineering Thermodynamics	3 "	
Ch.E. 9	Unit Operations	3 "	
Ch.E. 28	Material Balances	2 "	
Chem. 69	Organic Chemistry (with Lab.)		4 hrs.
Ch.E. 4	Chemical Technology of the Inorganic Industries		2 "
Ch.E. 5	Chemical Technology of the Organic Industries		4 "
Ch.E. 32	Explosives and Pyrotechnics		4 "

Completion of this course leads to the degree of Master of Science in Engineering.

(7725 - 7/11/31)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Aeronautical Engineers in
Power Plants at
Mass. Institute of Technology.

Dean Prof. C. F. Taylor.

Summer Course.

M 43	Theoretical Aeronautics	3	- 6
M 44	Theoretical Aeronautics	3	- 6
1.401	Airplane Structures	3	- 5
16.00	Aerodynamics of Airplane Design	2	- 3
16.02	Aircraft Structures	4	- 4

First Term

16.82	Aero. Power Plants	3	- 2B
16.85	Airplane Eng. Design Practice	8	- 0B
F 16	Automotive Fuels	3	- 3B
2.254	Dynamics of Engines	2	- 4A
2.981	Manufacturing Processes	3	- 3A
3.655	Aircraft Met. and Met.	4	- 2A
M 791	Theoretical & Applied Elasticity	2	- 6A
	Thesis	10	A 55

Second Term

16.83	Airplane Engines	6	- 6B
16.86	Airplane Eng. Design Practice	6	- 6B
5.75	Thermodynamics	2	- 2A
16.30	Aerial Propellers	4	- 4A
16.69	Aeronautical Seminar	2	- 6A
16.89	Combustion Engine Lab,	0	- 8
	Thesis	12	A 56

(7725 - 10/27/32) (5b) (Rev)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Aeronautical Engineers in
Power Plants at
Massachusetts Institute of Technology.

Prof. C. F. Taylor.

SUMMER COURSE

M 43	Theo. Aero.	3	-	6
M 44	Theo. Aero.	3	-	6
1.401	Airplane Structures	3	-	5
16.00	Aerodyn. of Air. Des.	2	-	3
16.02	Aircraft Structures	4	-	4

FIRST TERM.

16.01	Aerodyn. of Airplane Design (except Lt. Greenwald	4	-	4B
16.06	Air.Struct.Adv. (except Lt.Greenwald)	3	-	6A
16.26	Adv.Aero.Probs(Engines) (Except Lt.Greenwald)	11	-	0A
16.85	Air. Eng. Des. Practice	8	-	0B
10.79	Automotive Fuels	3	-	3B
2.255	Dyn. of Air. Eng.	2	-	2A
2.981	Mfg. Processes	3	-	3A
3.651	Phy. Met. Adv.	4	-	2A
10A	Thesis - Lt. Greenwald only	(20-A)		
		58		

16.06 and 16.26 are given instead of thesis.

SECOND TERM.

16.83	Airplane Engines	6	-	6B
16.86	Air. Eng. Des. Pract.	8	-	0B
5.75	Thermodynamics	2	-	2A
16.30	Aer. Propeller Des. (except Lt.Greenwald)	4	-	4A
16.69	Aero. Seminar	2	-	2A
12A	Thesis	20 A		
		56		

Lieut. Greenwald (L.A.) will take following
alternative courses

First Term

Thesis instead of 16.06
16.21 Airship Theory instead of 16.01

Second Term

16.22 instead of 16.30

(7726 - 10/29/32) (5b) -Rev-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

AERONAUTICAL ENGINEERS IN STRUCTURES AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Prof. C. F. Taylor.

SUMMER COURSE.

M 43	Theo. Aero. - - - - - - - - - - -	3 -	6
M 44	Theo. Aero. - - - - - - - - - - -	3 -	6
1.401	Airplane Structures - - - - - - - -	3 -	5
16.00	Aerodyn. of Air. Design - - - - - - -	2 -	3
16.02	Aircraft Structure- - - - - - - - -	4 -	4

FIRST TERM

16.01	Aerodyn. Airplane Design- - - - - -	4 -	4B
16.11	Airplane Design Practice- - - - - -	4 -	0B
3.651	Phy. Met. Adv. - - - - - - - - - -	4 -	2A
16.62	Aero. Laboratory - - - - - - - - -	4 -	3B
16.21	Airship Theory - - - - - - - - - -	2 -	2A
16.06	Airplane Structure advanced- - - - -	3 -	6A
16.73	Advanced Wing Theory - - - - - - - -	3 -	6A
			47

SECOND TERM.

16.30	Aircraft Propeller Design - - - - -	4 -	4A
1.57	Secondary Stresses- - - - - - - - -	2 -	4A
16.69	Aeronautical Seminar - - - - - - - -	2 -	2A
16.74	Adv. Wing Theory - - - - - - - - -	3 -	6A
16.22	Airship Structures- - - - - - - - -	2 -	4A
	Thesis - - - - - - - - - - - -		20-A
			53

(7785 - 11/8/32)(5b)-(Rev)

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

GAS ENGINEERS AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Supervision Dr. F. G. Keyes.

First Term

"A" Subjects		Hours
2.501	Advanced Refrigeration	3-0-9
5.98	Research	0-17-0
5.911	Journal Meeting, Inorganic Chemistry	1-0-1
5.51	Organic Chemistry II (Lt. Jenkins only)	2-0-2
"B" Subjects		
10.79	(Old F-16) Automotive Fuels	3-0-3
10.31	Chemical Engineering	5-0-4
3rd Year Subjects		
5.41	Organic Chemistry I (Lt. Evans only)	4-0-3

Second Term

10.65	High Pressure Processes	2-0-4
2.502	Advanced Heat Transmission	3-0-9
5.98	Research	0-21-0
5.912	Journal Meeting Inorganic Chemistry	1-0-1
5.51	Organic Chemistry II (Lt.Jenkins only)	2-2
"B" Subjects		
10.32	Chemical Engineering	5-0-4
3rd Year Subjects		
5.42	Organic Chemistry I (Lt. Evans only)	3-0-2

Total Points	Lt. Evans	Lt. Jenkins
"A"	72	80
"B"	24	24
3rd Year	12	

(8251 - 6/28/32)(4)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

NAVAL CONSTRUCTION COURSE AT MASS. INSTITUTE OF TECHNOLOGY.

First Year.
(Old Plan)

		First Term: per week: Exer.	Prep.	Second Term: per week: Exer.	Prep.
L 13	Elementary German			4	8
Ec.61	Business Law	2	4		
M 38	Advanced Calculus	3	6		
2.48	Internal Combustion Engine			1	2
13.64	Marine Engineering Design			4	0
13.58	Marine Engineering	3	4		
13.37	Merchant Shipbuilding			2	2
13.48	Model Making			2	0
13.01 13.02	Naval Architecture	2	2	2	2
Ec. 35	Political Economy	3	5		
13.39	Shipyard Practice			2	2
13.70	Steam Turbines			2	3
13.11 13.12	Theory of Warship Design	4	6	4	4
13.21 13.22	Warship Design	8	0	8	0
Total		25	27	31	23

(8252 - 6/28/32)(4)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

NAVAL CONSTRUCTION COURSE AT MASS. INSTITUTE OF TECHNOLOGY.

Second Year.
(M.I.T. Course XIII).
(Old Plan).

		First Term: per week	Second Term: per week
16.76	Aeronautics	3 - 2	
16.78	Aeronautics		3 - 5
13.03	Naval Architecture	3 - 3	
8.07	Precision of Measurements	1 - 1	
2.291 2.292	Theoretical Mechanics	3 - 6	3 - 6
1.46	Structural Design		2 - 0
1.45	Structures	3 - 6	
13.13 13.14	Theory of Warship Design	6 - 9	5 - 6
13.23 13.24	Warship Design	8 - 0	10 - 0
Thesis			0 - 13
Theory of Elasticity (Option) *		2 - 6	2 - 6
Total		27 - 27	23 - 30

The completion of this course leads to the degree of Master of Science in Naval Construction.

* Students taking this option omit 16.76 and 16.78

(7736-7/21/31)(4)75

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

NAVAL CONSTRUCTOR COURSE AT
MASS. INSTITUTE OF TECHNOLOGY

SUMMER SESSION

Course		Approx. Time
2.92	Pattern Making	7 days
2.911	Foundry	7 days
2.90	Forging	4 days
2.951	Machine Tool Lab.	15 days
2.952	Machine Tool Lab.	15 days

Note:
Above course taken by Naval Constructor students immediately after completing the regular two year course at the Institute.

(7058 - 8/20/30)(4a)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

TORPEDO DESIGN COURSE at MASS. INST. OF TECHNOLOGY

1st Year.

SUBJECT		First Term 15 Weeks Class.	First Term 15 Weeks Prep.	Second Term 15 Weeks Class	Second Term 15 Weeks Prep.
Automatic Machinery	2.07 2.08	3	3	4	4
Dynamics of Machines	2.251	2	4		
Engineering Thermodynamics	2.40 2.42	4	5	4	5
Heat Treatment	3.713	3	2		
Machine Design	2.761 2.762	6	2	6	2
Materials of Engineering	2.301	1	2		
Mechanism of Machines	2.06	2	2		
Metallography	3.615	3	2		
Physical Chemistry	5.683	2	2		
Physical Metallurgy	3.731 3.732	1	2	8	2
Aero. Engine Laboratory	2.691			2	0
Application of X-Ray Photoelasticity	2.32			4	0
Dynamics of Rotation	2.256			1	2
Thermodynamics	5.75T			2	2
Torpedoes	2.51			2	4
Total Hours		27	26	33	21
2nd Year.					
Torpedo research in Torpedo Research Laboratory		15 weeks		15 weeks	

The completion of this course leads to the degree of Master of Science in Mechanical Engineering.

(6751 - 4/3/30)(4)-25

RENSSELAER POLYTECHNIC INSTITUTE
CIVIL ENGINEERS 1st & 2nd YEARS

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Div. A First Term	Bridges									Highways					Reviews and Examinations			
	Transmission and distribution of electrical energy					Elec. Engrg. Lab. & Design		Utilization of Electrical Energy										
	Materials Testing Laboratory			Railroad Engineering				Elec. Engrg. Lab. & Design		Bridge Computations								
Div. A Second Term	Power Plants Mechanical Equipment				Power Plants & Substations Elec. Equipment			Machine Construction				Building Construction						
	Water Works and Sewers.										Reinforced Concrete			Reinforced Concrete Design		Thesis		
	Bridge Design					Thesis			Building Construction	Thesis			Paints, Oils & Varnishes					
	Power Plant and Substation of a Public Utility Corporation. 8 weeks.																	
Graduate Year First Term	Geology							Graphics			Electron Theory				Reviews and Examinations			
	Heating, Ventilation and Refrigeration			Railroad Track Construction						Compressed Air								
	Power Plant Design - Mechanical Equipment Power Plant & Substation Design - Electrical Equipment - Each every other day												Power Plant Architecture					
Graduate Year Second Term	Design of Structures, Retaining walls, Dams and Docks							Business Administration							Thesis			
	Theory of Least Work			Electric Welding				Communication Engineering				Thesis						
	Specifications							Heating & Ventilation Lab.		Thesis								

The Degree of C.E. will be conferred on candidates satisfactorily completing the work of Division A and the Degree of M.C.E. on candidates satisfactorily completing the work of the Graduate Year at the Institute.

During the Summer vacation between the Graduate Year at the Academy and Division A at the Institute:

Railroad Survey the last three weeks of the vacation.

(82.49-W78132)(4)

3 Year Postgraduate Civil Engineer Course at —

RENSSELAER POLYTECHNIC INSTITUTE

YEAR	TERM	WEEKS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I	1	MECHANICS							HYDRAULICS							REVIEWS AND EXAMINATIONS			
		THERMODYNAMICS							ELECTRICAL ENGINEERING										
		ELECTRICITY THAND LAB							Mechanical Eng Lab.										
	2	STRUCTURES	RESISTANCES								REINFORCED CONCRETE			REINFORCED CONC DESIGN					
		DIAGRAMS ETC	R.R. CURVES						PAINTS, OILS AND VARNISHES		BUILDING CONSTRUCTION								
		ELECTRICAL ENG LAB 3 TIMES AND WELDING 2 TIMES PER WEEK																	
II	1	BRIDGES									BRIDGE COMPUTATIONS								
		TESTING LAB	RR ENGINEERING						UTILIZATION OF ELECTRICAL ENERGY										
		TRANSMISSION AND DISTRIBUTION				ELECTRICAL DISTRIBUTION DESIGN					HIGHWAYS								
	2	POWER PLANTS MECH. EQUIP			POWER PLANTS ELEC EQUIP				MACHINE DESIGN				MECHANICAL LABORATORY						
		WATER SUPPLY AND SEWERS							METALLURGY				METALLOGRAPHY						
		BRIDGE DESIGN					WATER SUPPLY AND SEWERS				THESIS								

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
III	1	MATHEMATICS 2 TIMES AND INTERNAL WORK 3 TIMES PER WEEK														REVIEWS AND EXAMINATIONS			
		HEATING AND VENTILATING			R.R. TRACK, CONSTRUCTION AND MAINTENANCE				COMPRESSED AIR										
		POWER PLANT DESIGN MECH EQUIP (EACH) POWER PLANT AND SUB STA DESIGN ELEC EQUIP (E.O.D.)							Reinforced Concrete										
	2	STRUCTURES, DOCKS, DAMS, AND WALLS							BUSINESS ADMINISTRATION							THESIS			
		SPECIFICATIONS							COMMUNICATING ENGINEERING				THESIS						
		MATHEMATICS 2 TIMES PER WEEK POWER PLANT ARCH. 3 TIMES PER WEEK							HEAT AND VENT. LAB				THESIS						

DURING THE SIX WEEKS PRIOR TO THE FIRST YEAR A COURSE IN MATHEMATICS AND SURVEYING WILL BE GIVEN. DURING THE SUMMER VACATION BETWEEN THE 1ST AND 2ND YEARS COURSES WILL BE GIVEN IN SURVEYING, 3½ WEEKS IN HYDROGRAPHICAL AND TOPOGRAPHICAL SURVEYS AND 3 WEEKS IN A R.R. SURVEY.

DURING THE SUMMER VACATION BETWEEN THE 2ND AND 3RD YEARS EIGHT WEEKS WORK WITH AN ELECTRIC POWER AND LIGHT CORPORATION IS REQUIRED.

THE DEGREES OF C.E. WILL BE CONFERRED ON CANDIDATES SATISFACTORILY COMPLETING THE WORK OF THE 1ST AND 2ND YEARS AND THE DEGREES OF M.C.E. ON CANDIDATES SATISFACTORILY COMPLETING THE WORK OF THE 3RD YEAR

(8235 - 6/14/32)(4)-150

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Naval Constructor Course
under the 3-year plan of instruction
at Mass. Institute of Technology.

Preliminary summer mathematics course during nine weeks in first summer, consisting of a review of:

Plane and Solid Geometry
Algebra
Trigonometry
Elementary Calculus.
Differential Equations.

First Year (Junior Class)

No.	Subject	1st Term		2nd Term.	
		Exer.	Prep.	Exer.	Prep.
13.11	Theory of Warship Design	4	6		
13.12	" " " "			4	6
13.21	Warship Design	5	0		
13.22	" "			5	0
2.20	Applied Mechanics	3	6		
2.221	" "			3	6
M 36	Advanced Calculus	3	6		
M 37	" "			3	6
13.01	Naval Architecture	2	2		
13.02	" "			2	2
2.461	Heat Engineering	4	5		
2.30	Materials of Engineering	2	2		
2.601	Engineering Laboratory			4	4
5.35	Applied Chemistry			1	2
8.07	Precision of Measurements	1	1		
2.36	Test Materials Laboratory			2	1
	Total	24 - 28		24 - 27	

Second Year (Senior Class)

No.	Subject	1st Term Exer.	1st Term Prep.	2nd Term Exer.	2nd Term Prep.
13.13	Theory of Warship Design	3	6		
13.14	" " " "			3	4
13.23	Warship Design	5	0		
13.24	" "			5	0
13.03	Naval Architecture	3	3		
2.291	Theoretical Mechanics	3	6		
2.292	" "			3	6
13.48	Model Making			1	0
13.58	Marine Engineering	3	4		
Ec 35	Political Economy	3	5		
6.451	Electrical Engineering	3	6		
6.452	Alt. Currents & A.C. Mach.			1	2
13.64	Marine Engine Design			4	0
2.48	Internal Combustion Engine			1	2
6.87	Electrical Engineering Lab.			3	4
13.37	Merchant Shipbuilding			2	2
3.432	Metallurgy			2	1
Ec 46	Industrial Relations			3	3
	Total	23	30	28	24

Third Year

No.	Subject	1st Term Exer.	1st Term Prep.	2nd Term Exer.	2nd Term Prep.
13.15	Theory of Warship Design	3	6		
13.16	" " " "			3	6
--	Memoirs	0	3		
13.25	Warship Design	6	0		
13.26	" "			6	0
L 11	Elementary German	3	5		
L 12	" "			3	5
Ec 61	Business Law	2	4		
2.03	Mechanism (special)	5	0		
16.76	Aeronautics	3	1		
1.45	Structures	3	6		
3.612	Metallography	3	1		
	General Study			3	3
	Structures			3	6
1.46	Structural Design			2	0
	Thesis			0	13
	Total	28	26	20	33

Note: (a) The completion of this course leads to a degree as Master of Science in Naval Construction.

(b) A general study subject indicated in the second term, third year will be a non technical subject selected at a later date.

(c) Students who select the optional subject of Theory of Elasticity in first and second terms of third year will omit memoirs and metallurgy.

(d) Optional study of French may be substituted for L 11 and L 12 German.

(e) The subject of Memoirs consists of the preparation of several technical articles, stress being laid on organization and form of the article.

(8634 - 12/19/32)(4)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Course in Naval Construction with Aviation bias at Mass. Inst. of Technology

About seven weeks of the summer immediately prior to the first academic year to be given to a refresher course covering the mathematics of the Naval Academy course. M.I.T. shop course to be taken subsequent to graduation. At least one summer to be spent at an aircraft factory.

First Academic Year.

First term.

13.11	Theory of Warship Design	4	6	
T 13.21	Warship Design	5	0	
2.20	Applied Mechanics	3	6	
M 36	Advanced Calculus	3	6	
13.01	Naval Architecture	2	2	
2.461	Thermodynamics	3	6	
2.30	Materials of Engineering	2	2	
8.07	Precision of Measurements	1	1	
	Total	26	29	52

Note. The above is the same as for students of Naval Construction.

Second term.

T 13.12	Theory of Warship Design	4	6	
T 13.22	Warship Design	5	0	
2.21	Applied Mechanics	3	5	
M 37	Advanced Calculus	3	6	
13.02	Naval Architecture	2	2	
2.601	Engineering Laboratory	4	4	
16.00	Aerodynamics; Airplane Design	5	3	
2.38	Test Materials Laboratory	2	1	
	Total	26	27	53

Second Academic Year.

First Term.

T 13.13	Theory of Warship Design	3	6	
T 13.23	Warship Design	5	0	
13.03	Naval Architecture	3	3	
2.291	Theoretical Mechanics	3	6	
6.451	Electrical Engineering	3	6	
16.01	Aerodynamics of Airplane Design	4	4	
16.02	Aircraft Structures	2	2	
16.11	Airplane Design Practice	4	0	
	Total	27	27	54

Second term.

T 13.14	Theory of Warship Design----------	3	4	
T 13.24	Warship Design----------	5	0	
13.43	Model Making----------	1	0	
2.292	Theoretical Mechanics----------	3	6	
2.43	Internal Combustion Engines----------	1	2	
6.87	Electrical Engineering Laboratory----------	3	4	
6.432	Alternating Current and A.C. Machinery-----	1	2	
16.55	Airplane Design----------	7	2	
16.06	Airplane Structures----------	3	3	
16.12	Airplane Design Practice----------	4	0	
	Total----------	31	23	54

Third Academic Year.

First term.

13.15	Theory of Warship Design----------	3	6	
13.25	Warship Design----------	6	0	
L 11	Elementary German----------	3	5	
Ec 61	Business Law----------	3	3	
1.45	Structures----------	3	6	
Ed 35	Political Economy----------	3	5	
16.82	Aeronautical Laboratory----------	4	3	
	Total----------	25	28	53

Second Term.

13.16	Theory of Warship Design----------	3	6	
13.26	Warship Design----------	6	0	
3.432	Metallurgy----------	2	1	
L 12	Elementary German----------	3	5	
----	General Study----------	2	2	
16.08	Airplane Design Problem----------	6	6	
1.46	Structural Design----------	2	0	
	Thesis (on aeronautical subject)----------	0	9	
	Total----------	24	29	53

Note. Numbers to left refer to M.I.T. course numbers. First column on right gives class room or laboratory hours per week. Second column on right gives estimated hours of preparation per week.

(8242 - 6/21/32)( )-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

COMMUNICATION ENGINEERING AT UNIVERSITY OF CALIFORNIA.
1932-1933

First Semester

		Class	Lab.
EE 112C	Acoustics and Electron Tubes Lab.	- -	5
EE 116A	Acoustics and Electron Tubes	3 -	
EE 216A	Electric Communications	3 -	
EE 221A	Transient Phenomena and Advanced Research Mathematics	2 -	
EE 221C	Transient Phenomena Laboratory	-	2-1/2
	Total - -	8 -	7-1/2

Second Semester.

		Class	Lab.
EE 112D	Acoustics and Electron Tube Lab.	-	5
EE 116B	Acoustics and Electron Tubes	3 -	
EE 198B	Electric Oscillations & Circuit Theory	2 -	
EE 216B	Electric Communications	3 -	
EE 221B	Transient Phenomena and Advanced Research Mathematics	2 -	
EE 221D	Transient Phenomena Laboratory	-	2-1/2
	Total	10 -	7-1/2

(8243 - 6/21/32)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Course for Engineering
at University of California

Prof. B. M. Woods - Chairman, Dept. Mech. Eng.

1st semester

		Lec.	Lab.	Points
E.E. 111A	Electrical Eng. (A.C.)- - - - -	3	-	3
E.E. 112A	Electrical Eng. (Elec.Mech.Lab)	-	3	3
M.E. 217A	Mech. Eng. (heat Trans.)- - - -	3	-	3
M.E. 218A	Mech. Eng. (Dyn. of Mach.)- - -	3	-	3
Mar.Eng.103A	Marine Eng. (Diesel)- - - - - -	4	-	4
		13	3	16

2nd semester.

E.E. 111B	Elec. Engrg. (A.C.) - - - - - - -	3	-	3
E.E. 112B	Elec. Engrg. (Elec.& Mech. Lab)	-	3	3
M.E. 217B	Mech. Engrg. (Heat Trans.)- - -	3	-	3
M.E. 218B	Mech. Engrg. (Dyn. of Mach.)- -	3	-	3
Mar.Eng.103B	Marine Eng. (Diesel)- - - - - -	4	-	4
		13	3	16

(8240 - 6/21/32)(5b)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

OUTLINE OF COURSE AT
UNIVERSITY OF CALIFORNIA
FOR
ENGINEERS.

Elec. Engrg. 111A-B (3-3)

1. Induction motors, speed control, phase advancers.
2. Synchronous machine theory; motors and generators.
3. Load power factor control.
4. Converters, both synchronous and rectifier.
5. A-C commutator motors; single phase motors; commutation of A-C machines.
6. Studies in the selection of electrical equipment for various applications.

Three lectures per week; test assignments, reports, problems.

Elec. Engrg. 11aA-B (3-3)

Laboratory experiments designed to illustrate the material presented in Course 111A-B; special problems, experiments, and analytical reports thereon.

1 5-hour laboratory period per week; special instruction sheets furnished in the laboratory.

Mech. Engrg. 217A-B (3-3)

Heat transfer.

The three classical subdivisions, conduction, radiation and convection, are considered. Under conduction periodic variations are emphasized (example: the reciprocating engine). In addition to radiation through diathermic fluids, gaseous radiation and radiation of luminous flames are stressed (example: the boiler). Convection is attacked from three points of view: (1) classical differential equations; (2) similarity; (3) relation between friction factor and transfer factor in accordance with Reynolds' analogy.

Mech. Engrg. 218A-B (3-3)

Dynamics of Machinery. This course will replace M.E. 104A-B. The subject matter chosen takes account of the instruction

previously received by the students. The following outline lists the topics:

1. Free and forced vibration of a simple spring mass system without damping and with viscous damping. Hort, Lehr.
2. Solution of problems in dynamics by means of LaGrange's method and vector analysis. Byerly, Brand.
3. Dynamics of the engine, including balancing considerations of rotating and reciprocating parts. Stodola, Cormac, U. of C. Theses.
4. Regulation of prime movers. Governors, Hort. Flywheels, McKay. Flywheels for reciprocating engine-alternator, Current literature.
5. Numerical Integration of differential equations with applications to pseudo-harmonic oscillation. Adams, Smithsonian Mathematical Formulae.
6. Critical speeds of rotating machinery. Stodola, Hort, Foppl.
7. Torsional oscillations of engine shafts. Holzer, Wydler
8. Carriage and ship oscillations. Geiger, Hort.
9. Measuring Instruments; Steuding, Geiger, Hort.

Problems illustrating the theory are solved during the laboratory period. In addition each student is assigned an individual problem involving the dynamical analysis of a mechanism. There will be little or no repetition of the work covered in Root.

Marine Engrg. 103A-B (4-4)

Designed primarily for students from the Naval Academy pursuing graduate study in engineering. A study of powerplant characteristics and their influence on the vibration characteristics of the vessel. Emphasis will be placed upon the dynamics of the Diesel Engine, the characteristics of fuel oil and their relation to engine operation. This study will be amplified by problems covering a complete analysis of the Bureau Type 4-cycle 10 cylinder oil engine.

(8241 - 6/21/32)(5b)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

ENGINEERS
at
University of California.

Text and Reference Books.

Course.

E.E. 111 A-B 3-3
Christie - "Electrical Engrg.", McGraw-Hill.
Lawrence - "Alternating Current Machinery", McGraw-Hill.

E.E. 112 A-B 3-3
Karapetoff - "Experimental Elec. Engrg.", Vol. I & II./ John Wiley.
Christie - "Elect. Engrg.",
Lawrence - "Alternating Current Machinery".

Mech. Engrg. 217 A-B 3-3
Mimeo. notes "Prins. of Heat Transfer" pub. by Univ. of California Press.
McAdams - Heat Transfer, McGraw-Hill.

M.E. 218 A-B 3-3
Timoshenko - "Vibration Probs. in Engrg." - D. VanNostrand

References:

Hort)
Lehr) Vibration Study.

Byerly)
Brand) Dynamics

Stodola)
Cormac) Balancing
U.of C. Theses)

Hort)
McKay) Regulation-governors.

Adams) Differential Equations applied to
Smithsonian Tables) pseudo harmonic oscillations.

Stodola)
Hort) Critical Speeds.
Foppl)

Holzer)
Wydler) Torsional oscillations.

Geiger)
Hort) Carriage & ship oscillations.

Steuding)
Geiger) Measuring Instruments.
Hort)

and for review
Angus - "Theory of Mechanics", McGraw-Hill
Ham & Crane - "Mechanics of Machinery", McGraw-Hill
Seeley - "Strength of Materials", John Wiley & Son.
Seely & Ensign - "Analytical Mechanics for Engineering", - John Wiley & Son.

Marine Engrg. 103 A-B 4-4

Mimeo. notes "Marine Diesels & Applications" - pub. by U. of C. press.

References:

Hort, "Technische Schwingungslehre
Sass, "Kompressorlose Dieselmaschinen".
S.A.E. Journals
Institute of Naval Architects.
N.A.C.A. Reports.

(7773 - 8/7/31)(4a)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Practical Instruction for Ordnance Group.

The students in the Ordnance group at the Postgraduate School are assigned to specialties prior to the 4th term.

A. The officers specializing in General Ordnance (fire control, ballistics and design) follow a schedule approximately as follows:

Complete first year of instruction
at Postgraduate School - - About 29 May.

Report to Naval Gun Factory, Washington, D.C.
Follow course of instruction prescribed by
N.G.F. Order No. 294 of 24 February 193 - - - 12 weeks

Leave - 30 days
Return to Postgraduate School about 21 September
for term 6 and term 7.
Complete all work at Postgraduate School about - - 5 March.

During the next 14 months -

Visit Naval Proving Ground, Naval Powder Factory, Bureau of Ordnance, Ammunition Depot, Iona Island; Ford Instrument Company,, Army Proving Ground, Edgewood Arsenal, Midvale Steel Co., General Electric Co., etc. A special schedule is prepared for each student which is approved by the Bureau of Ordnance and Bureau of Navigation.
Schedule allows one month for leave.

B. The Officers specializing in Ordnance (Aviation) follow a schedule approximately as follows:

Complete first year of instruction at
Postgraduate School about - - - - - - - - 29 May

Report to Naval Gun Factory, Washington,
D.C., Follow course of instruction
prescribed by NGF Order No. 294 - - - - - - - - 8 weeks.

Report to Naval Aircraft Factor, Navy Yard,
Philadelphia, instruction - - - - - - - - - 4 weeks

Leave - 30 days

Return to Postgraduate School about 21 September
for Term 6 and 7.
Complete all work at Postgraduate School about - 5 March.

During the next 14 Months:-

Visit Naval Proving Ground, Naval Powder Factory, Bureau of Ordnance, Bureau of Aeronautics, Air Corps Engineering School, Wright Field, Air Corps Technical School, Chaunte Field, Ordnance Specialists' School, Raritan Arsenal, Torpedo Station, Newport,; Hartford Inspection District, For Instrument Co. Army Proving Ground, Edgewood Arsenal, etc. A special schedule is prepared for these students which is approved by the Bureau of Ordnance and Bureau of Navigation. Schedule allows one month for leave.

C. The Officers specializing in Metallurgy and Explosive Chemistry.

Complete 1st year of regular instruction at Postgraduate School about 29 May. They remain at the Posgraduate School through the summer during term 5 taking special courses in Chemistry and metallurgy. Complete the work of Term 5 about 15 August.

Visit local plants and stations such as Bureau of Ordnance, Naval Gun Factory, Bellevue Lab., etc. - 10 days approx

Leave - 30 days

Explosive Engineer commences one year course at University of Michigan - - - - - - - - -about 25 September

Metallurgy Engineer commences one year course at Carnegie Institute of Technology - - about 25 September.

Explosive Engineer completes work at University of Michigan about 22 June
Metallurgy Engineer completes work at Carnegie Institute of Technology about 9 June.

During the remaining eleven months (approx) of their course these officers visit:
Ford Instrument Company, Naval Powder Factory, Naval Proving Ground, Naval Ammunition Depot, Iona Island; Mine Depot, Yorktown; Naval Ammunition Depot, St. Julien's Creek; Picatinny Arsenal, Aberdeen Proving Ground, Edgewood Arsenal, Bureau of Ordnance, etc. A special schedule is prepared for

each student which is approved by the Bureau of Ordnance and Bureau of Navigation. The schedule allows one month for leave.

D. The Officers specializing in Torpedo Design.

Two students are selected from the Ordnance Group on alternate years for specialization in Torpedo Design and Torpedo Research.

First Summer after completing one year at the P. G. School:

Permanent change of duty orders are issued to torpedo design students which require them to carry out a summer schedule approximately as follows:

Proceed to Mass. Institute of Technology and take summer shop courses as indicated in Stencil #7729 - - - - - - - - - - - - - - - - 8 June to 24 July, Approx.

Report for instruction in Torpedoes at Naval Torpedo Station, Newport, R. I. - - - - - - - - - 30 days

Leave - 30 days

Commence Torpedo design course at Mass. Institute of Technology - - - - - - - - - 28 September, approx

Second Summer, after completing of junior year at Massachusetts Institute of Technology:

Temporary duty orders are issued in order to carry out the following schedule:

Complete junior year at M.I.T. about 10 June.

Report to Naval Torpedo Station, Newport, R.I., Work in Research Department - - - - - - - - - - - - 80 days approx

Leave - 30 days

Commence second year at M.I.T. consisting of Torpedo Research Work in Torpedo Research Lab. - 28 September, approx.

Note: The Torpedo Research Laboratory at M.I.T. is contracted for and paid for by the Bureau of Ordnance. Projects of Torpedo Research are assigned by the Bureau of Ordnance.

Third Summer after completing research year at Mass. Institute of Technology:

Complete research projects at M. I. T. by 10 June.

Report to Bureau of Ordnance - - - Until end of June approx.

The postgraduate course ie terminated on completing the duty in the Bureau of Ordnance.

Note: Visits to army posts must be arranged through the Bureau of Navigation with the War Department. See Bu. Nav. file NC4÷P11-1(488) of 8 February 1930 (P.G.S. Serial 31117) for the Bureau's instructions concerning the arrangements with the War Department and the desired procedure in preparing the practical work schedule.

Note: The Bureau of Ordnance policy regarding the assignment of student officers to specialties is outlined by enclosure to Bu.Ord. file NC4(551)(H8) of 19 July 1930. (analysis of Postgraduate Requirements).

(8230)

SCHEDULES OF SUMMER PRACTICAL WORK

(7774 - 8/7/31)(4a)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SUMMER PRACTICAL INSTRUCTION FOR
CIVIL ENGINEER GROUPS.

Class completing first year at Postgraduate School:

Permanent change of duty orders are issued to students in this group which require them to carry out a schedule approximately as follows under the supervision of the Postgraduate School:

Leave - 30 days

Report to Inspector of Naval Material, Pittsburgh Inspection District, to visit industrial plants in the Pittsburgh area - - 44 days, approx

Summer Railroad Survey under supervision of Rensselaer Polytechnic Institute in the vicinity of Troy, N.Y. - - - - - - - - - - - - - 26 days approx.

Commence junior year of Civil Engineer Course at Rensselaer Polytechnic Institute - - - about 11 September

Note: Additional temporary duty orders are issued to cover the travel involved in visiting plants in the Pittsburgh area and for the Railroad Survey.

During the junior year, usually about 1 November, additional temporary orders are issued to the students in this group authorizing their travel to New York, N.Y. (or elsewhere) in connection with instruction in bridges under the supervision of Rensselaer Polytechnic Institute.

Class Completing first year at Rensselaer Polytechnic Institute:

Temporary additional duty orders are issued to the students in this group which require them to carry out a schedule approximately as follows:

Finish first year at Rensselaer Poly. Inst. - About 13 June.

Report for summer practical instruction at the Electric Power Company of a large city. In recent years students have been assigned to Edison Electric Illuminating Company of Boston or Brooklyn Edison Company, Inc., New York, N.Y. Arrangements for these visits are made by Rensselaer Polytechnic Institute - - - - 56 days approx.

Leave - 30 days

Commence Second year of Civil Engineer Course
at Rensselaer Polytechnic Institute - - - about 11 September

Note: During the senior year, usually about 1 December and 1 January, temporary additional duty orders are issued to students in this group to cover their travel to commercial power plants in connection with their course in Power Plant Design under the supervision of Rensselaer Polytechnic Institute. Visits have been made to South Amboy, N.J. and to Hartford, Conn. in this connection.

The Postgraduate course for Civil Engineers terminates on their graduation from Rensselaer Polytechnic Institute.

Note: The practical work schedule during the first summer is approved by the Bureau of Yards and Docks and the complete summer schedule for both groups is approved by Bureau of Navigation.

(8237 - 6/14/32)(4)-75

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Art 2.

Schedule of Summer Instruction
for Civil Engineer Class 1932-1935
during the summer 1932.

Reference: (a) Administration & Organization of the Postgraduate School - Stencil 7771.
(b) Instructions for student officers - Stencil 8087.

1. The Civil Engineer Class of 1932-1935 will follow the schedule below for instruction during the summer of 1932.

2. Civil Engineer Class of 1935:

Ensign William F. Wesanen, USN
" Alexander S.C. Wadsworth, USN
" Henry G. Clark, USN

3. Schedule:

(A) Period 27 July 1932 to 12 September 1932.

Take summer course in mathematics and surveying at Rensselaer Polytechnic Institute, Troy, N.Y. as arranged by the Postgraduate School.

(B) On 12 September 1932 begin first academic year at Rensselaer Polytechnic Institute. Courses as arranged by the Postgraduate School.

4. Students will comply with references (a) and (b), copies of which are mailed to each student.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8126 - 4/1/32)(4)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Practical Instruction for Civil Engineer Class of 1933 during the Summer 1932.

Reference: (a) Administration & Organization of the Postgraduate School, Stencil 7771.
(b) P.G.S. Stencil 8087 - Instructions for students, etc.
(c) Bu.Nav. file Nav-143-ES., NC4/P11-1(662) 26 March, 1932.

1. The Civil Engineer Class of 1933 will follow the schedule below for summer practical instruction. These schedules were approved by reference (c).

2. Civil Engineer Class of 1933:

For: Ensign A. J. Fay, USN
" H. R. Ransford, USN

Schedule:

11 June 1932 - Finish first year work at Rensselaer Polytechnic Institute.
14 June 1932 to 12 Aug. 1932:- Practical Instruction at Brooklyn Edison Company, 380 Pearl St., Brooklyn, N.Y. under the immediate supervision of Mr. R. V. Rickcord, Director, Department of Personnel and Statistics, Brooklyn Edison Company.
13 Aug. 1932 to 11.Sept.1932:- Leave.
12 September 1932:- Register and begin second year of regular course at R. P. I.

For: Ensign H. V. Jones, USN.

Schedule:

11 June 1932 - Finish first year work at Rensselaer Polytechnic Institute.
14 June 1932 to 12 Aug.1932:- Practical Instruction at Edison Electric Illuminating Co. of Boston, Mass., under the immediate supervision of Mr. E. S. Mansfield, Head of Educational Department, Edison Electric Illuminating Company, 39 Boylston St., Boston, Mass.
13 Aug.1932 to 11 Sept.1932:- Leave.
12 Sept. 1932:- Register and begin second year of regular course at R. P. I.

3. Students will comply with references (a) and (b), and will carry out such schedules of instruction as may be prepared for them at the plants visited.

4. Students will comply with all local plant instructions and regulations.

5. The orders covering the travel involved and authority for leave will be issued by the Bureau of Navigation.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(S63C - 2/9/33)(4)-150

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Practical Instruction for
Naval Constructor Groups during
Summer 1933.

Reference: (a) Administration & Organization of the Postgraduate School - Stencil 7771.
(b) Bu. C&R file CC-P11-(2)(0) of 9 April 1928.
(c) Bu. C&R file CC-P11-(2)(0) of 17 Jan. 1929.
(d) P.G.S. Stencil 8087 - Instructions for student officers, etc.
(e) BuNav. file Nav-143-ES, NC4-14/P11-1(13) of 2 Feb. 1933.

1. The Naval Constructor groups will follow the schedules below for summer practical instruction. These schedules are approved by reference (e).

2. For Naval Constructor Class of 1933:

Lieut(jg) A. Sledge, (CC) U.S.Navy
" " J. L. Bird, (CC) U.S.Navy
" " E. M. Ragsdale, (CC) U.S.Navy
" " C. M. Tooke, (CC) U.S.Navy
" " H. T. Koonce, (CC) U.S.Navy
" " J. H. Spiller, (CC) U.S.Navy
" " A. M. Zollars, (CC) U.S.Navy
" " J. B. Smyth, (CC) U.S.Navy
" " C. R. Watts, (CC) U.S.Navy
" " W. E. Howard, (CC) U.S.Navy
" " R. O. Burznyski, (CC) U.S.Navy
" " R. K. James, (CC) U.S.Navy
" " J. Zabilsky, (CC) U.S.Navy

Schedule:

6 June 1933:- Commencement at Mass.Inst. of Technology, completing second academic year old plan.
Take Summer Shop Course at M.I.T. as follows:
5 June - 10 June 1933:- 2.922 Pattern making.
5 June - 17 June 1933:- 2.90 Forging.
12 June- 17 June 1933:- 2.911 Foundry.
19 June- 5 July 1933:- 2.951 Machine Tool Laboratory.
6 July- 21 July 1933:- 2.952 Machine Tool Laboratory
22 July 1933:- End of course.

3. For Naval Constructor Class of 1934:

Lieut(jg)	J. H. Ellison,	U.S.Navy
" "	M. C. Vangeli,	U.S.Navy
" "	W. T. Jones,	U.S.Navy
" "	H. C. Zitzewitz,	U.S.Navy
" "	W. H. Leahy,	U.S.Navy
" "	V. B. Cole,	U.S.Navy
Ensign	J. M. Farrin,	U.S.Navy
"	J. H. Keatley,	U.S.Navy
"	W. C. Allen,	U.S.Navy
Lieut(jg)	H. J. Hiemenz,	U.S.Navy
" "	T. E. Kent,	U.S.Navy.

Schedule:

6 June, 1933:- Commencement at Mass.Inst. of Technology, completing first academic year, old plan.
9 June 1933-25 Aug.1933:- At Navy Yard, Portsmouth, N.H. Practical instruction in trades as follows:
Wood working - 4-1/2 weeks
Outside machinists - 3 weeks
Electrical Shop - 2 weeks
25 Aug. - 25 Sept.1933:- Leave (Academic)
25 Sept. 1933:- Register and start second academic year at Mass. Institute of Technology, Cambridge, Mass.

4. For Naval Constructor Class of 1935:

Lieut(jg)	P. F. Wakeman,	U.S.Navy
Ensign	S. M. Alexander,	U.S.Navy
"	O. M. Browne,	U.S.Navy
"	H. W. Englund,	U.S.Navy
Lieut(jg)	H. R. Garner,	U.S.Navy
Ensign	M. H. Gluntz,	U.S.Navy
"	H. M. Heiser,	U.S.Navy
"	R. E. Perkins,	U.S.Navy
"	R. T. Sutherland,	U.S.Navy

Schedule:

6 June 1933:- Commencement at Mass. Inst. of Technology, completing first academic year, new plan.
7 June - 25 Aug. 1933:- At Navy Yard, Boston, Mass. Practical Instruction in trades as follows:
Pipe fitting, Plumbing, Copper shops - 3-1/3 wks.
Ship fitter and Sheetmetal shop - 8 weeks.
25 Aug. - 25 Sept. 1933:- Leave (academic)
25 September 1933:- Register and start second academic year at Mass. Institute of Technology.

For Lieut(jg) L. E. Richardson, USN(Aviation bias)

8 June 1933:- Commencement at Mass. Inst. of Technology, completing first academic year, new plan.
9 June - 25 Aug.1933:- At Naval Aircraft Factory, Philadelphia, Pa. for practical instruction.
25 Aug. - 25 Sept.1933:- Leave (academic)
25 September 1933:- Register and start second academic year at Mass. Inst. of Technology.

5. For Naval Constructor Class of 1936:

Lt(jg) Charles E. Trescott, U.S.Navy
Ensign Richard K. Anderson, U.S.Navy
" Ernest C. Holtzworth, U.S.Navy
" Albert K. Romberg, U.S.Navy
" Alexander C. Veasey, U.S.Navy.

Schedule:

From reporting at Navy Yard Boston to 12 July 1933:
Practical instruction at Navy Yard, Boston, as follows:
(a) Study of processes in chain shop.
(b) Study of procedure at marine railway.
(c) Study of all-welded tug boat construction.
(d) Study activities at Fore River Ship Yard.
(e) Other subjects for profitable study assigned by the Commandant, Navy Yard.

13 July - 6 Sept. 1933:- Register and take summer mathematics course at Mass. Inst. of Technology.
7 Sept.-24 Sept.1933:- Practical instruction at Navy Yard, Boston. Continue studies terminated on 12 July, 1933.
25 September 1933:- Register and start first academic year at Mass. Institute of Technology.

6. Students will comply with references (a) and (d).

7. Students will carry out such schedules of instruction as will be prepared for them at the various plants visited, and will carry out all local plant instructions and regulations.

8. All orders concerning travel involved in these schedules and authority for leave will be issued by the Bureau of Navigation, and will be requested by the Postgraduate School.

9. The following extract from reference (b), indicating the wishes of the Bureau of C&R is quoted for information and compliance:

"The summer practical instruction has two objectives: (1) to give the student officers some practical knowledge of the processes of the various trades with a general idea of the possibilities and limitations of these processes and also of what daily production can be expected under reasonable conditions; and (2) which the Bureau feels is equal to, if not more important than the one just mentioned, to familiarize these officers with the psychology of the workman."

10. The following extracts from reference (c) indicating the desires of the Bureau of C&R are quoted for information and compliance:

"The basic principles underlying the Navy Yard practical courses are not understood or appreciated by the student officers or by the Navy Yard Officers, and as a result the practical work has been relegated to a secondary position; whereas lectures, visits to various yard departments, etc.; have been given prominence. The student officers naturally are eager to become acquainted with the yard organization and the methods of carrying on work in the different yard departments so as to be able to have a flying start, so to speak, when given their first assignment to regular yard duty; and they have an idea that the members of the supervisory force, as well as the officer in general charge of them, should give them much personal time and instruction. On the contrary, however, it is the intention and desire of the Bureau that these student officers be considered as workmen during the period of the practical course and that the above officials of the management give them no more particular attention and time than would be given to any other new set of employees. Otherwise the basic principle of the practical course is lost and the results not satisfactory. The best results can be obtained only when the students lose themselves in, or are absorbed by, the mechanical working force and learn by personal contact the difficulties that exist in any plant. They are expected to become acquainted with the character of the workmen, and the difficulties that exist and interfere with efficient management; such as delays in getting materials on time, in loss of time in going from one shop or one machine to another, in getting some other trade to do its part of the job, in securing systematic methods of handling the different operations of the job, etc.; so that in the end they will have well formed opinions of improvements desirable or necessary. Their discussions during the days with their fellow workmen and at night with their fellow officer students, will help and are essential. Such knowledge as how accounting is handled, how draftsmen perform their work, how planners and estimators do their job, must be acquired after their regular assignment and in connection with their regular duties. The chief aim of the practical course is to give

them a foundation of information to help and to guide them later in official dealings with the employees at a time when they will be in a position to institute improvements for the more efficient conduct of the management. They must eliminate the idea that when they have watched an operation once, they know enough about it, whereas they have merely seen it and have not understood or mastered it. Watching a bending slab gang or a plater's gang day after day is not wasting time. They must observe all these things as much and as often as possible while forming a part of such a gang or when doing their own different jobs."

"The Bureau does not believe that it is desirable for the yards to require the students to keep note books. If the students desire to keep note books, there is of course no objection but the work on them should be done exclusively outside of yard working hours. The Bureau believes that if the student applies himself conscientiously during the entire working day for the periods assigned, he will absorb such subject matter as would find its place in a note book and will not keep one except on particular subjects."

"For similar reasons, it is not considered that an examination at the end of the course is desirable. The officers' record is adequately covered by his fitness reports, which the Bureau prefers to have based on the students' strict appliance to the jobs assigned during the summer and the ability to carry out implicitly yard regulations as applied to the mechanical trades".

"The Bureau has no objection to tours through nearby factories and plants which will prove instructive to the students, but such trips should be limited to not more than three and included during the last week of the course."

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8233 - 6/13/32)(5aa)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Practical Instruction for
Senior Communication Engineering Group
during Summer 1932.

Reference: (a) Administration and Organization of the Postgraduate School - Stencil 7771.
(b) P.G.S. file NC4(5a)/P11-1(20-R-2) of 3 Feb.,1932.
(c) Opnav file Op-20-C 2/26/32 00/P11-1(8) (320205) of 27 Feb., 1932.
(d) Bunav file Nav-143-ES NC4-5/P11-1(8) of 14 March, 1932.

1. The senior communication engineering group will follow the below schedule of summer practical instruction. This schedule was approved by reference (d).

11 June - Yale group detached from Yale University.
13 June - Yale group only. At Central Office, RCA, New York, N.Y. Study office organization and administration.
14 June - Yale group only. At RCA transmitting stations, Rocky Point and Riverside, Long Island. Inspect installation.
15 June - Yale group only. At Radio Frequency Laboratories, Boonton, N.J. Inspection trip through laboratories.
15 June - Harvard group detached from Harvard University.
16- 22 June - At Westinghouse Elec. & Manufacturing Co., Chicopee Falls., Mass. Study modern materials and methods of construction of radio equipment.
22 June - Yale group returns to Yale University for graduation ceremonies.
23 - 30 June - At General Electric Co., Schenectady, N.Y. Study modern materials and methods of construction of radio equipment; visit research laboratories.
30 June - Course completed.

(8125 - 4/1/32)(4)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Practical Instruction for
Ordnance Class of 1934, during the
Summer, 1932.

Reference: (a) Administration & Organization of the Postgraduate School, Stencil 7771.
(b) P.G.S. Stencil 8087 - Instructions for student officers, etc.
(c) BuNav. file, Nav-143-ES, NC4/P11-1(662) of 26 March 1932.

1. The Ordnance Class of 1934 will follow the schedule below for summer practical instruction. This schedule was approved by reference (c).

2. For officers specializing in Ballistics, Ordnance Design, and Fire Control:

Lieut.(jg) W. H. Benson, U.S.N.
" " C. E. Haugen, U.S.N.
" " J. R. VanNagell, U.S.N.
" " I. T. Duke, U.S.N.

31 May 1932 to 18 August 1932:- Practical Instruction at Naval Gun Factory, Washington, D.C.
18 Aug. 1932 to 18 Sept.1932:- Leave.
19 September 1932:- Resume instruction at Postgraduate School.

3. For officers specializing in Aviation Ordnance:

Lieut(jg) M. S. Teller, USN
" " W. W. Harvey, USN

31 May 1932 to 18 July 1932:- Practical Instruction at Naval Gun Factory, Washington, D.C.
20 July 1932 to 18 August 1932:- Practical Instruction at Naval Aircraft Factory, Navy Yard, Philadelphia, Pa.
18 Aug. 1932 to 18 Sept. 1932 - Leave.
19 September 1932:- Resume instruction at Postgraduate School.

4. For officers specializing in Torpedo Design:

Lieut(jg) H. E. Hubbard, USN
" " J. M. Robinson, USN

1 June 1932 to 26 Aug. 1932- Practical Instruction at Naval Torpedo Station, Newport, R.I.
27 Aug. 1932 to 25 Sept. 1932:- Leave.
26 September 1932- Register and begin course at Mass. Inst. of Tech

5. For one officer specializing in Explosives:

Lieut(jg) J. H. Sides, USN

31 May 1932 to 13 Aug. 1932:- Term 5 at Postgraduate School.
14 Aug. 1932 to 19 Sept.1932:- Leave.
19 September 1932 :- Register and begin course at University of Michigan,Ann Arbot, Mich.

6. For one officer specializing in Metallurgy:

Lieut(jg) J. W. Ludewig, USN

31 May 1932 to 2 Sept. 1932:- Term 5 at Postgraduate School.
2 Sept.1932 to 2 Oct. 1932:- Leave
4 October 1932 - Register and begin course at Carnegie Inst. of Techology, Pittsburgh, Pa.

7. Students will comply with references (a) and (b). Students will carry out such schedules of instruction as will be prepared for them at the various plants visited, and will carry out all local plant instructions and regulations.

8. The orders covering the travel involved, and authority for leave will be issued by the Bureau of Navigation.

9. Attention is invited to the fact that the curriculum of the Postgraduate School does not provide for the training of technical ordnance students in the field of practical ordnance and gunnery, except in so far as ordnance subjects are assigned for collateral reading. It is therefore incumbent on each student to take advantage of the excellent opportunity for study in this line offered during the period of practical instruction, to the end that he will properly fit himself for his gunnery duties afloat. The Ordnance Assistant at the Postgraduate School is prepared to render assistance to students as they may desire.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8236 - 6/14/32)(4)-100

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Summer Instruction
for Naval Constructor Class 1932-1935
during the summer 1932.

Reference: (a) Administration & Organization of the Postgraduate School - Stencil 7771.
(b) P.G.S. Stencil 8087- Instructions for student officers.

1. The Naval Constructor Class of 1932-1935 will follow the schedule below for instruction during the summer 1932.

2. Naval Constructor Class of 1935:

Lt(jg) P. F. Wakeman, USN
Ensign S. M. Alexander, USN
" O. M. Browne, USN
" H. W. Englund, USN
" H. R. Garner, USN
" M. H. Gluntz, USN
" H. M. Heiser, USN
" R. E. Perkins, USN
" L. E. Richardson, USN
" R. T. Sutherland, USN

3. Schedule:

(A) From reporting at Boston until 14 July 1932:

Practical instruction at Navy Yard, Boston, in following subjects:
(a) Study of processes in chain shop.
(b) Study of procedure at Marine railway.
(c) Study of all-welded tugboat construction.
(d) Study of activities at Fore River Ship Yards.

(B) Period from 14 July 1932 to 7 September 1932 inclusive.

Take summer mathematics course at Massachusetts Institute of Technology as arranged by Postgraduate School.

(C) Period 8 September 1932 to 25 September 1932.

Practical instruction at Navy Yard, Boston.

Members of class to be assigned as mechanics helpers in various shops.

(D) 26 September 1932 begin first academic year at Mass. Institute of Technology. Courses as arranged by the Postgraduate School.

4. Students will comply with references (a) and (b), copies of which are mailed to each student.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8234 - 6/13/32)(4)-100

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Part 2

Stays in until 5/01/33.

Revised Schedule of Practical Instruction
for Postgraduate Ordnance Class of
1930 - 1933.

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(8234)

(GROUP A) — (FIRE CONTROL - GENERAL)

Lt(jg) Edward L. Woodyard, USN
(Not married)

Disposition on 1 July 1932: at Ford Inst. Co., N.Y. where he reported on 29 April 1932.

Revised Schedule:

Ford Inst. Co., N. Y., 29 April 1932 to 10 Dec. 1932.:

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire control course)
(b) Arma Engineering Co.
(c) Navy Yard, N. Y.
(d) C. L. Norden Co.
(e) N.A.D. Iona Island, N.Y.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.
(i) 30 Days leave from 16 September 1932 to 15 October 1932 in accordance with Art. C-6001, Bu.Nav. Manual, is authorized and may be requested by this student, subject to modifications imposed by a Furlough Plan.

At Navy Yard, Washington, D.C. 12 Dec. 1932 to 31 May 1933.

During this interval, travel by government conveyance, and carry out the plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, 13 Dec. 1932 to 20 Dec. 1932, approximately, depending on govt. conveyance.
(b) Naval Proving Ground, Dahlgren, Va., 20 Dec. 1932 to 29 April 1933, approximately, depending on govt. conveyance.
(c) Naval Gun Factory, Washington, (Fire Control Section) 1 May 1933 to 31 May 1933 approximately, depending on govt. conveyance.
(d) At the discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the government.

End of course 31 May 1933.

-2-

GROUP B1 - (GENERAL - BALLISTICS.

Lt(jg) Merle A. Sawyer,USN (married,1 child)
" Joseph M.P.Wright,USN (not married)

Disposition on 1 July 1932: Naval Proving Ground, Dahlgren, where they reported on 21 March 1932.

Revised Schedule :

Naval Proving Ground, Dahlgren, 21 March 1932 to 15 Sept. 1932.

By Govt. conveyance to Navy Yard, Washington, D.C.

Navy Yard, Washington, D.C. 15 Sept. 1932(approx)to 11 Jan. 1933.

During this interval, travel by government conveyance, and carry out the plan indicated below as directed by the Bureau of Ordnance:

(a) Bureau of Ordnance 15 Sept.1932 (approx)to 11 January 1933.
(b) 30 days leave from 18 Sept. 1932 to 17 October 1932 in accordance with Art. C-6001, Bu. Nav. Manual, is authorized, and may be requested by these students, subject to modifications imposed by a Furlough Plan.
(c) At the discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the government.

Fort Instrument Co., N.Y. 13 Jan. 1933 to 31 May 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire control course).
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L. Norden Co.
(e) N.A.D. Iona Island.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

End of Course - 31 May 1933.

GROUP B2 - (GENERAL AND BALLISTICS)

Lt(jg) James S. Laidlaw, USN(married-no children)
" Fremont B. Wright, USN (not married).

Disposition on 1 July 1932: at Ford Instrument Company, N.Y. where they reported on 29 April 1932.

Revised Schedule:

Ford Instrument Co., N.Y., 29 April 1932 to 6 Sept. 1932:

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire Control Course)
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L. Norden Co.
(e) Naval Ordnance Plant, Baldwin, L.I.
(f) Other inspection activities.
(g) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned, and which are approved by the Postgraduate School.

Navy Yard, Washington, D.C., 8 Sept. 1932 to 31 May 1933.

During this interval, travel by government conveyance, and carry out the plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md. - 9 Sept. 1932 to 16 Sept. 1932 (approx) depending on govt. conveyance.
(b) Naval Proving Ground, Dahlgren, Va. 16 Sept. 1932 (approx) to 1 March 1933 (approx) depending on govt. conveyance.
(c) Bureau of Ordnance, 1 March 1933 (approx) to 31 May 1933 depending on govt. conveyance.
(d) At discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the government.

End of course - 31 May 1933.

(8234)

GROUP C- (GENERAL- DESIGN)

Lt(jg) William J.Longfellow,USN (married-no children)

Disposition on 1 July 1932: At Ford Instrument Company, N.Y. where he reported on 29 April 1932.

Revised Schedule:

Ford Instrument Co., N.Y.- 29 April 1932 to 10 Dec. 1932.

During this interval, employment and travel by govt. conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire Control Course)
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L. Norden Co.
(e) N.A.D. Iona Island, N.Y.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned, and which are approved by the Postgraduate School.
(i) 30 Days leave from 16 Sept. 1932 to 15 Oct. 1932 in accordance with Art. C-6001, Bu.Nav. Manual is authorized and may be requested by this student, subject to modification imposed by a Furlough Plan.

At Navy Yard, Washington, D.C., 12 Dec. 1932 to 31 May, 1933.

During this interval, travel by government conveyance, and carry out the plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md., 13 Dec., 1932 to 20 Dec. 1932 (approx), depending on govt. conveyance.
(b) Naval Proving Ground, Dahlgren, Va., 20 Dec. 1932 to 29 April 1933 (approx) depending on govt. conveyance.
(c) Bureau of Ordnance - Navy Dept., 1 May 1933 (approx) to 31 May 1933.
(d) At the discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the government.

End of Course - 31 May 1933.

GROUP D. - (ORD. METALLURGY)

Lt(jg) William C. France, USN (not married)

Disposition on 1 July 1932: At Navy Yard, Washington, D.C. where he reports on 17 June 1932.

Revised Schedule:

Navy Yard, Washington, D.C. - 17 June 1932 to 11 Jan. 1933.

During this interval, travel by government conveyance, and carry out the plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Gun Factory - (metallurgy laboratory) 17 June 1932 to 23 August 1932.
(b) 30 days leave from 17 July 1932 to 16 August 1932 in accordance with Art. C-5001, Bu.Nav. Manual, is authorized and may be requested by this student, subject to modification imposed by a Furlough Plan.
(c) Bureau of Ordnance 23 August 1932 to 24 Sept. 1932 (approx) depending on govt. conveyance.
(d) Naval Powder Factory, Indian Head, Md. 24 Sept. 1932 to 30 Sept. 1932 (approx) depending on Govt. conveyance.
(e) Naval Proving Ground, Dahglren, Va. 1 Oct. 1932 (approx) to 11 Jan. 1933, depending on govt.conveyance.
(f) At the discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the govt.

Ford Instrument Co., N.Y. - 13 Jan. 1933 to 31 May 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire Control course)
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L. Norden Co.
(e) N.A.D. Iona Island, N.Y.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

End of course - 31 May 1933.

GROUP E - (ORD.-AVIATION).

Lt(jg) Normen W. Ellis, USN (married - 2 children)
" Sherman E. Burroughs, USN (Married - 1 child)

Disposition on 1 July 1932: At Naval Proving Ground, Dahlgren, Va. where they reported on 25 April 1932.

Revised Schedule:

For Lt(jg) Ellis:

Naval Proving Ground, Dahlgren - 25 April 1932 to 8 July 1932 (approx). By government conveyance to Navy Yard, Washington, D.C.

Navy Yard, Washington, D.C. 8 July 1932 - 11 Jan. 1933.

During this interval travel by government conveyance and carry out the plan indicated below as directed by the Bureau of Ordnance:

(a) Bureau of Ordnance (and Aeronautics) 9 July 1932 (approx) to 9 Nov. 1932 (approx) depending on govt. conveyance.
(b) 30 days leave from 10 July 1932 to 9 August 1932 in accordance with Art. C-8001, Bu.Nav. Manual is authorized and may be requested by this student subject to modifications imposed by a Furlough Plan.
(c) Naval Proving Ground, Dahlgren, 9 Nov. 1932 (approx) to 11 Jan. 1933 depending on govt. conveyance.
(d) At the discretion of the Bureau of Ordnance, additional employment under instruction and not involving expense to the government.

For Lt(jg) Burroughs:

Naval Proving Ground, Dahlgren, 25 April 1932 to 10 Oct. 1932 (approx)

(a) 30 days leave from 10 July 1932 to 9 August 1932 in accordance with Art. C-8001, Bu.Nav. Manual, is authorized, and may be requested by this student, subject to modifications imposed by a Furlough Plan.

By government conveyance to Navy Yard, Washington, D.C.

Navy Yard, Washington, D.C. 11 Oct. 1932 to 11 Jan. 1933.

During this interval travel by government conveyance and carry out the plan indicated below as directed by the Bureau of Ordnance:

(a) Bureau of Ordnance (and Aeronautics) 11 October 1932 (approx.) to 11 Jan. 1933 depending on govt. conveyance.
(b) At the discretion of the Bureau of Ordnance additional employment under instruction and not involving expense to the government.

For Lt(jg) Ellis and Lt(jg) Burroughs:

Ford Instrument Co., N.Y., 13 Jan. 1933 to 31 May 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire Control Course)
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L. Norden Co.
(e) N.A.D. Iona Island, N.Y.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

End of Course - 31 May 1933.

(8234)

GROUP F -(EXPLOSIVES)

Lt(jg) Charles H.Anderson,USN (not married).

Disposition on 1 July 1932 - at Naval Powder Factory, Indian Head, Md. where he will report on 24 June 1932.

Revised Schedule:

Naval Powder Factory, Indian Head, Md. 24 June 1932 - 15 Sept. 1932 (approx).

By government conveyance to Navy Yard, Washington, D.C.

Navy Yard, Washington, D.C. 15 Sept.1932(approx) to 11 Jan. 1933

During this interval, travel by government conveyance, and carry out the plan indicated below, as directed by the Bureau of Ordnance:

(a) Bureau of Ordnance 15 Sept. 1932 to 15 Nov. 1932 (approx)
(b) 30 days leave from 18 Sept. 1932 to 17 Oct. 1932 in accordance with Art. C-6001 Bu.Nav. Manual, is authorized, and may be requested by this student, subject to modification imposed by a Furlough Plan.
(c) Naval Proving Ground, Dahlgren 15 Nov. 1932 (approx) to 11 January 1933 depending on government conveyance.
(d) At the discretion of the Bureau of Ordnance additional employment under instruction and not involving expense to the government.

Ford Instrument Co., N.Y. 11 Jan. 1933 - 31 May 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co. (Fire control course)
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) C.L.Norden Co.
(e) N.A.D. Iona Island.
(f) Naval Ordnance Plant, Baldwin, L.I.
(g) Other inspection activities.
(h) Visits to outlying plants at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

End of course - 31 May 1933.

(8503 - 10/20/32)(4)-40

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

Schedule of Practical Instruction

for

Postgraduate Ordnance Class of 1931-1934

Approved by Bu.Nav. file Nav-143-RN, NC4-15/P11-1(19) of 9 November 1932.

Group designations herein are NOT related to general group designations of P.G.School.

(8503)

Group A - General Fire Control:

Lieut.(jg) Irving T. Duke, U.S.N.
Married
1 child

Group B_1 - General - Ballistics:

Lieut.(jg) William H. Benson, U.S.N.
Married
No children

Group B_2 - General - Ballistics:

Lieut.(jg) Clarence E. Haugen, U.S.N.
Married
1 child

Group C - General - Design:

Lieut.(jg) John R. VanNagell, U.S.N.
Married
1 child

Group D - Ordnance Metallurgy:

Lieut.(jg) Joseph W. Ludewig, U.S.N.
Married
No children

Group E - Ordnance Aviation:

Lieut.(jg) Warren W. Harvey, U.S.N.
Married
2 children

Lieut.(jg) Myron S. Teller, U.S.N.
Married
No children.

Group F - Ordnance Explosive:

Lieut. John H. Sides, U.S.N.
Married
No children.

Group G - Torpedo Design:

Lieut.(jg) Harry E. Hubbard, U.S.N.
Married
1 child
Lieut.(jg) James M. Robinson, U.S.N.
Married
No children.

Group A - Fire Control.

Lieut.(jg) Irving T. Duke, USN.

At Navy Yard, Washington, D.C. - 15 March 1933-6 January 1934.

During this interval, travel by government conveyance, and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md., 16 Mar.1933-15 April 1933.
(b) Naval Proving Ground, Dahlgren, Va., 16 April 1933-21 Aug.1933
(c) Naval Gun Factory, Washington, D.C. 22 Aug.1933- 4 Sept.1933
(d) Naval Mine Depot, Yorktown, Va., 4 Sept.1933 - 18 Sept. 1933
(e) Naval Gun Factory, Washington, D.C.,19 Sept.1933-30 Sept.1933
(f) Leave - 30 Sept. 1933 - 30 October 1933.
(g) Bureau of Ordnance, 30 Oct. 1933 - 6 January 1934.

At Ford Instrument Co., New York, N.Y. - 8 Jan.1934-31 May 1934.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) Navy Yard, New York.
(d) N.A.D. Iona Island, N.Y.
(e) Naval Ordnance Plant, Baldwin, L.I.
(f) Other inspection activities.
(g) Visits to outlying plants, at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

Group B1 - Ballistics

Lieut.(jg) William H. Benson, USN.

At Navy Yard, Washington, D.C.- 15 March 1933- 6 January 1934.

During this interval, travel by government conveyance, and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md., 16 March 1933 - 15 April 1933.
(b) Naval Proving Ground, Dahlgren, Va., 16 April 1933 - 21 August 1933.
(c) Bureau of Ordnance, 22 August 1933.- 4 September 1933.
(d) Naval Mine Depot, Yorktown, Va. - 4 September 1933 - 18 September 1933.
(e) Bureau of Ordnance, 19 Sept. 1933 - 30 October 1933.
(f) Naval Gun Factory, Washington, D.C. - 30 October 1933 - 7 December 1933.
(g) Leave 8 Dec. 1933 - 8 January 1934.

At Ford Instrument Co., New York, N.Y. 8 Jan. 1934- 30 May 1934.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Company.
(b) Arma Engineering Company.
(c) Navy Yard, N. Y.
(d) N.A.D. Iona Island, N. Y.
(e) Naval Ordnance Plant, Baldwin, L. I.
(f) Other inspection activities.
(g) Visits to outlying plants, at student's expenses, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

Group B2 - Ballistics

Lieut.(jg) Clarence E. Haugen, USN

To Navy Yard, Washington, D.C. as permanent station for duty on 13 March 1933.

Temporary duty at Ford Instrument Company, New York, N. Y. - 15 March 1933 - 21 August 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) Navy Yard, N. Y.
(d) N.A.D. Iona Island, N. Y.
(e) Naval Ordnance Plant, Baldwin, L. I.
(f) Other inspection activities.
(g) Visits to outlying plants at student's expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.
(h) 30 days leave from 21 July 1933 to 21 August 1933 in accordance with Art. C-6001 Bu.Nav. Manual, subject to modification by a Furlough Plan.

At Navy Yard, Washington, D.C. - 22 Aug. 1933 - 31 May 1934.

During this interval, travel by government conveyance, and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md., 23 August 1933 - 18 September 1933.
(b) Naval Proving Ground, Dahlgren, Va., 19 September 1933 - 18 December 1933.
(c) Bureau of Ordnance - 19 Dec. 1933 - 12 March 1934.
(d) Naval Gun Factory, Washington, D.C. - 13 March 1934 - 19 March 1934.
(e) Naval Mine Depot, Yorktown, Va., 19 March 1934 - 2 Apr.1934
(f) Naval Gun Factory, Washington, D.C., 3 April 1934 - 31 May 1934.

Group C - Design

Lieut.(jg) John R. VanNagell, USN.

To Navy Yard, Washington, D.C. as permanent station for duty on 13 March 1933.

Temporary duty at Ford Instrument Company, New York, N.Y. - 15 March 1933 - 21 August 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) Navy Yard, N. Y.
(d) N.A.D. Iona Island, N. Y.
(e) Naval Ordnance Plant, Baldwin, L. I.
(f) Other inspection activities.
(g) Visits to outlying plants at student's expense, which are agreeable to the parties concerned, and which are approved by the Postgraduate School.
(h) 30 days leave from 21 July 1933 to 21 August 1933 in accordnace with Art. C-6001, Bu.Nav.Manual, subject to modification by a Furlough Plan.

At Navy Yard, Washington, D.C. - 22 Aug.1933 - 31 May 1934.

During this interval, travel by government conveyance and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Bureau of Ordnance, 22 Aug. 1933 - 20 November.1933.
(b) Naval Powder Factory, Indian Head, Md., 21 November 1933 - 18 December 1933.
(c) Naval Proving Ground, Dahlgren, Va., 19 December 1933 - 12 March 1934.
(d) Naval Gun Factory, Washington, D. C., 13 March 1934 - 19 March 1934.
(e) Naval Mine Depot, Yorktown, Va., 19 March 1934 - 2 April 1934.
(f) Naval Gun Factory, Washington, D. C., 3 April 1934 - 31 May 1934.

(8503)

Group D - Metallurgy.

Lieut.(jg) Joseph J. Ludewig, U.S.N.

(Finish at Carnegie Institute of Technology at Pittsburgh, Pa. on 13 June 1933.)

At Naval Gun Factory, Washington, D.C. - 15 June 1933-6 Jan.1934.

During this interval, travel by government conveyance and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Gun Factory, Washington, D.C., 15 June 1933 - 21 July 1933.
(b) Leave - 22 July 1933 - 21 August 1933.
(c) Bureau of Ordnance, 21 August 1933 - 4 September 1933.
(d) Naval Mine Depot, Yorktown, Va., 4 Sept.1933-18 Sept.1933
(e) Bureau of Ordnance, 18 September 1933 - 9 October 1933.
(f) Naval Powder Factory, Indian Head, Md., 10 October 1933 - 6 November 1933.
(g) Naval Proving Ground, Dahlgren, Va., 7 November 1933 - 6 January 1934.

At Ford Instrument Company, New York, N.Y. - 8 Jan. 1934-31 May 1934.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) Navy Yard, N.Y.
(d) N.A.D. Iona Island, N.Y.
(e) Naval Ordnance Plant, Baldwin, L.I.
(f) Other inspection activities.
(g) Visits to outlying plants at students' expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.

(8503)

Group E - Ordnance Aviation.

Lieut.(jg) Warren W. Harvey, USN
" " Myron S. Teller, USN

To Navy Yard, Washington, D.C. as permanent station for duty on 13 March 1933.

Temporary duty at Ford Instrument Company, New York, N. Y. 15 March 1933 - 21 August 1933.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) Navy Yard, N. Y.
(d) N.A.D. Iona Island, N. Y.
(e) Naval Ordnance Plant, Baldwin, L. I.
(f) Other inspection activities.
(g) Visits to outlying plants at students' expense, which are agreeable to the parties concerned and which are approved by the Postgraduate School.
(h) 30 days leave from 21 July 1933 to 21 August 1933 in accordance with Art. C-6001 Bu.Nav.Manual, subject to modification by a Furlough Plan.

At Navy Yard, Washington, D.C. - 22 Aug.1933 - 31 May 1934.

During this interval, travel by government conveyance, and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

For Lieut. Harvey:

(a) Bureau of Ordnance, 22 August 1933 - 4 September 1933.
(b) Naval Mine Depot, Yorktown, Va., 4 Sept.1933-18 Sept.1933
(c) Bureau of Ordnance, 19 Sept. 1933 - 15 January 1934.
(d) Naval Gun Factory, Wash.D.C., 16 Jan. 1934 - 12 Feb. 1934.
(e) Naval Powder Factory, Indian Head,Md., 13 Feb.1934-12 March 1934.
(f) Naval Proving Ground,Dahlgren,Va., 13 Mar.1934-31 May 1934.

For Lieut. Teller:

(a) Naval Powder Factory, Indian Head,Md.,23 Aug.1933- 18 Sept. 1933.
(b) Naval Proving Ground,Dahlgren,Va., 19 Sept.1933-11 Dec.1933.
(c) Bureau of Ordnance, 12 December 1933 - 19 March 1934.
(d) Naval Mine Depot,Yorktown,Va., 19 March 1934-2 April 1934.
(e) Naval Gun Factory,Wash.D.C., 3 April 1934-31 May 1934.

(8503)

Group F - Explosive.

Lieut.(jg) John H. Sides, U.S.N.

(Finish at University of Michigan on 19 June 1933).

At Naval Gun Factory, Washington, D.C.- 22 June 1933-6 Jan.1934.

During this interval, travel by government conveyance and carry out the general plan indicated below, as directed by the Bureau of Ordnance:

(a) Naval Powder Factory, Indian Head, Md., 23 June 1933 - 4 September 1933.
(b) Naval Mine Depot, Yorktown, Va., 4 September 1933 - 18 September 1933.
(c) Leave - 19 September 1933 - 18 October 1933.
(d) Bureau of Ordnance - 18 October 1933 - 13 November 1933.
(e) Naval Proving Ground, Dahlgren, Va., 14 November 1933 - 18 December 1933.
(f) Naval Gun Factory, Washington, D.C. 19 December 1933 - 6 January 1934.

At Ford Instrument Co. N. Y. 8 January 1934- 31 May 1934.

During this interval, employment and travel by government conveyance to visit the following plants for such periods as may be deemed desirable by the Inspector of Ordnance:

(a) Ford Instrument Co.
(b) Arma Engineering Co.
(c) N.A.D. Iona Island, N. Y.
(d) Navy Yard, N. Y.
(e) Naval Ordnance Plant, Baldwin, L. I.
(f) Other inspection activities.
(g) Visits to outlying plants at student's expense, which are agreeable to the parties concerned, and which are approved by the Postgraduate School.

(8503)

Group G - Torpedo Design

Lieut.(jg) Harry E. Hubbard, USN
" " James M. Robinson, USN

(Finish first year at Mass. Institute of Technology on 6 June 1933).

Temporary duty Naval Torpedo Station, Newport, R. I.
7 June 1933 - 25 August 1933.
Leave 25 August 1933 - 25 September 1933.
Research year at Mass. Inst. of Tech. 25 Sept. 1933 - 14 May 1934.
Bureau of Ordnance 15 May 1934 - 18 June 1934.

(8215 - 5/24/32)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

24 May 1932.

From: Head of Postgraduate School.
To: Groups concerned.

SUBJECT: First Summer's practical instruction - Engineering groups.

References: (a) Stencil 8214, schedule.
(b) Stencil 8215, instructions.

Enclosures: (A) References.

1. There is forwarded herewith schedules and instructions for summer practical work together with plant schedules and questionnaire furnished the Postgraduate School; together with instructions to officers attending universities.

F. H. Sadler,

(8214 - 5/24/32)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

First Summer (1932)

FIRST SUMMER SCHEDULE OF PRACTICAL INSTRUCTION FOR ENGINEERING GROUPS NOW AT POSTGRADUATE SCHOOL.

1. The following groups will pursue summer work as noted in following schedules:

Aeronautical
Gas
Engineering.

2. Aeronautical Group - Mass. Inst. of Technology

Lieut. S. H. Arthur, USN
Lt(jg) E. M. Ellis, USN
" J. A. Greenwald, USN
1st Lt. W. G. Manley, USMC
Lieut. J. E. Pixton, USN
Lst Lt R. H. Rhoads, USMC
Lieut. R. W. Ruble, USN

28 May 1932 - Complete course at Postgraduate School.
28 May - 3 June 1932 - Leave or duty.
4 June 1932:- Report to Commandant 1st Naval District.
6 June - 10 Sept. 1932:- Summer Course, M. I. T.
10 Sept. - 26 Sept. 1932:- Leave.
26 September 1932:- Registration, Mass. Inst. of Tech.

3. Gas Engineering Group - Mass. Inst. of Technology.

Lt(jg) G. W. Evans, jr., USN
Lieut. J. O. Jenkins, USN

28 May 1932:- Complete 4th term, P.G. School.
30 May 1932:- Holiday.
31 May - 13 Aug. 1932:- 5th Term at P.G. School.
13 Aug. - 24 Sept. 1932:- Leave.
24 September 1932:- Report to Comdt. 1st Naval District.
26 September 1932:- Registration, Mass. Inst. of Technology.

4. Engineering Group - University of California:

Lt(jg)	J. O. Banks, Jr., USN
Lieut.	R. W. Bowers, USN
Lt(jg)	J. B. Brown, USN
"	E. C. Buerkle, USN
"	E. P. Creehan, USN
"	T. T. Dantzler, USN
"	J. D. Hayes, USN
"	W. S. Howard, jr, USN
"	J. G. Hughes, jr, USN
"	K. C. Hurd, USN
"	A. E. Jarrell, USN
"	R.F.J. Johnson, jr., USN
"	W. W. Johnson, USN
"	H. O. Larson, USN
"	W. J. Marshall, USN
"	C. E. McDonald, USN
"	T. M. McGraw, USN
"	W. P. Mowatt, USN
"	O. F. Naquin, USN
"	W. J. O'Brien, USN
"	H. E. Richter, USN
"	E. L. Schleif, USN
"	L. D. Sharp, USN
"	S. D. Simpson, USN
Lieut.	C. F. Swanson, USN
"	R. G. Thayer, USN
Lt(jg)	H. G. Trainer, USN
"	R. C. Webb, jr, USN
Lieut.	J. L. Welch, USN
Lt(jg)	E. E. Yeomans, USN

28 May 1932:- Complete course at Postgraduate School.
28 May - 3 June 1932:- Duty or leave.
4 June 1932:- Report to Comdt. 4th Naval District.
6 June - 11 June 1932:- At Fuel Oil Testing Plant.
13 June 1932:- Exide Storage Battery Plant.
14 June - 18 June 1932:- At Fuel Oil Testing Plant.
20 June - 24 June 1932:- Westinghouse Elec. & Mfg. Co.
25 June 1932:- Detached to leave and University of California.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8215 - 5/24/32)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

1st Summer. 23 May 1932.

Instruction for Summer Work.
Engineering Groups now at Postgraduate School.

1. The following instructions are issued in connection with Summer employment schedules.

2. Groups are employed during Summer in general as follows:

Aeronautical - Summer Course at M. I. T.
Gas - Summer Course at Postgraduate School
Engineers - Practical work at Fuel Oil Test. Plant.
Exide Plant and Westinghouse Co.

3. Notebooks covering summer practical work will be kept and submitted to the Head of the Postgraduate School by the following group:

Engineering for
(a) Fuel Oil Plant
(b) Exide Plant.
(c) Westinghouse Plant.

4. Groups required to keep a notebook will submit same immediately on completion of summer practical work. After examination by the Head of the Postgraduate School they will be returned.

5. Senior officer in group will have a master notebook prepared covering composite work of indivisuals notebooks for files of Postgraduate School.

6. Notebooks should reflect actual value of summer practical instructions. They should be written with the view of future reference value.

7. Names of officials and engineers, leaders in their line, contacted with are most valuable for future reference. New apparatus and new or improved processes should be made special note of.

8. Notebooks should conform to the following:

(a) Be smoothly and carefully prepared by assigning special time for preparation and entry of material while still fresh in mind.

(b) Be neatly and legibly written.

(c) Be on uniformly sized paper 8 x 10-1/2 loose leaf.

(d) Account for daily expenditure of time under practical instruction by giving dates of lectures and visits on work.

(e) Give name of plant, machine or methods under study or observation.

(f) Give names of officials who direct work and give lectures.

(g) Notes on lectures and talks.

(h) Notes or descriptions of machines and methods with particular reference to their design, operation and application.

(i) Notes on descriptions on manufacturing methods and administration with particular reference to their naval application.

9. Notebook will be formally submitted from student officer giving name, course in, date and signature.

10. Any absence from scheduled work for any reason or promotion of an officer will be reported by the individual officer as soon as practicable.

11. Summer schedules and schedules prepared for individual plants visited will be carried out. Any changes recommended should be forwarded through officials of activity concerned.

12. Any correspondence to officials of plants visited will be forwarded through the Head of the Postgraduate School.

13. On reporting at Universities you will report as follows:

At Mass. Inst. of Tech.
(a) Aero. Eng. to Prof. C. F. Taylor.
(b) Gas Engineers to Dean Potter or Prof. Keyes.

At. Univ. of California.
(a) Engineers to Officer-in-Charge Naval R.O.T.C. Unit and to Prof. Woods.

14. Immediately after arrival at University, group senior will have books inventoried and submit to Head of Postgraduate School. He will note discrepancies, new texts needed, giving name of book, author, publisher, cost and date desired. Obsolete books or books not required will be returned to Postgraduate School for disposition.

(8215)

15. Uniform at Fuel Oil Testing Plant is prescribed by Comdt. 4th Naval District. This is usually white or blue service for reporting and dungarees, service or civilian clothes for work.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8167 - 5/2/32)(5b)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Instruction for Postgraduate Officers at Navy Fuel Oil Testing Plant Navy Yard, Philadelphia.

6 - 25 June 1932.

(8167)

Day	Date		Subject:
Monday	6 June	A.M.	(a) Introductory comments. Officer-in- Charge. (b) Inspection of F.O.T.P. Mr. Howarth.
		P.M.	Lecture - Character of fuel oils available to U.S.N. Mr. Howarth.
Tuesday	7 June	A.M.	Lecture - Burning of fuel oil - types of burners, registers, etc. Mr. Howarth.
		P.M.	Same - Discussion of Test #1056 (Capacities of various sized sprayer plates. Mr. Howarth.
Wednesday	8 June	A.M.	Lecture- Effect of viscosity excess air, etc. on boiler eff. - Discussion of Test. #1037. Mr. Howarth.
		P.M.	Lecture various boiler front arrangements and burner combinations for each type. Mr. Howarth.
Thursday	9 June	A.M.	Lecture - Fireroom operation. Mr. R. C. Brierly.
		P.M.	Discussion of Riley Lamont Water Wall. Mr. R. C. Brierly.
Friday	10 June	A.M. & P.M.	Discussion of performance of B&W Sectional Express Boiler and effect of steam drum baffling. Mr. R. C. Brierly.
Saturday	11 June		Write up notes.

Day	Date		Subject
Monday	13 June	A.M.) & P.M.)	Discussion of performance of W.F. Cruiser Boiler. Mr. R. C. Brierly.
Tuesday	14 June	A.M.) & P.M.)	Discussion of performance of Cox Boiler. Mr. R. C. Brierly.
Wednesday	15 June	A.M.	Fire clays and manufacture of fire-clay brick. Lieut. James B. Donnelly, U.S.N.
		P.M.	Properties of fireclay brick and performance of same in service. Lieut. James B. Donnelly, U.S.N.
Thursday	16 June	A.M.	Plastic firebrick and fire cements. Lieut. James B. Donnelly, U.S.N.
		P.M.	Safety valves. Lieut. James B. Donnelly, U.S.N.
Friday	17 June	A.M.) & P.M.)	General Discussion.
Saturday	18 June		Write up notes.
Monday	20 June	A.M.) & P.M.)	Check up set-up for Boiler tests, Instruments and their uses. Mr. R. C. Brierly.
Tuesday Wednesday Thursday Friday	21 June) 22 June) 23 June) 24 June)		Take data on test runs of Light Cruiser SX boiler. Calculate efficiencies, etc.
Saturday	25 June		Write up notes.

(8161 - 4/27/32)(5b)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

SUMMER PRACTICAL WORK
EXIDE STORAGE BATTERY PLANT.

QUESTIONNAIRE - LEAD-ACID STORAGE BATTERIES.

I. DESCRIPTION AND THEORY.

1. What is a storage battery?

2. Name several parts of a storage cell.

3. Describe briefly the construction of a storage cell.

4. What is the function of the separator?

5. What are the chemical reactions on discharge and charge?

6. What is the voltage of a single cell, of a battery of 120 cells? How does voltage vary on charge and discharge?

7. What is local action?

8. What is means by "normal" and "abnormal" sulphation?

II. MANUFACTURE.

9. What is the difference between a Plante and a Faure type of plate?

10. Which is most generally used? What are its disadvantages?

11. What material is used in the grid?

12. What material is used in the active material of the plates?

13. How is it applied?

14. What is meant by a binder? An expander?

15. How does the Ironclad positive plate differ from other types?

16. What are the advantages of the Ironclad type?

17. What is the formation process?

18. Mention some inspections and tests made on Navy type batteries and parts at the place of manufacture.

19. For what classes of work are (a) Glass jar types of batteries used? (b) Rubber Jar types?

III. OPERATION AND CARE.

20. Why is ventilation necessary?

21. State briefly the rules to follow in submarine battery ventilation?

22. What is a cycle? (a) In General. (b) As computed in submarine service?

23. (a) What is a normal charge? (b) What is an equalizing charge?

24. (a) What are the two general methods of giving a normal charge? (b) Describe the two methods.

25. What is the purpose of the equalizing charge?

26. When should a charge be given?

27. What are the important points to watch in charging?

28. At what rates may a battery be charged?

29. At what rates may a battery be discharged?

30. How does the rate of discharge affect the capacity?

31. What is meant by "factory" and "service" ratings as applied to submarine batteries?

32. What is meant by "floating"?

33. What are its objects?

34. What are the effects of temperature on a battery? What temperature limits are permissible?

35. Of what value are specific gravity readings?

36. When should water be added? Why is the proper electrolyte level important?

37. What kind of water is it permissible to use in batteries?

38. What are the two most common impurities to be found in electrolyte?

39. How should a battery shipped wet be kept in storage?

40. When batteries are shipped dry, what steps are necessary before putting into service?

41. What precautions should be taken in mixing acid (Vitroil) and water in preparing electrolyte?

42. How may freezing be avoided?

43. What is the full charge specific gravity of (a) Navy portable batteries, (b) Submarine batteries?

44. What are the different sizes of Navy portable batteries?

45. Describe briefly the installation of a submarine battery?

46. What care is required of the battery connections?

47. What are indications of a low cell?

48. What are some of the causes of a low cell?

49. What is a convenient way for boosting a low cell?

50. What are the causes of sulphation?

51. What are the remedies for a "sulphated" battery?

(8219 - 5/24/32)(5b)-25

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

24 May 1932.

From: Head of Postgraduate School.
To: Groups concerned.

SUBJECT: Second Summer's Practical Instruction for Engineering groups at Universities - Schedule for.

Reference: (a) Head of P.G.S. letter NC4(5b)/P16-4 of 8 April 1932 to Bu. Nav.
(b) Minutes of Postgraduate Council Meeting of 16 March 1932.

Enclosure: (A) Stencil 8209, Second Summer Practical instructions for Petroleum Eng. Group.

1. In accordance with reference (b) no Summer practical work is scheduled for the following groups. These officers will be ordered direct to duty on completion of their university work.

Aeronautical Eng.	Mass. Inst. of Tech.
Gas Engineer	Mass. Inst. of Tech.
Diesel Eng.	Penn State.
Foundry Metallurgists	Carnegie
Mechanical Eng.	Columbia Univ.
Electrical Eng.	Columbia Univ.

2. Petroleum Engineering Group at the University of California have practical work in accordance with enclosure (A) for period

16 May to 30 July 1932 at the Richmond Refinery of the Standard Oil Co., Richmond, Calif.

F. H. Sadler.

(8220 - 5/24/32)(50)-25

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

24 May 1932.

Instructions for Second Summer Practical Instruction 1932.

To: Petroleum Eng. Group, University of California.

1. Petroleum Engineering Group, University of California:

Lt(jg) W. A. Hickey, USN
" W. C. Latrobe, USN

2. The schedule of employment for summer practical work as approved by the Bureau of Navigation is forwarded herewith.

3. Group will carry out schedules as arranged by officials of the activity visited. Particular attention will be paid to instructions and regulations of the various plants visited.

4. Each student officer will keep a notebook of his activities during the summer instruction period 1932. Notebooks should reflect actual value of summer practical instruction. They should be written with the view of future reference value. Names of persons, leaders in their profession are of special future value. New apparatus and new or improved processes should be of special note.

5. Group will compile a "file" notebook of summer work which should be a composite duplicate of the individual's notebooks for the files of the Postgraduate School. This notebook should include a copy of any pamphlets or publications obtained. Also a resume of lectures.

6. Notebooks should conform to the following:

(a) Assign special time for preparation and entry of material while still fresh in your mind.
(b) Be neatly and legibly written.
(c) Be on uniformly sized paper 8 x 10-1/2 in. loose leaf form.
(d) Account for daily expenditure of time under practical instruction in chronological order.
(e) Give name of plant, machine and methods under study or observation.
(f) State names of officials who direct work and give lectures.
(g) Give notes on lectures and talks.
(h) Give notes or descriptions of machines and methods with particular reference to their design, operation and application.

(i) Give notes or descriptions on manufacturing methods and administration with particular reference to their Naval application.

6. All notebooks will be submitted by mail to the Head of the Postgraduate School immediately on completion of summer work. They will be returned after inspection.

7. Cover page of notebook will contain formal submission from student officer to Head of Postgraduate School.

8. Any absence from scheduled work for any reason or promotion of any officer will be reported by the individual officer as soon as practicable.

9. Student officers at private institutions are not only students but representatives of the Navy. It is expected that they will conduct themselves in accordance with the best naval traditions and in conformity with the rules and customs of the institution which they are attending in order that they may avoid criticism, uphold strictly the dignity of an officer and a gentleman thus reflecting credit upon themselves and the Service. The courtesies of both social and official intercourse must be punctiliously observed.

10. Any comment on summer practical work which an officer desires to make to any official of the plants visited must be forwarded through the Head of the Postgraduate School.

F. H. Sadler,
Captain, U.S.N.,
Head of Postgraduate School.

(8209 - 5/23/32)(5b)-

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Schedule of Instruction

for

Postgraduate Officers at

Richmond Refinery

Standard Oil Company

Richmond, Calif.

Petroleum Eng. Group.

(8209)

Week of May 16th:

Straight run gasolines and lamp oils:
3 days at Crude Stills; handling of crude oil into refinery, kinds of crude, distillation, disposal, vapor recovery system.
2 days writing report - preferably at laboratory.
Saturday; questions, if any, J. B. Terry.

Week of May 23rd:

Treatment of straight run gasolines and lamp oils:
3 days at gasoline treating plant and Refined Pump House, the latter to learn about blending and transferring, loading cars and boats.
2 days writing report.
Saturday; questions.

Week of May 30th:

Pressure Gasoline:
3 days at Pressure Stills on plant operation and products - gasoline, residuum, coke.
2 days writing report.
Saturday; questions.

Weeks of June 6th and 13th:

Transformer oils and lubricating oils:
7 days at Oil treating and Filter Plants.
3 days writing report.
Saturday; questions.

Week of June 20th:

Asphalts, Road Oils, Fuels:
3 days at Asphalt Plant, Crude Pump House, Long Wharf.
2 days writing report.
Saturday; questions.

Week of June 27th:

Shipping.
3 days at Can Factory, Shook Factory, Refined Filling - possibly specialties.
2 days writing report.
Saturday; questions.

Week of July 4th:

Greases and Compounded oils:
3 days at Grease Works, Pulp Plant, Lub. Compound.
2 days writing report.
Saturday; questions.

Week of July 11th:

Acid Recovery and SO_2 Plant.
3 days at SO_2 Plant, Acid Works and allied connection - sludge systems, etc.
2 days writing report.
Saturday; questions.

Week of July 18th:

Chemical Laboratory and Dynamometer Laboratory.
3 days actual experience in testing; explain significance of specifications and show them outside specifications for various products. Explain control of products; examination of equipment in Motor Testing Department (Research & Development).
2 days writing report.
Saturday; questions.

Week of July 25th:

One week writing report, made possible by reading Gruse, Gurwitsch and oil journals on entire oil refining situation on the Pacific Coast.

(8361 - 8/19/32)(3d)-50

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

TECHNICAL GROUPS.

(Text and Reference Books).

G - Engineering (Technical)
H - " (Technical) Gas
I - " (") Aero
J - " (") Radio
K - " (") Ordnance
KG - General
KM - Metallurgy
KE - Explosive
KT - Torpedoes
S - Engineering (Tech.) 2nd year ——— 1 Term
T - Engineering (") Gas 2nd year. 1 Term
UG - Eng. Tech. Ord. (General) 2nd year 2 Term finish 3rd Term
UM - " " " (Met). 2nd year - 1 Term and finish
UE - " " " (Expl.) 2nd year 1 Term and finish
UA - " " " (Aero.) 2nd year. 2 Term finish 3rd Term

(8361)

Term	Subject	Text and Reference
1st	Mathematics	Mathematics of Engineering - Root
	Mechanics	Analytical Mechs. for Engrs.-Seely&Ensign
	Physics	General Physics - Ferry
		Physics Measurements - Ferry
		Optics Notes. P.G.S.
	Eng. Measurements	Engineering Instruments & Meters-Griffiths
		Mechanical Engineers Handbook - Marks
	Hydraulics	Hydraulics - Daugherty
	Chemistry	Principles of Chemistry - Hildebrand
		Smith's Gen.Chem.for Colleges - Kendall
		Theoretical Chemistry - Getman
		General Chemistry - Deming
2nd	Mathematics	Mathematics of Engineering - Root
		Graphical & Mech. Computation - Lipka
	Mechanics	Analytical Mechs.for Engrs.-Seely&Ensign
	Physics	Experimental Optics - Wagner
		Misc.Mimeo.Lab.Instr'n. Sheets - Wagner
	Thermodynamics	Prins. of Engrg.Thermo. - Kiefer&Stuart
		P.G.S. Stencil No. 4907.
	Electricity	Electrical Engineering, Vol. I - Dawes
		Electric & Magnetic Measurements- Smith
		Probs. in Electrical Engrg. - Lyon
	Engrg.Materials	Resistance of Materials - Seely
		Materials of Construction - Johnson
		Mechanical Engrs. Handbook - Marks
		Navy Dept. Specifications.
	Metallurgy	Engrg. Metallurgy - Stoughton & Butts
		Metallurgy of Iron & Steel - Bradley Stoughton
		Making, Shaping and Treating of Steel - Camp and Francis
		Heat Treatment & Metallography of Iron and Steel - Sauveur.
3rd.	Mathematics	Mathematics of Engineering - Root
	Mechanics	Analytical Mechs. for Engrs.-Seely&Ensign
	Electricity	Electricity & Magnetism - Starling
		Elec. Engineering, Vol. I - Dawes
		Problems in Eleg. Engrg. - Lyon
		Elec. Engrg. Lab Expts. - Ricker & Tucker
	Thermodynamics	Prins.of Engrg. Thermo. - Kiefer&Stuart
	Metallography	Heat Treatment & Metallography of Iron and Steel - Sauveur
		Lab. Manual of Metallography(1930)-Woldman
		Principles of Metallography - Williams & Homerberg

Term	Subject	Text and Reference
3rd	Chemistry	Book of Stencils on Expts. Bureau of Mines Tech. Paper 323B U.S. Govt. Specs. for Lubricants and Liquid Fuels.
4th	Mathematics	Mathematics of Engineering - Root Differential Equations - Cohen Aerofoil and Airscrew Theory - Glauert Theory of Functions of a Complex Variable - Fiske Hyperbolic Functions - MacMahon Elec. Oscillations & Elec.Waves-Pierce Vector Analysis - Coffin
	Mechanics	Naval Ordnance 1926 Exterior Ballistics - Alger A Course in Exterior Ballistics - Ord. Dept. U.S.A. Exterior Ballistics - Hermann Introduction to Ballistics - Ord.Dept.USA Dynamics of Engine & Shaft - Root Airplane Stress Analysis - Klemin Airplane Structures - Niles & Newell
	Chemistry	General Chemistry - Deming Inorganic Chemical Tech., Badger & Baker. Industrial Chemistry, by Rogers Solutions of Electrolytes - Hammett * Qualitative Chemical Analysis - Noyes Qualitative Chemical Analysis - Scott Qualitative Analysis, Vol.I - Stieglitz Theoretical Chemistry - Getman & Daniels
	Electricity	Electrical Engrg. Vol. II - Dawes Problems in Elec. Engrg. - Lyon Electrical Engrg. - Ricker & Tucker
	Thermodynamics	Prins. of Engrg. Thermo.-Kiefer & Stuart Kinematics of Machines - Guillet Engrg. Thermodynamics - Lucke Thermodynamics - Ewing
	Kinematics	Kinematics of Machines- Guillet Theory of Machines - Angus Elements of Mechanics - Schwamb, Merrill & Jones Mechanics - Dunkerly Pure Mechanism - Sibley Mechanics - Krown
	Metallurgy	Light Alloys - Bu.Stds. Circ. No. 346 Metallurgy in Aircraft Construction - Daniels & Sisco Physical Properties of Materials - Bu. Stds. Circ. # 101.

* Qualitative Analysis - Prescott & Johnson

Term	Subject	Text and Reference
4th	Metallurgy	Selected References to Scientific and Technical Literature
		Metallurgy Papers - P.G.S.
	Science of Metals	Science of Metals - Jeffries & Archer
		Heat Treatment & Metallography of Iron and Steel - Sauveur
		Prins. of Metallography - Williams and Homerberg
		Metallic Alloys - Gulliver
	Optics	P.G.S. Optic Notes - Wagner
		Experimental Optics - Wagner
		Light for Students - Edser
		Ultra-Violet Radiation - Luchiesh
		Theory of Modern Optical Instruments - Gleichen.
	Damage Control	The Stability of Dhips and Damage Control - Bu. C & R.
		Buoyance & Stability of Submarines-Bu C&R
	Sound	Sound - Capstick
		Textbook of Sound - Barton
		Sound - Richardson
		Sound - Poynting & Thompson
		Lab. Stencils
	Radio Engrg.	Prins. of Radio Comm. - Moredroft
		Thermionic Vacuum Tubes - Peters
5th	Chemistry	Inorganic Quantitative Analysis - Fales
		Theoretical Chemistry - Getman, 1928, Ed.
		Lab. Manual: Experimental Physical Chemistry - Daniels, Mathews & Williams
		International Critical Tables
		Thermodynamics - Lewis & Randall
		Practical Physical Chemistry - Findlay and others
		Analytical Chemistry - Treadwell-Hall
	Metallurgy	Heat Treatment & Metallography of Iron and Steel - Sauveur
		Lab Manual - Physical Metallurgy - Woldman 1930
		Selected Ord. Pamphs. & P.G. Met. Papers
		Lab. Experiments in Metallurgy - Sauveur & Boylston.
		Physical Metallurgy - Woldman
		Engrg. Non-Ferrous Metals & Alloys - Aitchison & Barclay
		Handbook of Non-Ferrous Metallurgy - Liddell
		Engrg. Metallurgy - Stoughton & Butts

(8361)

Term	Subject	Text and Reference
5th	Radio Engineering	Thermionic Vacuum Tubes - Peters
	Mathematics	Differential Equations - Cohen
		Vector Analysis - Coffin
		Elec. Oscillations & Elec. Waves- Pierce
		Hyperbolic Functions - McMahon
6th	Mathematics	Differential Equations - Cohen
		Hyperbolic Functions - McMahon
	Mechanics	Analytical Mechanics - Barton
		Spinning Tops and Gyroscopic Motion - Crabtree
		Applied Elasticity - Timoshenko & Lessells
		Notes on Beams Continuous over Several Supports
	Electricity	Electrical Engrg. Vol. II - Dawes
		Lab. Elec. Engrg. Lab. Expts. - Ricker and Tucker
	Metallography	Heat Treatment & Metallography of Iron and Steel - Sauveur
7th	Mathematics	Practical Least Squares - Leland
		Mathematical Analysis of Statistics - Forsythe
		Naval Ordnance
	Mechanics	Exterior Ballistics - Moulton
		Course in Exterior Ballistics - U.S.Army
		Applied Elasticity - Timoshenko& Lessells
		Notes on Vibratory Elastic Bodies
		Airplane Structures - Niles & Newell
		~~Elements of Aviation - Clark~~
		Supplementary Notes
	Electricity	Elec. Engrg. Vol. II - Dawes
		Lab. Elec. Engrg. Lab. Experiments - Ricker and Tucker
	Optics	Fundamentals of Applied Optics - Wagner
		Experimental Optics - Wagner
		Light for Students - Edser
		Ultra-Violet Radiation - Luchiesh
	Machine Design	Machine Design - Bradford & Eaton
		Machine Design - Hyland & Kommers
		Mechanical Engineers Handbook - Marks
		Machine Design - Leutwiler
		Prins. of Machine Design - Norman

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

TEXTBOOKS TO BE USED - RADIO ENGINEERS
UNIVERSITY OF CALIFORNIA (2) TERMS.

Electrical Engineering 116A-B)
Electrical Engineering 198B) Communication Engineering, by Everitt.

Electrical Engineering 216A-B. No textbook to be purchased.

Electrical Engineering 221A-B-C-D. Operational Circuit Analysis Bush.

Electrical Engineering 112C-D. No textbook to be purchased.

REFERENCE BOOKS SUPPLIED BY THE DEPARTMENTAL LIBRARY

For Electrical Engineering 116A-B:

Theory of Sound; Lord Rayleigh
The Science of Musical Sounds; Miller
Theory of Vibrating Systems and Sound; Crandall
Collected Papers on Acoustics; Sabine
Electrical Vibration Systems; Kennelly
Speech and Hearing; Fletcher
Acoustics of Buildings; Watson
Architectural Acoustics; Knudson .
Acoustics; Stewart and Lindsey
Recording Sound for Motion Pictures; Cowan
Principles of Radio Communication; Morecroft
Thermionic Vacuum Tubes; Van der Bijl
The Emission of Electricity from Hot Bodies; Richardson
Photoelectric Cells; Campbell and Ritchie
Television; Felix
The Radio Handbook; Moyer and Wostrel.

For Electrical Engineering 112C-D:

Experimental Radio Engineering; Morecroft
Radio Frequency Electrical Measurements; Brown
Hochfrequenzmesstechnik; Hund
Radio Instruments and Measurements; Bureau of Standards Circular 74.

For Electrical Engineering 198B:

Transmission Networks and Filters; Shea
Transmission Circuits for Telephonic Communication: Johnson
Telephone Communication; Wright and Puchstein
Electric Current Analysis; Malti
Electric Circuits and Nets; Kennelly
Electric Circuits; Theory and Applications; Dahl

For Electrical Engineering 221A-B-C-D:

Electric Oscillations and Electric Waves; Pierce
Electric Circuit Theory and the Operational Calculus; Carson
Electric Transients; Magnusson
Heaviside's Operational Calculus; Berg
Heaviside's Electrical Circuit Theory; Cohen
Transient Phenomena; Steinmetz

For Electrical Engineering 216A-B:

Electricity and Magnetism; Maxwell
High Frequency Alternating Currents; McIlwain and Brainerd
The Propagation of Radio Waves Along the Surface of the Earth and in the Atmosphere; Pederson:

Research literature in:

I. R. E. Proceedings
Experimental Wireless
Zeitschrift fur Hochfrequenztechnik
Bell Technical Journal
Physical Review
Bureau of Standards Scientific Papers
A. I. E. E. Journal

In addition to the books and magazines mentioned, practically everything of value which has been written on the subject of electrical communication is available in our main and departmental libraries.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

GAS ENGINEERS - MASS. INST. OF TECHNOLOGY.

Text and Reference Books.

Course	Text
5.71, 5.72	Principles of Chemistry - Moyes & Sherrill
2.501, 2.502	Mathematical Theory of Heat Conduction- Ingersoll and Zobel
5.41, 5.42	Organic Chemistry - J. F. Norris.
F-16	No text.
10:31	Principles of Chemical Engineering - Walker, Lewis, McAdams.
10:63 F-9	Fuels and Their Combustion - Haslam & Russell.

1st Term.

2.501 Advanced Refrigeration:
No text book.
Ref.Books: Kiefer & Stuart- Prins.of Engrg.Thermo.
Sir J.A.Ewing- The Mechanical Production of Cold-- Cambridge Univ.Press.

F-16 Automotive Fuels:
Text: Notes furnished by the Dept.of Gas & Fuel Engrg. at cost of one dollar per student.
No ref. books.

10.31 Chemical Engineering:
Text: Walker, Lewis & McAdams- Prins.of Chem.Engrg.
No Ref. Books.

5.411 Organic Chemistry:
Text: Notes furnished free by the Institute.
Ref: Norris- Organic Chemistry.
Moore & Underwood- Expts. in Organic Chemistry.

2nd Term.

10.63 F-9 Manfactured fuels:
Text: Fuels & Their Combustion - Haslam & Russell.
No. ref. books.

5.42

10.32 Chemical Engineering:
Text: Walker, Lewis & McAdams- Prins. of Chemical Engrg.
No Ref. books.

10.50 Heat Transmission:
No. Text book - Notes by Institute $1.00 per student.
Ref.Books: P.W.Bridgeman- Dimensional Analysis 1931 Ed.---Yale Univ. Press.
Lamb - Hydrodynamics - Cambridge Univ.Press

10.62 Chemical Thermodynamics.
No Text book.
Ref. Book: Kiefer & Stuart - Prins. of Engrg. Thermo.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

ENGINEERS
at
University of California.

Text and Reference Books.

Course.

E.E. 111 A-B 3-3
Christie - "Electrical Engrg.", McGraw-Hill.
Lawrence - "Alternating Current Machinery", McGraw-Hill.

E.E. 112 A-B 3-3
Karapetoff - "Experimental Elec. Engrg.", Vol. I & II./ John Wiley.
Christie - "Elect. Engrg.",
Lawrence - "Alternating Current Machinery".

Mech. Engrg. 217 A-B 3-3
Mimeo. notes "Prins. of Heat Transfer" pub. by Univ. of California Press.
McAdams - Heat Transfer, McGraw-Hill.

M.E. 218 A-B 3-3
Timoshenko - "Vibration Probs. in Engrg." - D. VanNostrand

References:

Hort)
Lehr) Vibration Study.

Byerly)
Brand) Dynamics

Stodola)
Cormac) Balancing
U.of C. Theses)

Hort)
McKay) Regulation-governors.

Adams) Differential Equations applied to
Smithsonian Tables) pseudo harmonic oscillations.

Stodola)
Hort) Critical Speeds.
Foppl)

Holzer)
Wydler) Torsional oscillations.

Geiger)
Hort) Carriage & ship oscillations.

Steuding)
Geiger) Measuring Instruments.
Hort)

and for review
Angus - "Theory of Mechanics", McGraw-Hill
Ham & Crane - "Mechanics of Machinery", McGraw-Hill
Seeley - "Strength of Materials", John Wiley & Son.
Seely & Ensign - "Analytical Mechanics for Engineering", - John Wiley & Son.

Marine Engrg. 103 A-B 4-4

Mimeo. notes "Marine Diesels & Applications" - pub. by U. of C. press.

References:

Hort, "Technische Schwingungslehre
Sass, "Kompressorlose Dieselmaschinen".
S.A.E. Journals
Institute of Naval Architects.
N.A.C.A. Reports.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

AERONAUTICAL ENGINEERS

~~Mass. Inst. of Tech.~~

Textbooks.

Course. Summer.

M 43.44	Aeronautics, Wilson.	John Wiley & Sons.
1.401	Airplane Structures, Niles & Newell.	Wiley.
16.00	Eng. Aerodynamics, W.S.Diehle.	Ronald Press.
	Airplane Design - Warner.	McGraw-Hill.
	References:	
	Aviation Handbook, Warner & Johnson.	
	Handbook of Instructions for Airplane Designers - Material Div. U.S. Air Corps.	
16.03	Airplane Design, Warner.	McGraw-Hill.
	Aeronautical Bulletins &-A, 14.	Dept. Commerce.

First Term, Engine Specialists

16.82	Aircraft Power Plants, Jones, Insley, Caldwell and Kohr - -	Ronald Press
	Naval Aviation Engine Manual	Bu. Aero.
16.85	S.A.E.Handbook -	Society of Automotive Engrs.
F 16	Classroom notes.	
2.254	Class room notes	
	Ref. Engine Dynamics & Crankshaft Design, G. B. Angle -	Simmons-BoardmanPubCo
2.981	Class room notes	
3.655	Prins. of Metallographs, Williams & Homerberg -	McGraw-Hill.
	Aluminum in Aircraft,	Aluminum Co. of America.
	Ref. Metallography of Aluminum & Aluminum Alloys - Anderson	H.C. Baird.
	The Metallography & Heat Treatment of Iron & Steel, - Sauveur	McGraw-Hill.
M 791	Classroom notes.	
	Ref. Applied Elasticity, Timoshenko-	Westinghouse Press

Second Term, Engine Specialists

16.83	Engines of High Output, Ricardo-	MacDonalsEvans, London
	Ref. The Testing of High Speed Internal Combustion Engines, Judge -	D. Van Nostrand Co.
16.86	Same as 16.85	
5.75	None. Classroom notes.	
16.39	Aircraft Propeller Design, Weick -	McGraw-Hill.
16.69	None.	
16.89	None.	

First Term, Structures Specialists.

16.82	Aircraft Power Plants,- Jones, Insley, Caldwell and Kohr - -	Ronald Press
	Naval Aviation Engine Manual -	Bu. Aero.
16.11	None.	
	Ref. Airplane Structures,- Niles & Newell -	Wiley.
3.655	Prins. of Metallography, Williams & Homerberg-	McGraw-Hill.
	Aluminum in Aircraft, Aluminum Co. of America.	
	Ref. Metallography of Aluminum & Aluminum Alloys - Anderson - -	H.C.Baird
	The Metallography and Heat Treatment of Iron & Steel, Sauveur - -	McGraw-Hill.
16.62	Classroom notes.	
	Ref. Airplane Design, Warner -	McGraw-Hill
	Technical Notes and Reports -	N.A.C.A.
16.04	Airfoil & Airscrew Theory, Glauert-	UnivPress, Cambridge
16.06	Applied Mechanics, Vol. 2, Fuller & Johnson -	Wiley
	Strength of Materials, Timoshenko-	Westinghouse Press.
M 46	Same as 16.04	

Second Term, Structures Specialists

M 47	Airfoil & Airscrew Theory, Glauert,	Univ. Press, Cambridge
16.08	Aviation Handbook, Warner & Johnson -	McGraw-Hill
16.30	Aircraft Propeller Design, Weick -	McGraw-Hill
16.21	Aerostatics, Warner - -	Ronald Press
16.22	None. Classroom notes.	
	Ref. Airship Design, C.P.Burgess -	Ronald Press
1.57	Modern Frame Structures, Vol. 2, Bryan, Johnson & Turneaure -	Wiley
16.69	None.	

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL.

Test Books used by

Civil Engineer Groups

at Rensselaer Polytechnic Institute

3 Year Plan.

Note: This stencil supercedes stencils #7723-7722-8318.

First Year - First Term

Course	Title	Author	Publisher
Mechanics	Mechanics for Engineers	Clark	Waverly Press
Thermo.	Principles of Engineering Thermodynamics	Kiefer-Stuart	John Wiley
Electricity	Electricity & Magnetism	Culver	Macmillan
	Elec. Magnetic Meas.	Smith, C.	Macmillan
Hydraulics	Solution of Special Problems in Pipe Flow by Graphical Analysis	Palsgrove	R.P.I. Bulletin #37
Electrical Engineering	Principles & Practice of Electrical Engineering	Gray	McGraw-Hill
Mechanical Engineering Lab.	Departmental Lab. Notes	(Mimeographed)	

First Year - Second Term

Structures	Elements of Graphic Statics	Hudson & Squire	McGraw-Hill
Resistances	Resistance of Materials	Seely	John Wiley
Diagrams, etc.	Mechanical Engrs. Handbook	Marks	McGraw-Hill
	Graphical & Mechanical Computations completed	Lipka	John-Wiley
R.R.Curves	R.R.Curves & Earthwork (With tables)	Allen	McGraw-Hill
Reinforced Concrete	Design of Concrete Structures	(Urquhart & (O'Rourke	McGraw-Hill
Reinforced Concrete Design	Design of Concrete Structures		McGraw-Hill

BM

Course	Title	Author	Publisher
Paints, Oils, etc.	----- (Lectures)	----	----
Bldg. Construction	Masonry Structures	Spalding, Hyde Robinson	John-Wiley
Electrical Eng.Lab.	-----	----	----
Welding	Manual of Elec.Arc.Welding Manuals of Welding of American Welding Society	Hubert	McGraw-Hill American Welding Society.

Second Year - First Term

Bridges	Stresses in Bridges	Lawson	Hill & Co.
Bridge Computations	Specifications for Steel Bridges	A.R.E.A.	Am.Railway Eng.Assoc.
Testing Laboratory	Student Pamphlet of A.S.T.M.		A.S.T.M.
R.R.Engrg.	R. R. Engineering	Raymohd	John Wiley
Utilization	Illuminating Engineering Electric Railways	Cady& Dates Buck	John Wiley McGraw-Hill
Trans.& Dist.	Transmission Line Eng. Electrical Dist. Eng. National Electric Code	Lewis Seelye	McGraw-Hill McGraw-Hill
Elect.Dist.Des.	----	----	----
Highways	Const.of Roads & Pavements	Agg	McGraw-Hill

Second Year - Second Term

Power Plants Mech.	Steam Power Plant Eng. Electric Power Plants	Gebhardt Morrow	John Wiley McGraw-Hill
Power Plants Elec.	Generating Stations Electric Power Plants	Lovell Morrow	McGraw-Hill McGraw-Hill
Machine Design	Elements of Mach. Design	Kimball-Barr	John Wiley
Mech. Lab.	Departmental Lab. Notes	Mimeographed	

Course	Title	Author	Publisher
Water Supply	Water Supply Engineering	Babbitt-Doland	McGraw-Hill
Metallurgy	Elements of Ferrous Metallurgy	Rosenholtz	John Wiley
Metallography	Mimeographed Notes		
Bridge Design	Notes taken by student in course.		
Water Supply	Sewerage & Sewage Treatment.	Babbitt	John Wiley

Third Year - First Term (Graduate)

Mathematics	Integral Calculus Notes	Byerly Crockett	Stechert &Co.
Internal Work	Mechanics of Internal Work	Church	John Wiley
	Statically Indeterminate Stresses	(Parcell (Manny	John Wiley
Heating and Ventilation	(Mech. Equip. Vol. I	(Harding	John Wiley
	(Heating & Ventilation	(Willard Greene	John Wiley
	Refrigeration		
	Mech. Engrs. Handbook	Marks	McGraw-Hill
R.R.Track Const.	Railway Track & Maint.	Tratman	McGraw-Hill
Compressed Air	Heat Engineering	Greene	McGraw-Hill
	Mech. Engineers Handbook	Marks	McGraw-Hill
	Mimeographed notes loaned by department.		
Power Plant. Mech.	Steam Power Plant Engineering	Gebhardt	John Wiley
Power Plant Elect.	Generating Stations	Lovell	McGraw-Hill
Reinforced Concrete	Elastic Arch. Bridges	(McCullough (Thayer	John Wiley

AW

Third Year - Second Term

Course	Title	Author	Publisher
Structures, Docks	No textbook	Lectures	
Business Adminis.	*(See note)		
Specifications	Elements Spec. Writing	Kirby	John Wiley
Communication Eng.	Telephone Communication	Wright Puchstein	McGraw-Hill
Mathematics	Differential Equations	Cohen	D.C. Heath
Power Plant Arch.	No text used. Reference Material. Mimeographed notes.		
Heating Vent. Lab.	No text used.		

* Text book has not been selected.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

TEXTBOOKS

Junior Group - Naval Constructors at Massachusetts Institute of Technology

Subject		Text
Business Law	Ec.61	Prins.of Business Law-Dillavou and Howard
Internal Combustion Engine	2.48	None
Marine Eng.Design	13.64	References - Blueprints, specifications
Marine Engineering	13.58	The Marine Power Plant by Lawrence B.Chapman
Merchant Shipbldg.	13.37	None
Model Making	13.48	None
Naval Architecture	13.01 13.02	None Reference - Naval Architecture - Peabody
Political Economy	Ec 35	Outline of Economics - Ely 5th Ed.
Shipyard Practice	13.39	None
Steam Turbines	13.70	References: Steam Turbines - Moyer Steam Turbines - Goudie Principles of Eng.Thermo. - Kiefer and Stuart Text Marine Engineer's Handbook - Frank Ward Sterling
Theory of Warship Des.	13.11 13.12	General Design of Warships-Hovgaard Modern History of Warships- " Speed & Power of Ships,Vol.I&II - Taylor
Warship Design	13.21 13.22	Structural Design of Warships - Hovgaard Stability Calculations - Bu.C&R References - Janes Fighting Ships and Texts of "Theory of Warship Design"

Subject		Text
Advanced Calculus	M38	Advanced Calculus - Woods
Elementary German	L13	Essentials of German-Vos.5th Ed. German-English Dictionary - Langenscheidt 2d Ed. Gasmaschinen und Olmaschinen,Vol. I-II, A.Kirschke No.316 & 651 Gleichstrommotoren - F.Niethammer, No.798

(8323-7/30/32)

UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

TEXTBOOKS

Senior Group - Naval Constructors at Massachusetts Institute of Technology.

Subject		Text
Aeronautics	16.78	Aircraft Propellers - Weick Aerostatics - Warner (Ref)
Naval Architecture	13.03	None
Precision of Measurements	8.07	Precision of Measurements & Graphical Methods - H.M.Goodwin
Theoretical Mechanics	2.291 2.292	Mechanics for Students of Physics and Engineering - Crew & Smith
Structural Design (Drawing Room Course)	1.46	No text books
Structures	1.45	Theory of Structures - C.M.Spofford
Theory of Warship Design	13.23 13.14	Structural Design of Warships - Hovgaard Modern History of Warships - Hovgaard
Warship Design	13.23 13.24	(Same as above)
Theory of Elasticity (2 terms) (2-6)	M791	Reference 1 copy - Applied Elasticity - J.Prescott 2 copies - Applied Elasticity - S.Timoshenko & J.M.Lessels
Aeronautics	16.76	None

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

Ordnance Explosive Engineer at University of Michigan

Subject	Text
Organic Chemistry-Chem.67	"Text Book of Organic Chemistry" by Holleman - 7th ed. Laboratory Manual of Organic Chemistry by Backman & Anderson
Engrg.Thermo. Chem.E 11	Thermodynamics - Lewis & Randall
Unit Processes Chem. E9	Principles of Chemical Engrg.by Badger and McCabe,pub.McGraw-Hill
Material Balances Chem.E28	Industrial Stoichemetry by Lewis & Randall
Organic Chemistry Chem. 69	Organic Chemistry - Perkins & Kipping
Chemical Technology of the Inorganic Industries Chem. E4	Inorganic Chemical Technology - by Badger and Baker
Chemical Technology of the Organic Industries Chem. E5	None - use various reference books
Explosives and Pyrotechnics Chem.E32	Explosives - 2 vols.by Marshall Explosives - Brunswick Military Explosives - War Dept. Ammunition Instructions for Naval Service - Navy Dept. Military Pyrotechnics - 3 vols. War Dept.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

TEXTBOOKS

Torpedo Design Group - 1st Year at Mass. Inst. Tech.

SUBJECT	TEXTBOOK
Automatic Machinery 207-208	:Notes, problems and lithographs :on Mechanism of Machines. Pub- :lished by M.I.T.
Dynamics of Machines 2.251	:No text required
Eng. Thermodynamics 2.40 2.42	:Thermodynamics - Goodenough or :Kiefer & Stuart. :Temperature Enthropy Diagram - :Berry. :Steam Tables - Keenan or Marks & :Davis.
Heat Treatment 3.713	:No text required
Machine Design 2.761 2.762	:Notes on Machine Design - Haven :1929
Materials of Eng. 2.301	:Materials of Eng.-Mills, 4th Ed. :Mechanical Engineers' Handbook - :Kent.
Mechanisms of Machines 2.06	:Notes; problems and lithographs :on mechanisms of Machines - Pub- :lished by M.I.T.
Metallography 3.615	:Metallic Alloys - Gulliver.
Physical Chemistry 5.683	:Physical Chemistry for Colleges - :3rd Ed. - Millard.
Physical Metallurgy 3.731 & 3.732	:The Science of Metals - Jeffries :& Archer. :Materials & Their Application to :Eng. Desigh - Allcut & Miller.
Automotive Eng. Lab. 2.691	:Manufacturers and Govt. Handbooks :& Reports. SAE data sheets and :text forms. Testing of High Speed :Internal Combustion Engines - :Judge.
X-Ray Photoelasticity 2.32	:No text required.
Dynamics of Rotation 2.256	:Price's Analytical Mechanics Vol. :IV (Always available in M.I.T. :Library
Thermodynamics 5.75T	:Thermodynamics - Translation by :Max. Plauck.
Torpedoes 2.51	:No text required.

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UNITED STATES NAVAL ACADEMY POSTGRADUATE SCHOOL

TEXTBOOKS FOR NAVAL CONSTRUCTOR GROUP

3-Year Plan - First Year

SUBJECT	TEXT
First Summer Mathematics	College Algebra - Harding & Mullins
do	Plane & Spherical Trigonometry - L.M.Passano
	Calculus - H.B.Phillips
	Differential Equations - H.B. Phillips
13.11-13.12 Theory of Warship Design	General Design of Warships - Hovgaard.
	Modern History of Warships - Hovgaard.
	Speed & Power of Ships Vol.1-2 Taylor
13.21-13.22 Warship Design	Structural Design of Warships - Hovgaard
	Stability-Calculations - Bu.C&R
2.20-2.221 Applied Mechanics	Mechanics - Crew & Smith
M36-37 Advanced Calculus	Advanced Calculus - Woods
13.01-13.02 Naval Architecture	Naval Architecture - Peabody
2.461 Heat Engineering	Notes on Heat Eng.-E.F.Miller '31
2.30 Materials of Engineering	Materials of Eng. - Mills
2.601 Engineering Lab.	
5.35 Applied Chemistry	Chemistry of Materials - Leighou
8.07 Precision of Measurements	Preciaion of Measurements & Graphical Methods - H.M.Goodwin
2.36 Test Materials Lab.	Materials of Testing - Cowdrey & Adams

Reuss 8318 - 7/21/32 (4)

Catalogues Issued

POSTGRADUATE SCHOOL. (DO NOT DETACH)

DATE

Serial No. File No.

TO	Ck	Init.
Head of School	X	
Exec. Officer	X	
Lt.Cdr. Woodruff	X	
Lt.Cdr. Little	X	
Lt.Cdr. Eldredge	X	
Lt.Cdr. Nimitz	X	
Lt.Cdr. Richards	X	
Lt.Cdr. Pigman	X	
Lt.Cdr. Lovette	X	
Lieut.Poehlmann		
Lieut. Lyttle		
Lieut. Brumbaugh		
Lieut. Wellings		
Lieut.Taylor		
Lieut. Stokes	X	
Lieut.Strong		
Prof. Root	X	
" Bramble		
Assoc.Prof. Rawlins		
Asst.Prof. Coates		
Prof. Kiefer	X	
AssocProf.Kavanaugh		
" " Wilbur		
Prof.Wagner	X	
Assoc.Prof. Giet		
" " Terwilliger	X	
Asst.Prof. LaCauza		
" " Wheeler		
" " Dornblatt	X	
" " Coonan		
Prof. Hill		
Assoc.Prof. Dorcas		
Librarian		
Chief Clerk		
Ldr.Sht.Met.Wkr.		
Aviators		
Mrs. Brown		

FOR

Action
Investigation
Information
Prepare (Report
(Reply
Oral Comment
Memo. Comment
Inspection
Keep ( )
Return to
File
Tracer
Destroy
Expedite

Remarks:

S.C. Hooper
I. Noyes –
E.M. Shipp
H.B. Hird –
B.V. McCandlish (4) –
Am Soc Fulton.
Comdr.