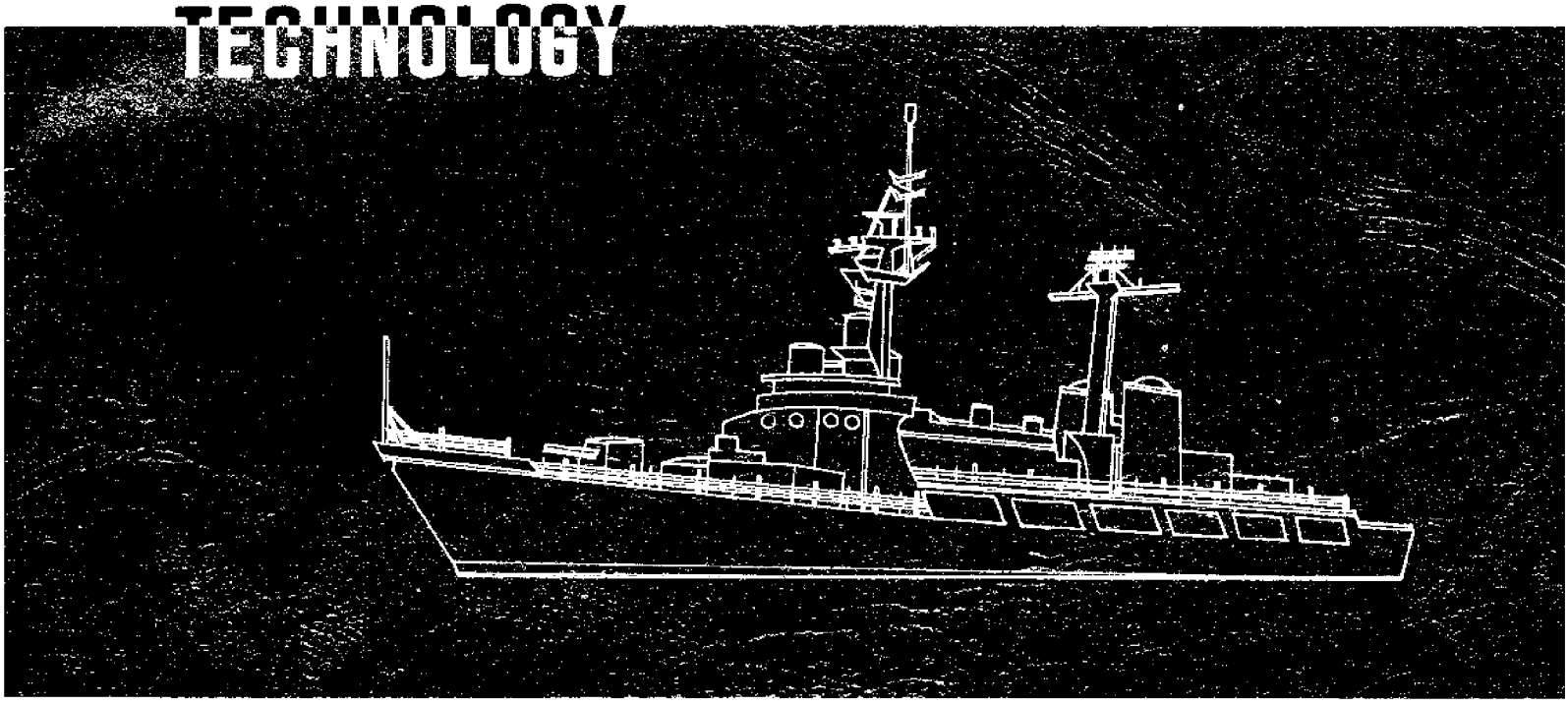
A CURRICULUM IN MARINE ENGINEERING TECHNOLOGY



prepared by the

INSTITUTE OF ENGINEERING TECHNOLOGY

a Division of the
COLLEGE OF ENGINEERING
MISSISSIPPI STATE UNIVERSITY

DRAWER GL
STATE COLLEGE, MISSISSIPPI

under GRANT GH — 25 from the

OFFICE OF SEA GRANT PROJECTS
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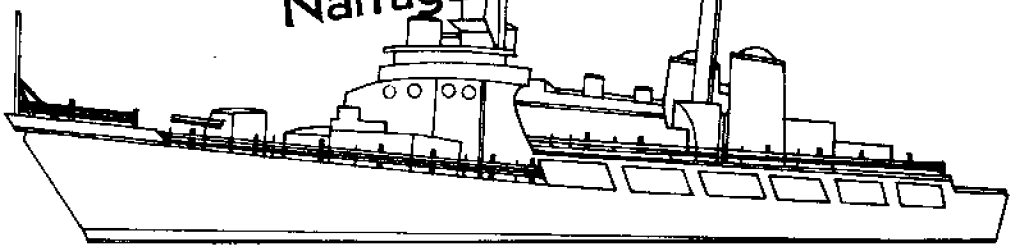
A CURRICULUM IN MARINE ENGINEERING TECHNOLOGY



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INTRODUCTION

Grant GH-25 was made to the Gulf Coast Technical Institute, now the Institute of Engineering Technology by the Sea Grant Office of the National Science Foundation to develop and offer a curriculum to produce highly competent manpower to work in those industries concerned with ship construction and ship repair. The curriculum has been titled Marine Engineering Technology, and is included with this report as Appendix A.

The Institute of Engineering Technology is a two year, senior college division of the College of Engineering of Mississippi State University whose graduates receive the Bachelor of Engineering Technology degree.

Engineering Technology at the Institute of Engineering Technology is intended to meet the academic needs of those students who are capable of completing a highly technical baccalaureate degree curriculum and whose inherent aptitude is for the application of engineering principles toward the solution of problems of a practical nature.

PRE-ENGINEERING TECHNOLOGY

Students admitted to the Institute must complete a 62 semester hour Pre-Engineering Technology curriculum to qualify for admission to the technology curriculums offered by the Institute. This curriculum is included with this report as Appendix B.

MARINE ENGINEERING TECHNOLOGY

The following chart shows the structure of the Marine Engineering Technology curriculum.

SUPPORT AREAS	MECHANICAL TECHNOLOGY	MARINE ENGINEERING TECHNOLOGY	NAVAL ARCHITECTURE TECHNOLOGY
	JUNIOR YEAR Fall Semester		
Mech & Mat I Comput Tech I Comput Tech Lab I Applied Calculus	Applied Thermodynamics		Shipbuilding Tech I
	Spring Semester		
Mech & Mat II Applied Math	Metals Tech	Marine Engineering Tech I	Naval Architecture Tech I
	SENIOR YEAR Fall Semester		
Oceanography II	Applied Dynamics	Marine Engineering Tech II Shipyard Op Tech I	Naval Architecture Tech II
	Spring Semester		
Oceanography I		Marine Engineering Tech III Shipyard Ventilation	Shipbuilding Tech II Naval Architecture Tech III

The courses listed under the headings Support and Mechanical Technology build on the Pre-Engineering Technology curriculum to provide the background in mathematics and applied science necessary for the proper development of the courses in Marine Engineering and Naval Architecture.

In the courses in Marine Engineering and Naval Architecture there is a strong emphasis on the applicability of the material to the shipbuilding industry.

Special attention is invited to the especially developed courses in Shipbuilding Technology and Shipyard Operations Technology.

A unique feature of the course in Shipbuilding Technology II is the "Shipyard Design Competition". In preparing for the competition the senior class is divided into two teams. Each team acts as a shipyard competing against the other for the contract to build a group of ships. Both teams work from identical sets of Preliminary Plans and Specifications.

In the Presentation the teams present their proposals before a guest panel of shipbuilders, naval architects and marine engineers.

FACULTY

The curriculum in Marine Engineering Technology has been developed and refined by a highly competent group of Naval Architects, Electrical, Mechanical, Aeronautical and Marine Engineers. Their resumes are included with this report as Appendix C.

TABLE OF CONTENTS

APPENDIX A

THE CURRICULUM IN MARINE ENGINEERING TECHNOLOGY

CET 2003

MECHANICS AND MATERIALS I

SYNOPSIS

A basic course in statics, a fundamental prerequisite to ensuing work in Marine Engineering Technology. Basic principles of static equilibrium are spiced with applications from ships and shipbuilding. Analytical solutions using vectors are emphasized and graphical solutions are introduced. Beam diagrams and stresses are introduced.

CET 2003

MECHANICS AND MATERIALS I

COURSE OUTLINE

I. Vectors

II. Vectors

III. Statics of Particles

IV. First Moments

V. Equilibrium Two Dimensional

VI. Equilibrium

VII. Equilibrium Three Dimensional

VIII. Centroids Two Dimensional

IX. Centroids Three Dimensional

X. Trusses

XI. Trusses

XII. Frames and Machines

XIII. Friction

XIV. Second Moments

XV. Beams

XVI. Stresses

TEXT:

Beer, F. P., and Johnston, E. R., Jr. Vector Mechanics for Engineers - Statics. New York, New York: McGraw-Hill Book Company,Inc., 1962.

CET 2014

MECHANICS AND MATERIALS II

SYNOPSIS

A practical introductory study of strength of materials. Strongly oriented toward simpler structural members in ships- Columns, Beams, torsion members, etc. Combined stresses and Mohr's Circle are given considerable attention. This course provides a firm foundation for more advanced structures courses in the Marine Engineering Technology program.

CET 2014

MECHANICS AND MATERIALS II

COURSE OUTLINE

I. Stresses and Deformation

II. Joints - Welding Riveted

III. Torsion

IV. Shear and Moment in Beams

V. Shear and Moment in Beams

VI. Shear and Moment in Beams

VII. Stresses in Beams

VIII. Stresses in Beams

IX. Stresses in Beams

X. Deflection in Beams

XI. Deflection in Beams

XII. Deflection in Beams

XIII. Combined Stresses

XIV. Combined Stresses

XV. Combined Stresses

XVI. Review

TEXT:

Robinson, J. L. Mechanics of Materials. New York, New York: John Wiley and Sons, Inc., 1969.

EET 2201

ELECTRONIC COMPUTING LABORATORY I

SYNOPSIS

The purpose of this course is to provide actual computer operation experience to students enrolled in the EET 2202 course. Emphasis is on actual computer operation and programming.

EET 2201

ELECTRONIC COMPUTING LABORATORY I

COURSE OUTLINE

The first three to five laboratory sessions are concerned with machine operation of the PDP-8 computer. Each student is required to lead the computer with the RIM loader, the BINARY loader and the FOCAL program. Each student is required to demonstrate a competency in the operation of all the equipment including the computer, the high speed paper tape reader and printer and the teletypes. During the next eight to ten laboratory sessions the student is required to use the computer to solve elementary engineering type problems using the FOCAL language. The last two laboratory sessions are devoted to other programming languages such as FORTRAN and PAL III.

TEXT:

_____. Introduction to Programming. Maynard, Massachusetts: Digital Equipment Corporation, 1968.

PRINCIPAL REFERENCES:

Andree, R. V. Computer Programming and Related Mathematics. New York, New York: John Wiley & Sons, Inc., 1967.

Rice, J. K. and Rice, J. R. Introduction to Computer Science. New York, New York: Holt, Rinehart & Winston, 1969.

EET 2202

ELECTRONIC COMPUTING TECHNOLOGY I

SYNOPSIS

The purpose of this course is to make the students aware of the computer as a design tool and get them to a reasonable level of proficiency in programming a small digital computer using a conversational language. The course includes introductions to such topics as binary and octal numbers Boolean algebra, and logic. However the major effort in this course is in programming and problem solving using the conversation language FOCAL as the basic tool.

EET 2202

ELECTRONIC COMPUTING TECHNOLOGY I

COURSE OUTLINE

I. Number Systems

II. Boolean Algebra

III. PDP-8 Introduction

IV. Flow Charts and Programming Logic

V. FOCAL Instructions

VI. Construction of Familiar Algorithum

VII. Classification of Solution Methods

VIII. Nature of Errors and Uncertainty

IX. Other Programming Languages, Fortram, Etc.

X. Quizzes and Review

TEXT:

_____. Introduction to Programming. Maynard, Massachusetts: Digital Equipment Corporation, 1968.

PRINCIPAL REFERENCES:

Andree, R. V. Computer Programming and Related Mathematics. New York, New York: John Wiley & Sons, Inc., 1967.

Rice, J. K. and Rice, J. R. Introduction to Computer Science. New York, New York: Holt, Rinehart & Winston, 1969.

GET 2103

APPLIED CALCULUS

SYNOPSIS

The intent of this course is to instruct the student in selected topics of differential and integral calculus and infinite series. Emphasis is placed on topics and applications pertaining to Engineering Technology.

GET 2103

APPLIED CALCULUS

COURSE OUTLINE

I. Review of Formulas from Algebra, Geometry and Trigonometry Required in Calculus

II. Differentiation: Concepts and Significance

- A. Increments
- B. Limits
- C. Slope
- D. Derivative

III. Differentiation of Algebraic Functions

- A. Formulas
- B. Applications

IV. Differentiation of Transcendental Functions, Differentials

- A. Formulas
- B. Applications

V. Successive Differentiation

- A. Formulas
- B. Applications

VI. Integration: Concepts and Significance

- A. Summation, inverse and significance
- B. Constant of Integration

VII. The Indefinite Integral Integration of Standard Elementary Forms

VIII. Constant of Integration and Applications

IX. The Definite Integral and Applications

X. Selected Devices for Formal Integration

XI. Use of Table of Integrals

XII. Series: Concepts and Significance

TEXT:

Granville, W. A., Smith, P. F., and Longley, W. R. Elements of the Differential and Integral Calculus. Waltham, Massachusetts: Blaisdell Publishing Company, 1962.

GET 2113

APPLIED MATHEMATICS

SYNOPSIS

The purpose of Applied Mathematics is to instruct the student in selected topics and applications of differential equations, vector algebra, and numerical methods. Emphasis is placed on applications of concern in engineering technology.

GET 2113

APPLIED MATHEMATICS

COURSE OUTLINE

I. Solutions of Selected Differential Equations of First and Higher Orders

   A. With variables separable

   B. With use of integrating factors

   C. Recognition of integrable combinations

II. Solutions of Special Forms of Differential Equations

   A. Homogeneous equations

   B. Linear equations

III. Applications of Differential Equations

   A. Dynamics

   B. Electric circuits

   C. Heat flow

   D. Mechanics

IV. Operators

   A. Complementary functions

   B. Particular integrals

   C. Simultaneous equations

V. Infinite Series

   A. Power Series

   B. Trigonometric series

   C. Applications

VI. Selected Topics of Vector Algebra

VII. Selected Examples of Numerical Methods

TEXT:

Reddick, H. N., and Miller, F. H. Advanced Mathematics for Engineers. New York, New York: John Wiley and Sons, Inc., 1967.

GET 2303

APPLIED THERMODYNAMICS

SYNOPSIS

The purpose of Applied Thermodynamics is to instruct the student in basic principles of thermodynamics. Emphasis is placed on topics having applications in heat engines and systems encountered in engineering technology.

GET 2303

APPLIED THERMODYNAMICS

COURSE OUTLINE

I. Concepts and Definitions

   A. Energy, matter, time

   B. Work, heat, temperature, friction

   C. Historical context of thermodynamic problems and application to steam engines

II. Internal Energy, Flow Work, Enthalpy

   A. Specific Heat, latent heat

   B. Examples and problems

III. First Law of Thermodynamics, Flow Processes

   A. Examples

   B. Problems

IV. The Second Law of Thermodynamics

   A. Reversibility and entropy

   B. Efficiency

   C. Applications to cycles

   D. Examples and problems

V. Properties of Pure Substances

   A. States

   B. Phases, Equilibrium

   C. Diagrams

   D. General relations of properties

VI. Use of Tabulated data

   A. Steam

B. Other gases

C. Vapors

D. Mixtures

VII. Vapor and Gas Cycles

A. Rankine cycle and variations

B. Otto cycle

C. Diesel cycle

E. Brayton cycle

VIII. Fluid Flow and Applications of Dynamics

A. Nozzle

B. Turbo Machines

IX. Combustion Processes

A. Concepts

B. Elementary applications

C. Mass and energy relations

D. Heating values and efficiencies

TEXT:

Mooney, David A. Introduction to Thermodynamics and Heat Transfer. Englewood Cliffs, New Jersey: Prentice Hall, 1965.

GET 2403

METALS TECHNOLOGY

SYNOPSIS

The purpose of Metals Technology is to instruct the student in basic principles of metalurgy, metal working, and the characteristics and properties of materials. Emphasis is placed on the requirements of marine applications.

GET 2403

METALS TECHNOLOGY

COURSE OUTLINE

I. Properties of Materials

A. Physical and mechanical properties

B. Stress and strain: compression, tension shear

C. Elastic limit yeild, plastic flow, ductility, ultimate strength

D. Hardness and hardness tests

E. Repeated loads, damping, hysteresis, toughness, fatigue

II. The Nature of Metals and Alloys

A. Metalic properties and structure

B. Crystaline structure of common metals

C. Grains, grain boundaries

D. Slip planes, dislocations

E. Plastic and brittle behavior

F. Hot and cold working, recrystalization, grain growth

III. Production of Metals Commonly Used in Marine Work

A. Pig iron and cast iron

B. Steel

C. Copper

D. Aluminum

E. Other Metals

IV. Equilibrium Diagrams

A. Phases

B. Cooling curves

C. Solubility, eutectics, solid solutions

D. Iron - carbon equilibrium diagram, iron structures, cast-irons

V. Heat Treatment

A. General

B. Steel-quenching, tempering, structures, hardenability

C. Case hardening, annealing, normalizing

D. Solution heat treating and precipitation hardening

E. Heat treating methods and equipment

F. Design factors, warping cracking

VI. Alloy Steels and Irons: Additions for:

A. Strength

B. Hardenability

C. High and low temperature stability

D. Corrosion resistance

E. Machinability

VII. Nonferrous Alloys

A. Aluminum

B. Copper

C. Titanium

VIII. Non-metalic materials

A. Plastics and reinforced plastics

B. Ceramics and cements

C. Wood

IX. Casting Processes

A. Sand

B. Permanent molds, die casting, investment casting

C. Centrifugal casting

D. Design for casting

X. Hot and Cold Forming

A. Rolling

B. Forging

C. Extruding

D. Stamping and Drawing

E. Spinning

XI. Machining

A. Chip formation

B. Grinding and abrasives

C. Electric, flame and chemical cutting

D. Machine configurations

XII. Corrosion of Metals in Marine Use

A. Ferrous

B. Non-ferrous

TEXT:

DeGarmo, E. P. Materials and Processes in Manufacturing. New York, New York: The Macmillian Book Company, 1969.

REFERENCES:

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Leward, H. L., Ed. Marine Engineering, Volumes I and II. New York, New York: The Society of Naval Architects and Marine Engineers, 1968.

_____. Rules for Building and Classing Steel Vessels. New York, New York: American Bureau of Shipping, 1970.

GET 2503

OCEANOGRAPHY I

SYNOPSIS

An introduction to the phenomena of Physical Oceanography, air-sea interaction and ocean meterology. The primary direction taken in the course is to provide information of interest to engineers as it relates to experimental and practical activities conducted in the ocean environment. Those aspects of oceanography that have a major effect on ships are emphasized.

GET 2503

OCEANOGRAPHY I

COURSE OUTLINE

I. Introduction - Earth

II. Maps - Time

III. Atmosphere

IV. Energy Source

V. Ocean Structure Fluid Behaviour

VI. Winds and Currents

VII. Wind Systems

VIII. Water Masses

IX. Circulation of Water Masses

X. Ice

XI. Condensation and Precipitation

XII. Air Masses Synoptic Meterology

XIII. Tropical Cyclones

XIV. Wind Waves

XV. Tides

XVI. Review

TEXT:

Williams, J., Higginson, John J., and Rohbough, J. D. Sea and Air. Annapolis, Maryland: United States Naval Institute, 1968.

PRINCIPAL REFERENCES:

Gorgn, P. The Waters and the Sea. London, United Kingdom: Van Nostrand Company, Ltd 1967.

Gross, M. Grant. Oceanography. Columbus, Ohio: Charles E. Morril Publishing Company, 1967.

King, Cochlaine A.M. An Introduction to Oceanography. New York, New York: McGraw-Hill Book Company, Inc., 1962.

Kusman, Blair. Wind Waves. Englewood Cliffs, New Jersey: Prentice Hall, 1965.

Novman, Girhard, Peirson, and Willard, J. Principals of Physical Oceanography. Englewood, Cliffs, New Jersey: Prentice Hall, 1966.

Spar, J. Earth, Sea and Air. Reading, Massachusetts: Addison Wesley Publishing Company, 1965.

GET 2603

OCEANOGRAPHY II

SYNOPSIS

A continuation of Oceanography I dealing with the phenomena of Geological, Chemical and Biological Oceanography. The information presented is of a practical nature intending to reveal those areas where various engineering talents are useful and necessary. Oceanographic aspects of pollution and shoreline utilization are demonstrated. Ships are affected by these branches of oceanography in many ways; these topics are given special emphasis.

GET 2603

OCEANOGRAPHY II

COURSE OUTLINE

I. Introduction

II. Continents and Sea Bed

III. Seismography

IV. Continental Shore

V. Coasts and Beaches

VI. Coastal Margin Shoreline Utilization

VII. Resource Exploitation

VIII. Water - Universal Solvent Electrolytic Corrosion

IX. Carbon Cycle

X. Biosphere Character of Oceans

XI. Energy Transmission Light Sound

XII. Basis of Life in Sea

XIII. Plant Life - Exploitation

XIV. Animal Life - Exploitation

XV. Marine Ecology

XVI. Pollution

TEXT:

Weyl, Peter K. Oceanography: An Introduction to the Marine Environment. New York, New York: John Wiley and Sons, Inc., 1970.

PRINCIPAL REFERENCES:

Scientific American. September, 1969 issue.

GET 3323

APPLIED DYNAMICS

SYNOPSIS

The intent of this course is to introduce the concepts and techniques of Classical Dynamics to the students. Particular attention is given to Kinematics of Particles, Kinetics of Particles (Force, Mass, and Acceleration; Work and Energy; and Impulse and Momentum), Kinematics of Rigid Bodies, and Mechanical Vibrations. An extensive effort is made to select problems and examples which occur in the shipbuilding industry.

GET 3323

APPLIED DYNAMICS

COURSE OUTLINE

I. Kinematics of Particles

   A. Rectilinear Motion

   B. Curvilinear Motion

II. Kinetics of Particles

   A. Force, mass and acceleration

   B. Work and Energy

   C. Impulse and Momentum

III. Kinematics of Rigid Bodies

   A. Forces and Accelerations

   B. Energy and Momentum Methods

IV. Mechanical and Shipboard Vibrations

   A. Free

   B. Damped

   C. Forces

TEXTS:

Beer, F. P. and Johnston, E. R. Vector Mechanics for Engineers: Dynamics. New York, New York: McGraw-Hill Book Company, Inc., 1962.

PRINCIPAL REFERENCES:

Church, A. H. Mechanical Vibrations. New York, New York: John Wiley & Sons, Inc., 1957.

Den Hartog, J. P. Mechanical Vibrations. New York, New York: John Wiley & Sons, Inc., 1957.

Meriam, J. L. Mechanics - Part II - Dynamics. New York, New York: McGraw-Hill Book Company, Inc., 1966.

Pletta, Dan H. Engineering Statics and Dynamics. New York, New York: The Ronald Press Company, 1951.

MAT 2004

SHIPBUILDING TECHNOLOGY I

SYNOPSIS

The intent of this course is to introduce the student to Shipbuilding, Naval Architecture, and Marine Engineering. Beginning with the peculiar nomenclature used in the shipbuilding industry, fundamental principles and concepts are explained and applied. Particular attention is given to ships' lines, weight and displacement calculations, integrating rules, coefficients of form, ship types, ship components, and ship arrangements. This course is the foundation for subsequent shipbuilding oriented courses.

MAT 2004

SHIPBUILDING TECHNOLOGY I

COURSE OUTLINE

I. Introduction and Nomenclature

II. Ship Lines and Offsets

III. Weight and Displacement Calculations

IV. Integrating Rules

V. Coefficients of Form

VI. Freeboard and Tonnage

VII. Ship Types (Merchant and Naval)

VIII. Classification Societies

IX. Ship Structural Components

X. Ground Tackle

XI. Marine Power Plants

XII. Habitability and General Arrangements (Merchant and Naval)

XIII. Access and Access Fittings

TEXT:

Baker, E. Introduction to Steel Shipbuilding. New York, New York: McGraw-Hill Book Company, Inc., 1953.

PRINCIPAL REFERENCES:

Comstock, J. E., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: McGraw-Hill Book Company, Inc., 1969.

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Gillmer, T. C. Modern Ship Design. Annapolis, Maryland: The United States Naval Institute, 1970.

Latham, R. F. Introduction to Marine Engineering. Annapolis, Maryland: The United States Naval Institute, 1968.

Rawson, K. J. and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Seward, H. L., Ed. Marine Engineering. New York, New York: McGraw-Hill Book Company, Inc., 1944.

MAT 2104

MARINE ENGINEERING TECHNOLOGY I

SYNOPSIS

Marine Engineering Technology I is to instruct the student in selected topics of Marine Engineering Technology. Emphasis is placed on basic principles of main propulsion and auxillary machinery. Steam propulsion is covered with study of steam cycles, steam generators, condensers, turbines and auxiliaries. Basic principles of Diesel and gas turbine plants are also covered.

MAT 2104

MARINE ENGINEERING TECHNOLOGY I

COURSE OUTLINE

I. Heat Engines and Cycles as Applied to Marine Propulsion
   A. Steam cycles: rankine, reheat, regenerative
   B. Diesel cycle, otto cycle
   C. Brayton cycle

II. Steam Generators
   A. Types and components, functions
   B. Operation and controls

III. Steam Turbines
   A. Types
   B. Principles of operation

IV. Other components of steam plants
   A. Condensers
   B. Feedwater heaters and feedwater treatment
   C. Feedwater pumps
   D. Piping and valves
   E. Circulating pumps and other auxiliaries
   F. Generators

V. Diesel engines
   A. Principles and types
   B. Components and construction
   C. Operation

VI. Gas Turbines
   A. Principles and types

B. Components and construction

C. Operation

VII. Nuclear Propulsior

A. Nuclear reactors

B. Plant types

C. Operation and control

D. Hazzards and protection

VIII. Fluid Mechanics

A. Fluid statics

B. Fluid flow continuity

C.. Bernouli's equation, dynamic pressure, momentum

D. Friction, boundary layers, separation

E. Nozzles and diffusers, pipe flow

TEXT:

Seward, H. L. Marine Engineering, Volumes I and II. New York, New York: The Society of Naval Architects and Marine Engineers, 1968.

REFERENCES:

Binder, R. C. Fluid Mechanics. Englewood Cliffs, New Jersey: Prentice Hall, 1962.

Latham, R. F. Introduction to Marine Engineering. Annapolis, Maryland: United States Naval Institute, 1968.

Mooney, David A. Introduction to Thermodynamics and Heat Transfer. Engle-Wood Cliffs, New Jersey: Prentice Hall, 1955.

MAT 2603

NAVAL ARCHITECTURE TECHNOLOGY I

SYNOPSIS

This course deals with the application of the principles of Statics to waterborne ships. The fundamental relationships governing the stability of ships are explained and used. Particular attention is given to Metacentric Height and Radius, Hydrostatic Curves, Cross Curves, Statical Stability Curves, Free Surface, Grounding, and the Inclining Experiment. Examples and problems are taken from shipyard experiences and situations. Actual stability data as delivered to existing ships are used in class.

MAT 2603

NAVAL ARCHITECTURE TECHNOLOGY I

COURSE OUTLINE

I. Hydrostatic Principles

II. Initial Stability - Metacentric Height - Metacentric Radius

III. Trim

IV. Hydrostatic Curves

V. Inching Experiment

VI. Cross Curves of Stability

VII. Curve of Statical Stability

VIII. Effect of Weight Changes

IX. Partially Waterborne Ships

X. Free Surface

XI. Stability Criteria

XII. Bon Jean Curves

TEXT:

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

PRINCIPAL REFERENCES:

Attwood, E. L. and Pengally, H. S. Theoretical Naval Architecture. London, W.1, United Kingdom: Longmans, Green and Company, Ltd., 1953.

Baker, E. Introduction to Steel Shipbuilding. New York, New York: McGraw-Hill Book Company, Inc., 1953.

Comstock, J. P., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Gillmer, T. C. Modern Ship Design. Annapolis, Maryland: The United States Naval Institute, 1970.

Rawson, K. J. and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Saunders, H. E. Hydrodynamics in Ship Design. New York, New York: The Society of Naval Architects and Marine Engineers, 1957.

MAT 3014

SHIPYARD OPERATIONS TECHNOLOGY

SYNOPSIS

This course is designed to explain the various aspects of building ships in shipyards. Important characteristics of the processes of fabrication and manufacture of ships are brought out. The organization of shipyard personnel, planning and scheduling operations, and various estimating activities are emphasized. Laboratory work includes a weight estimate and a preliminary design for a shipyard.

MAT 3014

SHIPYARD OPERATIONS TECHNOLOGY

COURSE OUTLINE

I. Introduction and Historical Review

II. Shipyards

III. Lofting

IV. Fabrication of Parts

V. Assembly and Fabrication of Sections

VI. Assembly and Alignment of Sub-Assemblies, Dimensional Control

VII. Machinery Installation

VIII. Fitting Out

IX. Launching Systems and Launching

X. Trials and Delivery

XI. Production Control

XII. Cost Control

XIII. Quality Control

XIV. Administration

XV. Estimating

XVI. Accounting - Review

PRINCIPAL REFERENCES:

Baker, E. Introduction to Steel Shipbuilding. New York, New York: McGraw-Hill Book Company, Inc., 1953.

D'Arcangelo, A. M. A Guide to Sound Ship Structures. Cambridge, Massachusetts: The M.I.T. Press, 1964.

D'Arcangelo, A. M. Ed., Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Dixon, J. H., Translated from Russian. Dormidontov, V. K., Arftgev, T. V., Kiseleva, N. A., Kuzmenko, V. K., Nikitin, E. L. and Turunov, S. U. Shipbuilding Technology. Moscow: Mir Publishers, 1969.

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Hind, J. Anthony. Ship Design and Shipbuilding Production. London: Temple Press, 1965.

_____. Marine Fouling and its Prevention. Annapolis, Maryland: The United States Naval Institute, 1952.

Articles from current periodicals.

MAT 3024

SHIPBUILDING TECHNOLOGY II

SYNOPSIS

The intent of this course is to integrate all aspects of the program into one final, comprehensive design course. The students are divided at the beginning of the semester into teams representing different shipyards of their own design. Each team, or "company", is then given an identical set of preliminary design plans and other data. In DIRECT COMPETITION the teams are expected to develop and present formally a comprehensive shipbuilding program. The presentation is judged by distinguished members of the shipbuilding community at the end of the semester, and one team emerges with a "contract". The students must therefore learn to correlate information from previous courses, to develop an integrated shipyard program, to work together for a desired end result, and to operate in an atmosphere of competition. Technical and managerial guidance is extended during the semester, but the design represents the students' decisions and approach.

MAT 3024

SHIPBUILDING TECHNOLOGY II

COURSE OUTLINE

The final Design Presentation by the students shall include, but shall not be limited to, the following items:

1. Inclining Experiment
2. Sea Trials
3. Launching
4. Specifications
5. Compartment Testing Plans
6. Painting Schedule
7. ABS Certification
8. Faired Offsets
9. Schedule of LOS for critical items
10. Subassembly Breakdown
11. Strength Check
12. Main Propulsion Layout
13. Piping Plans
14. Ventilation Plans
15. Steel Schedule
16. Electrical Plans
17. Quality Assurance Plan
18. Value Engineering Plan
19. Systems Test Agenda
20. Weight Calculations
21. Change Order System

22. General Arrangement Plans

23. Stability Data

24. Welding Sequence

25. Structural Details

26. Propeller Shaft Design

27. Tailshaft Design

28. Contract Proposal

29. Cost Estimate

30. Shipyard Organization and layout

31. Critical Path Example for Assembly

32. Shipway Schedule Chart

33. Plan Schedules - Strict, Mach, Piping, Ventilation, Joiner, Electrical

34. Erection Sequence of Ship and Major Assembly

35. Man Hour Estimates

36. Weld Inspection Plan

37. Anchor Selection

38. Material Identification System

39. Typical Foundation Plans

40. Structural Plans - DK, BHD, Stanchions

SUGGESTED REFERENCES:

Attwood, E. L., and Pengally, H. S. Theoretical Naval Architecture. London, W 1, United Kingdom: Longmans, Green and Company, Ltd., 1953.

Baker, E. Introduction to Marine Engineering. New York, New York: McGraw-Hill Book Company, Inc., 1953.

Blodgett, O. N. Design of Welded Steel Structures. Cleveland, Ohio: The James F. Lincoln Arc Welding Foundation, 1966.

Church, A. H. Mechanical Vibrations. New York, New York: John Wiley & Sons, Inc., 1957.

Comstock, J. P., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D' Arcangelo, A. M. A Guide to Sound Ship Structure. Cambridge, Maryland: The Cornell Maritime Press, Inc., 1964.

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Den-Hartog, J. P. Mechanical Vibrations. New York, New York: McGraw-Hill Book Company, Inc., 1957.

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Gillmer, T. C. Modern Ship Design. Annapolis, Maryland: The United States Naval Institute, 1970.

Korvin-Kruokovsky, B. V. Theory of Seakeeping. New York, New York, The Society of Naval Architects and Marine Engineers, 1961.

Latham, R. F. Introduction to Marine Engineering. Annapolis, Maryland: The United States Naval Institute, 1959.

L. Lord. Naval Architecture of Planing Hulls. Cambridge, Maryland: The Cornell Maritime Press, Inc.

Manning, G. C. The Theory and Techniques of Ship Design. Cambridge, Massachusetts: The M. I. T. Press, 1956.

Meriam, J. L. Mechanics - Part II - Dynamics. New York, New York: John Wiley & Sons, Inc., 1966.

Payne, C. N. Descriptive Analysis of Naval Turbine Propulsion Plants. Annapolis, Maryland: The United States Naval Institute, 1961.

Pletta, Dan H. Engineering Statics and Dynamics. New York, New York: The Ronald Press Company, 1951.

Rawson, K. J. and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Saunders, H. E. Hydrodynamics in Ship Design. New York, New York: The Society of Naval Architects and Marine Engineers, 1957.

Seward, H. L. Marine Engineering. New York, New York: The Society of Naval Architects and Marine Engineers, 1944.

Thein, Wah, Ed. A Guide for the Analysis of Ship Structures. Washington 25, D. C.: United States Department of Commerce, Office of Technical Services, 1960.

Todd, F. H. Ship Hull Vibration. London, United Kingdom: Edward Arnold, Ltd. 1961.

Williams, J. and Higginson, J. Sea and Air. Annapolis, Maryland: The United States Naval Institute, 1969.

_____. Marine Fouling and its Prevention. Annapolis, Maryland: The United States Naval Institute, 1952.

_____. Properties of Combined Beam and Plate. Washington, D.C.: United States Department of Commerce, Office of Technical Services.

_____. Steel Construction Manual. New York, New York: American Institute of Steel Construction, Inc.

MAT 3114

MARINE ENGINEERING TECHNOLOGY II

SYNOPSIS

The purpose of Marine Engineering Technology II is to instruct the student in the practices, principles and problems associated with ship propulsion units, hull machinery and systems. Emphasis in this course is placed on the design, mechanical and operational features. Topics emphasized include combustion, heat transfer, turbo machinery, diesel engines, gas turbines, hull machinery and electrical and piping systems.

MAT 3114

MARINE ENGINEERING TECHNOLOGY II

COURSE OUTLINE

I. Combustion Processes

- A. Fuels and composition
- B. Fuel air ratio
- C. Operation and control

II. Heat Transfer

- A. Heat and units of heat measurement
- B. Transfer by conduction
  1. Through plane and cylindrical walls
  2. Resistance, multiple walls, films
- C. Transfer by convection
- D. Transfer by radiation
- E. Heat exchangers
- F. Insulation

III. Turbo and positive displacement fluid handling machines

- A. Pumps
- B. Fans
- C. Turbines

IV. Propeller Drives

- A. Reduction gears
  1. Turbine drives
  2. Diesel drives, reverse gears, and clutches
- B. Electric Drives
- C. Shafting and bearings

V. Hull Machinery

A. Stearing gears

B. Winches, cranes, hoisting machinery, capstans, anchors and chains

VI. Systems

A. Electrical

B. Piping

TEXT:

Seward, H. L. Ed. Marine Engineering, Volumes I and II. New York, New York: The Society of Naval Architects and Marine Engineers, 1968.

REFERENCES:

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1968.

Rawson, K. J. and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, Inc. 1968.

MAT 3123

MARINE ENGINEERING TECHNOLOGY III

SYNOPSIS

This course delineates the characteristics of the resistance of bodies moving through the water and the design characteristics of propulsion systems for ships with emphasis on those aspects concerned with the installation of these systems in ships.

MAT 3123

MARINE ENGINEERING TECHNOLOGY III

COURSE OUTLINE

I. Introduction Bernoulli's Law Flow Characteristics

II. Viscous Resistance

III. Wave Making Resistance

IV. Geometric Similitude

V. Model Testing

VI. Ship Resistance Production

VII. Producing Thrust in Water

VIII. Hydrofoil Phenomena

IX. Propeller Action Aft of Ship

X. Propeller Selection

XI. Cauitation, Propulsion Experiments

XII. Rudders and Steering

XIII. Trials and Model Test Correlations

XIV. Main Propulsion Systems

XV. Dynamically Supported Craft

XVI. Submersibles - Review

PRINCIPAL REFERENCES:

Attwood, E. L., and Pengally, H. S. Theoretical Naval Architecture. London, United Kingdom: Longmans, Green and Company, Ltd. 1953.

Comstock, J. P., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Korvin-Kroukovsky, B. V. Theory of SeaKeeping. New York, New York: The Society of Naval Architects and Marine Engineers, 1961.

Lap, AJW, and Van Manen, J. D. Fundamentals of Ship Resistance and Propulsion. Rotterdam.

Lap, AJW, and Van Manen, J. D. International Shipbuilding Progress. Rotterdam.

Rawson, K. J., and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1958.

Saunders, H. E. Hydrodynamics in Ship Design. New York, New York: The Society of Naval Architects and Marine Engineers, 1957.

MAT 3404

SHIPBOARD VENTILATION

SYNOPSIS

The purpose of Shipboard Ventilation is to instruct the student in the fundamental principles and practice of environmental control aboard ship. Basic concepts required in the design of systems are presented along with practice in the design of typical systems for heating, ventilating and air conditioning of representative portions of a ship.

MAT 3404

SHIPBOARD VENTILATION

COURSE OUTLINE

I. Concepts and Definitions

A. Environmental requirements for occupants, cargo, and equipment

B. Atmospheric properties: Temperature, humidity, pressures, latent heat, specific heat, enthalpy, chemical properties, biological properties

II. Ventilation Requirements Aboard Ship

A. Living and work spaces

B. Cargo holds

C. Machinery spaces

III. Computation of heating and cooling Loads

A. Use of psychrometric charts

B. Computation of heat transfer through boundaries of compartments

IV. Environmental Control Machinery and Systems

A. Heat exchangers

B. Refrigeration machinery

C. Air moving equipment

D. Ducting and piping

E. Controls

V. Procedure for System Design

A. Factors involved in selection of type of system

B. System components and layout

C. Sizing of system components

VI. Practice in the Design of a Representative System

TEXT:

Severns, W. H., and Fellows, J. R. Air Conditioning and Refrigeration. New York, New York: John Wiley and Sons, Inc., 1966.

REFERENCES:

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Rawson, K. J., and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Seward, H. L., Ed. Marine Engineering, Two Volumes. New York, New York: The Society of Naval Architects and Marine Engineers, 1968.

MAT 3614

NAVAL ARCHITECTURE TECHNOLOGY II

SYNOPSIS

The intent of this course is to instruct the students in the principles of analysis of ship primary and secondary stresses. The basic fundamentals of strength of materials are applied to longitudinal and transverse ships' structures. Particular attention is given to Longitudinal Stress, Ships' Plating, Structural Bulkheads and Decks, Stanchions and Plasticity. Many examples and problems are taken directly from actual shipyard and ship design situations. Structural calculations and plans from shipyard files are used as teaching aids.

MAT 3614

NAVAL ARCHITECTURE TECHNOLOGY II

COURSE OUTLINE

I. Longitudinal Bending Moment

II. Midship Section Modulus

III. Primary Stresses - Bending and Shearing

IV. Hull Girder Deflections

V. Plating

- A. Under Lateral Load
- B. Under Edge Compression
- C. Under Pure Shear
- D. Under Combined Loading

VI. Beam and Girder Design

VII. Structural Bulkheads and Decks

VIII. Plasticity and Ultimate Design

IX. Stanchions

X. Corrugated Plating

XI. Moment Distribution

XII. Secondary Stresses

TEXT:

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

PRINCIPAL REFERENCES:

Attwood, E. L. and Pergally, H. S. Theoretical Naval Architecture. London, W. 1, United Kingdom: Longmans, Green, and Company, Ltd., 1953.

Comstock, J. P., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D'Arcangelo, A. M. A Guide to Sound Ship Structures. Cambridge, Massachusetts: The Cornell Maritime Press, Inc., 1964.

Gillmer, T. C. Fundamentals of Construction and Stability of Navy Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Gillmer, T. C. Modern Ship Design. Annapolis, Maryland: The United States Naval Institute, 1970.

Manning, G. C. The Theory and Technique of Ship Design. Cambridge, Massachusetts: The M. I. T. Press, 1956.

Rawson, K. J. and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Wah, Thein, Ed. A Guide for the Analysis of Ship Structures. Washington, D. C.: United States Department of Commerce, Office of Technical Services, 1960.

_____. Properties of Combined Beam and Plate. Washington, D. C.: United States Department of Commerce, Office of Technical Services.

_____. Steel Construction Manual. New York, New York: American Institute of Steel Construction, Inc.

MAT 3623

NAVAL ARCHITECTURE TECHNOLOGY III

SYNOPSIS

The intent of this course is to instruct the students in the principles of analysis of ship tertiary stresses. The basic fundamentals of strength of materials are applied to locally design ships' structure. In addition, ship joining processes are covered. Particular attention is given to Deckhouse Design, Structural Discontinuities and Reinforcement, Welding (Design, Inspection, Distortion, and Sequences), wire rope and cargo Handling Gear, Foundations, Ratproofing, and Life Saving Equipment Stowage. Many examples and problems are taken directly from actual shipyard and ship design situations. Structural calculations and plans from shipyard files are used as teaching aids.

MAT 3623

NAVAL ARCHITECTURE TECHNOLOGY III

COURSE OUTLINE

I. Deckhouse and Superstructure Design

II. Structural Discontinuities

III. Reinforcement of Openings

IV. Riveting

V. Welding Design

VI. Welding Distortion

VII. Welding Sequence

VIII. Brittle Fracture

IX. Wire Rope

X. Cargo Handling Gear

XI. Foundations

XII. Dynamic Loading

XIII. Structural Vibrations

XIV. Inspection and Non-Destructive Testing

XV. Ratproofing

XVI. Life Saving Equipment Stowage

TEXT:

D'Arcangelo, A. M. A Guide to Sound Ship Structures. Cambridge, Maryland: The Cornell Maritime Press, Inc., 1964.

PRINCIPAL REFERENCES:

Blodgett, O. W. Design of Welded Steel Structures. Cleveland, Ohio: The James F. Lincoln Arc Welding Foundation, 1966.

Comstock, J. P., Ed. Principles of Naval Architecture. New York, New York: The Society of Naval Architects and Marine Engineers, 1967.

D'Arcangelo, A. M., Ed. Ship Design and Construction. New York, New York: The Society of Naval Architects and Marine Engineers, 1969.

Gillmer, T. C. Fundamentals of Construction and Stability of Naval Ships. Annapolis, Maryland: The United States Naval Institute, 1966.

Gillmer, T. C. Modern Ship Design. Annapolis, Maryland: The United States Naval Institute, 1970.

Rawson, K. J., and Tupper, E. C. Basic Ship Theory. New York, New York: American Elsevier Publishing Company, 1968.

Todd, F. H. Ship Hull Vibration. London, U. K.: Edward Arnold, Ltd., 1961.

Wah, Thein, Ed. A Guide for the Analysis of Ship Structures. Washington, D.C.: United States Department of Commerce, Office of Technical Service, 1960.

_____. Properties of Combined Beam and Plate. Washington, D.C.: United States Department of Commerce, Office of Technical Services.

_____. Steel Construction Manual. New York, New York: American Institute of Steel Construction, Inc.

APPENDIX B

THE PRE-ENGINEERING TECHNOLOGY CURRICULUM

APPENDIX B

PRE-ENGINEERING TECHNOLOGY CURRICULUM

The Pre-Engineering Technology Curriculum is made up of the following courses which must have been satisfactorily completed at an accredited junior or senior college and acceptable for transfer to Mississippi State University in accordance with the requirements contained in the General Bulletin:

Course	Semester Hours	
English Composition	6	
College Algebra or Elective	3	
Trigonometry or Elective	3	
Calculus I	3	
Calculus II	3	
Calculus III	3	
General Chemistry	8	
General Physics	8	
Engineering Graphics	6	
TOTAL REQUIRED		43
Socio-Humanistic Electives	15	
Free Electives	4	
TOTAL ELECTIVES		19
TOTAL PRE-ENGINEERING TECHNOLOGY		62

APPENDIX C

THE FACULTY

APPENDIX C

PERSONNEL DATA

Project Director

J. E. Thomas

Education:

B.A. - 1937 - Lambuth College, Jackson, Tennessee
Majors - Chemistry and Mathematics
BEE - 1939 - Vanderbilt University, Nashville, Tennessee
Electrical Engineering
MS - 1951 - Vanderbilt University, Nashville, Tennessee
Major - Physics, Minor - Mathematics

Experience:

1964 - Present - Director, Institute of Engineering Technology, College of Engineering, Mississippi State University
1962 - 1964 - Director of Development and Public Relations, Mississippi State University
1951 - 1962 - Professor of Electrical Engineering, Mississippi State University
1947 - 1950 - Field Engineer, Allen & Hoshall, Consulting Engineers, Memphis, Tennessee
1946 - 1947 - Electrical Engineer, City of Lexington, Tennessee
1943 - 1946 - Military Service
1941 - 1943 - Electrical Designer, Stone & Webster Engineering Company Boston, Massachusetts
1939 - 1941 - Electrical Designer, City of Jackson, Tennessee

Military Service:

1943 - Radar School, Bowdoin College, Massachusetts Institute of Technology
1943 - 1944 - Office of Inspector of Naval Material, General Electric Company, Schenactady, New York
1944 - 1946 - Radar Maintenance Officer, USS Shangri-La, CV-38
Present - Captain, USNR - Retired

PRINCIPAL INVESTIGATOR

Richard D. Benton

Education:

BSEE - 1958 - Mississippi State University, State College, Mississippi
MSEE - 1959 - Mississippi State University, State College, Mississippi

Experience:

1965 - Present - Associate Professor of Electronic Engineering Technology, Institute of Engineering Technology, Mississippi State University
1960 - 1965 - Assistant Professor of Electrical Engineering, University of Mississippi, Oxford, Mississippi
1959 - 1960 - Electrical Engineer, Melpar, Inc., Falls Church, Virginia

Francis G. Bartlett

Education:

B.S. - 1952 - University of Michigan, Ann Arbor, Michigan
Naval Architecture and Marine Engineering
M.S. - 1956 - University of Michigan
Naval Architecture and Marine Engineering

Experience:

1970 - Present - Associate Professor of Marine Engineering Technology, Institute of Engineering Technology, Mississippi State University
1961 - 1969 - Associate Professor of General Engineering, University of Washington
1962 - 1963 - Fullbright Lecturer in Naval Architecture, University of Alexandria, Egypt
1956 - 1960 - Assistant Professor of General Engineering, University of Washington
1957 - 1959 - Naval Architect, Todd Shipyard
1954 - 1955 - Naval Architect, Puget Sound Bridge and Drydock
1952 - 1954 - Naval Architect, Philip F. Spaulding, Seattle

Military Service:

1944 - 1946 - Lieutenant JG, U. S. Navy
1942 - 1943 - Third Mate and Second Mate, U. S. Merchant Marine

Glenn D. Bryant

Education:

B.S. - 1949 - Mississippi State University, State College, Mississippi
Aeronautical Engineering
M.S. - 1951 - Mississippi State University
Aeronautical Engineering

Experience:

1969 - Present - Assistant Professor of Marine Engineering Technology, Institute of Engineering Technology, Mississippi State University
1967 - 1969 - Bryant Aircraft Company, Consulting and Development
1967 - 1968 - Research work, Aerophysics Department, Mississippi State University
1965 - 1967 - Chief Engineer, Burns Aircraft Company, Starkville, Mississippi
1951 - 1965 - Research, Aerophysics Department, Mississippi State University
1939 - 1947 - Draftsman, Cleveland, Ohio

Military Service:

1943 - 1945 - Second Lieutenant, U. S. Army Air Corps

James F. Hallock

Education:

B.S. - 1962 - Virginia Polytechnic Institute
Mechanical Engineering
M.S. - 1965 - Massachusetts Institute of Technology
Naval Architecture and Marine Engineering

Experience:

1969 - Present - Associate Professor of Marine Engineering Technology, Institute of Engineering Technology, Mississippi State University
1968 - 1969 - Manager, Advanced Manufacturing Technology Department, Litton Advanced Marine Production Division, Ingalls Shipbuilding, Pascagoula, Mississippi
1968 - Section Head (Hull Module Engineering) LAMP Division
1967 - 1968 - Supervisory Naval Architect, Charleston Naval Shipyard
1962 - 1967 - Naval Architect, Charleston Naval Shipyard, Charleston, South Carolina
1963 - 1964 - Instructor in Naval Architecture, Virginia Polytechnic Institute

Military Service:

1956 - 1965 - U. S. Coast Guard Reserve